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TRANSCRIPT OF PROCEEDINGS

O/N H-910795

MR B. WALKER SC, Royal Commissioner

IN THE MATTER OF THE MURRAY-DARLING BASIN ROYAL COMMISSION

ADELAIDE

10.01 AM, WEDNESDAY, 25 JULY 2018

Continued from 24.7.18

DAY 13

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

MR BEASLEY: Before we begin, we acknowledge that this land that we meet on today is the traditional lands of the Kaurna People and that we respect their spiritual relationship with their country. We also acknowledge the Kaurna People as the custodians of the Adelaide region, and that their cultural and their heritage beliefs are still as important to the living Kaurna People today. We also pay our respects to the cultural authority of Aboriginal people visiting attending from other areas of South Australia or Australia present here. Commissioner, Mr Johnson is here to give his evidence. He was to be followed by Dr Mallen-Cooper who is a fish ecologist, or aquatic scientist. His flight has been cancelled.

So the options are, I think, the staff are trying to get him on another flight, but I don't know that – what that will mean in terms of him getting here. Another option being discussed is whether it's possible to give his evidence by Skype today. Him not coming isn't the end of the world, but it would present difficulties re scheduling, in the sense that it will be quite some time before he gives evidence, which would be unfortunate. I'm also told it's my fault that the flight was cancelled by the current Senior Solicitor.

THE COMMISSIONER: The Senior Solicitor for the time being, you mean?

MR BEASLEY: Well, I was asked my view as to whether the witness should get a sleep in, which I view as an inquiry of me and a decision-making responsibility that I hadn't factored into my fee agreement, but in any event we will see what happens during the course of today. Before we get to Mr Johnson's evidence, yesterday we discussed with Mr Clements – perhaps I didn't discuss with Mr Clements in detail, I discussed with you prior to Mr Clements giving evidence, some reports by Bewsher Consulting of September 2016 and September, I think, 2017, dealing with modelling frameworks for the Northern Basin Review and the SDL adjustments.

I hadn't had an opportunity to read a report entitled – also by Bewsher, which is B-e-w-s-h-e-r, a report entitled 'Barwon-Darling Valley Independent Audit of Cap Model, Final Report, January 2013' that Mr Clements had a copy of and that I understand has been produced via an FOI request. I'm not quite sure whether it's the New South Wales or the Australian Institute, we will find that out, but it only turned up this year and only turned up on my desk yesterday's. Do you have a copy of that?

THE COMMISSIONER: Yes, I have.

MR BEASLEY: It's worth running through a couple of matters in this. This was an audit that was sought- it was ordered to be produced under schedule E of the Basin Agreement which is part of the Water Act, the schedule to the Water Act. I think the relevant clause is – it is either clause 15 or clause 16. I think there's an independent audit group referred to in 15.

THE COMMISSIONER: This is - - -

MR BEASLEY: Schedule 1.

THE COMMISSIONER: - - - clause 15 of the - - -

MR BEASLEY: Of schedule E of the – schedule E of schedule 1 of the Basin Agreement.

THE COMMISSIONER: That's right. Sorry, there comes a point where the - - -

MR BEASLEY: I might just give.

THE COMMISSIONER: No, that's all right. I've got it. The running heads in this print gives up on the components of schedule 1.

MR BEASLEY: It doesn't tell you E, no, I know. Sorry. If you go to page – there's page numbers, 503, the schedule starts at - - -

THE COMMISSIONER: Yes. I have got it, thanks.

MR BEASLEY: Yes. 495, I'm sorry. But I think the independent audit group, reading this report, then asked – engaged Mr Bewsher to do this, what he calls an independent and unbiased assessment of the suitability of the IQQM model for the Barwon-Darling Valley. Now, we know - - -

THE COMMISSIONER: I'm just – I'm just lost at the moment. I've read the – I think I've read the references to the parts of the agreement which this is intended to assist.

MR BEASLEY: Yes.

THE COMMISSIONER: But I'm not sure I followed how that works. What is the – there is a reference, for example, in the overview on page 2 to the models that are the subject of schedule E. What does that mean?

MR BEASLEY: Sorry, page?

THE COMMISSIONER: 2 of the Bewsher report. What does it mean to say that - - -

MR BEASLEY: The models that are subject of schedule E of this audit - - -

THE COMMISSIONER: So if you look – if you go back to schedule E, it's clause 1.

MR BEASLEY: Yes. But I think that's – is that schedule E of this actual – is there a schedule E here? I think he's – is that schedule E of the report, though?

THE COMMISSIONER: Yes, if you look at the top of page 1, first paragraph, Background, refers to the 24 river valleys that have been designated under schedule E of the Murray-Darling Basin Agreement appended to the Water Act. And then it says:

> *Computer modelling is necessary to allow –*

etcetera –

> …*when determining cap targets.*

MR BEASLEY: Yes.

THE COMMISSIONER: Now, when we're talking about cap targets, we are talking about the allocation between valleys, in particular of limits so as to produce in aggregate the overall limit.

MR BEASLEY: Yes.

THE COMMISSIONER: I think. So schedule E, cap on diversions, page 495 of the print says:

> *The purposes of the schedule are to establish long-term caps in order to protect and enhance the riverine environment.*

MR BEASLEY: Yes.

THE COMMISSIONER:

> *To set out action to be taken by MINCO authority and governments to quantify and comply with annual diversion targets.*

Pausing there, that 1(b) has nothing to do with models. It might be informed by models, but doesn't seem to be models. And then (c):

> *To prescribe arrangements for monitoring and reporting of 1(h) and taken to comply with targets.*

That's maybe, very indirectly, informed by models, but it's not the subject of models. So I've assumed that models come in in schedule E, because in order to establish long-term caps, in order to protected and enhance the river environment, one has resort to models, I gather.

MR BEASLEY: There's – clause 11 deals with developing analytical models.

THE COMMISSIONER: Yes.

MR BEASLEY: And 11(2).

THE COMMISSIONER: So just before we get to 11, clause 4 says this is going to result in a register recording the formulas for calculating diversions within each river valley. So I can see why reports – models might be important because those formulas are then mandatory.

MR BEASLEY: Yes.

THE COMMISSIONER: But you see in 4(2)(a), those formulas are mandatory to use for the purpose of developing or proving any model.

MR BEASLEY: Yes.

THE COMMISSIONER: So the models don't produce the formula, but the formula dictates the model, I gather.

MR BEASLEY: Yes.

THE COMMISSIONER: I'm not suggesting this is terribly clear. And then we have clause 11's obligation on the Authority to develop analytical models. And the purpose, or the nature of the model is stipulated in 11(4).

MR BEASLEY: Yes.

THE COMMISSIONER: So it must simulate the long-term diversion cap and the relevant designated river valley. I get lost at that point because if a model is simulating that cap, it's not obvious to me, and I'm not a modeller, it's not obvious to me how the model has produced the cap. It seems it's taking the cap as a given. In any event, it has to be tested against relevant historical data, and it has to be approved. It can be modified, and then it must be used to determine the average annual diversion under the conditions of the relevant long-term diversion cap determined under this schedule. And I get totally lost for 11(4)(e)(i). What does it mean to determine the annual average diversion under the conditions? That's a modelling hypothesis, is it? Because it talks about a period between 1891 and 1997.

MR BEASLEY: Yes. That's, I think the cap baseline – a reference to the cap baseline conditions that are agreed under the Murray-Darling Basin agreement.

THE COMMISSIONER: I think that's right. And then 11(5) confines the Authority to approving models or modifications of models if it would fairly – if it considers it would fairly determine the relevant annual diversion target given the climatic conditions experienced in any one year. Does that confine itself to history or does it involve prospect as well?

MR BEASLEY: I think that's – I'm not sure.

THE COMMISSIONER: No. Probably the draftsman isn't either.

MR BEASLEY: Yes.

THE COMMISSIONER: And then clause 12 says that progressively at the end of 40 years those models are to be used to calculate targets. So that's an element of prospect, obviously. And then we come to 13, to which I think you've drawn my attention. 13, as I see it, is the reporting on compliance or non-compliance.

MR BEASLEY: Yes.

THE COMMISSIONER: So by the time you get to 13 the model's work has already been done, hasn't it?

MR BEASLEY: It probably has, given that, for example, the Barwon-Darling Water Sharing Plan refers to a specific long-term average extraction limit that doesn't seem to change.

THE COMMISSIONER: That's right. It can be modified.

MR BEASLEY: It can be modified.

THE COMMISSIONER: Until ..... modified.

MR BEASLEY: If the model is recalibrated, which it doesn't seem to have been?

THE COMMISSIONER: That's right.

MR BEASLEY: So clause 33 of the Water Sharing Plan says that the computer model:

> *The IQQM computer model indicates a long-term average annual extraction volume of 214 gigalitres a year, 189 gigalitres from within channel extractions.*

As you said, the figure may change if the Barwon-Darling – I'm reading from the note to clause 33:

> *…the figure may change if the Barwon-Darling cap IQQM is recalibrated with new observed data as a result of more accurate metering data.*

THE COMMISSIONER: But by the time the Water Sharing Plan is made, the model has done its work, hasn't it?

MR BEASLEY: Yes.

THE COMMISSIONER: So what is the purpose of Mr Bewsher's report then? I mean, is this perhaps a precursor to a decision whether to modify it? Because his

report is – how shall I say – faint praise indeed for the modelling. It says it will do until the end of '14.

MR BEASLEY: That's right.

THE COMMISSIONER: Which is not a very long time. This is 2012, isn't it? 2013. So it's - - -

MR BEASLEY: Well, the requirement in 15 is for the independent audit group to annually audit the performance of each state government in implementing the long-term diversion cap. Why that means you have got to look at the model again, I'm not - - -

THE COMMISSIONER: Well, I think it's a terrific idea to look at models because they are inherently inaccurate, as they must be. So the prospect of improvement can only be applauded.

MR BEASLEY: Well, Mr Bewsher positively recommends it.

THE COMMISSIONER: Absolutely. Absolutely, so what was he doing? Was he saying, "Look, a model has been used to reach all these parameters, which have to be observed."

MR BEASLEY: Yes, I can only go on what is said in his report at the bottom of page 1 that the independent audit group recommended the cap models undergo an independent technical audit before they are submitted to the authority for adoption.

THE COMMISSIONER: Haven't the models been adopted?

MR BEASLEY: Well, they've been adopted by New South Wales in the Water Sharing Plan. Whether it's adopted by the Authority, I'm not sure. It would seem perhaps not, based on that. Because, as I understand it, the IQQM model for the Barwon-Darling Water Sharing Plan is, as Mr Bewsher said in his report of 2016/2017 the modelling, for example the Northern Basin Review, is a model that links together all of the 24 river system models that cover the Murray-Darling Basin which is referred to as the integrated river systems modelling framework. So, as I would understand that, this IQQM model for Barwon-Darling is one of those models that then somehow gets linked together to form the integrated river system modelling framework, which was the modelling tool used for the review.

THE COMMISSIONER: Yes. Clear as mud. Can I try and work something out. Clause 11 of schedule E to the Basin Agreement, which is schedule 1 to the Water Act, says in 11(2) that relevantly the government of New South Wales has to develop unlimited models for determining the annual diversion target for each designated river valley. Barwon-Darling is one of those. 111(4)(c) says that such a model must be approved by the Authority before it is used to determine an annual diversion

target. Now, as I understand it, a model was used to determine an annual diversion target.

MR BEASLEY: Yes.

THE COMMISSIONER: So - - -

MR BEASLEY: Must have been approved.

THE COMMISSIONER: Call me a naïve administrative lawyer: on the basis of the omnia rite, I assume it was approved by the Authority.

MR BEASLEY: Based on that, you would say yes.

THE COMMISSIONER: Well, otherwise somebody has done something that disobeys the law, which would be disappointing.

MR BEASLEY: Yes.

THE COMMISSIONER: And 11(5), to which I drew attention earlier, gives you a test of substance before the Authority can approve, namely the Authority has to consider that the model will fairly determine the relevant annual diversion target.

MR BEASLEY: Yes.

THE COMMISSIONER: And then the mysterious phrase "given the climatic conditions experienced in any one year". I think that must mean prospectively only because it's a target which will apply after it has been approved. That's a target for years to come.

MR BEASLEY: Just reading the top of page 2 of the report:

> *This report presents the findings of the audit of the model for the Barwon-Darling valley ..... the Barwon-Darling forms a major part of the Barwon, Upper Darling, and Lower Darling ..... simulation of the Lower Darling has been included with the MDBA's MSM big model and has previously been submitted for audit.*

Submitted for audit in 2007.

THE COMMISSIONER: Well, that may only go to show the linking is not straightforward but is plainly and correctly understood as being required to be done. But this notion of being submitted for audit, again, I don't want to be thought to think that that is not a good idea, it sounds like an excellent idea, but it is not obvious to me yet whether this precedes or not the approval by the Authority. I had rather gathered that, because it's in the Water Sharing Plan - - -

MR BEASLEY: It would be after.

THE COMMISSIONER: - - - it has been approved. See, there's odd language at the top of page 1, second paragraph, last sentence:

> *The models are being developed by each of the states and also by the Authority's office.*

Anyhow. Developed seems to be - - -

MR BEASLEY: That might be a reference to the integrated model as distinct from any single model used for - - -

THE COMMISSIONER: Maybe, but we are talking about lots of models. You see, the word "developed" is a term of art – which I don't say entirely praisingly – because that's what 11(1) says in schedule E, namely:

> *The Authority must develop models and the governments must develop models.*

MR BEASLEY: It may be that the language used by Bewsher is influenced by the fact that the models may have been developed, but are in some form of continuous state of upgrade.

THE COMMISSIONER: Which sounds like a – sounds like a splendid idea inherent in the nature of the model. But I'm just trying to – it does make this report, particularly its rather gloomy conclusions, a bit hard to follow, doesn't it? When I say rather gloomy, let's just say, picking up at page 67, among the conclusions and recommendations said to be the key outcomes of the audit, the first is that the model be approved by the Authority until the end of 2014. Now, that is language – that is what has thrown me, you see. I don't understand what's going on, because that is language suggesting it has not yet been approved and, as I say, it's faint praise indeed for the audited material because it says you can use it for a year.

MR BEASLEY: Its – your observation there - - -

THE COMMISSIONER: Which is not much use given the targets are meant to be for successive years.

MR BEASLEY: Yes. First of all, I agree with your observation that looks like it hasn't been approved, and secondly it's an odd recommendation given the content at page 65, concerning the robustness of the model or lack of robustness of the model ..... model, and the table on page 54.

THE COMMISSIONER: Well, they're said to be subjective comments. Not for the first time, Mr Bewsher seems to be more polite than I would be. That's his opinions.

MR BEASLEY: They are.

THE COMMISSIONER: Yes.

MR BEASLEY: But they're based on - - -

THE COMMISSIONER: But they're expert opinions and they - - -

MR BEASLEY: And I think, based on the observations that are made on page 54 in the table about the difference between - - -

THE COMMISSIONER: He says "robustness is not guaranteed". That's a rather roundabout way of saying it doesn't impress the auditor.

MR BEASLEY: I would have thought so.

THE COMMISSIONER: Anyhow. Then there is something called – which is not, I think, statutory, I don't mean to sound lawful, but it's not a statutory notion – there's this idea of provisional accreditation.

MR BEASLEY: Yes.

THE COMMISSIONER: And all this seems to be the ball in the state court:

The New South Wales Office of Water is undertaking further development.

Etcetera. And you see its request recorded at the middle of page 66, "Provisional accreditation subject to proposed improvements" which would be reviewed in, say, 2014. To put it mildly, the reference by the auditor, with which I'm very sympathetic to various delays in the next paragraph, just serves to obviously undermine confidence that these things are being done in a timely way. And so the auditor who writes about himself in the third person says that he believes that provisional accreditation is appropriate.

MR BEASLEY: Because there's staff shortages.

THE COMMISSIONER: Yes. But then - - -

MR BEASLEY: That's literally what it says.

THE COMMISSIONER: I know.

MR BEASLEY: It has been difficult for the responsible office in New South Wales to give priority to this modelling task because there's limited staff resources. So why not just accredit them provisionally?

THE COMMISSIONER: Well, why not – but why not refuse to, is the obvious question. Because, among the failures - - -

MR BEASLEY: That's a reason there, in itself to refuse it.

THE COMMISSIONER: Well, that's why I'm ponderously labouring the provisions of 11, in particular 11(5), because the end of the process is the Authority's approval and that is stipulated not to be possible except upon it considering that the model will fairly determine, etcetera, etcetera. And the gist of this report is, with respect to its author, that it won't do that. I mean, for example, on page 66, the failure to improve the model's replication of flow and diversion behaviour, and interpolating: flow and diversion behaviour, if I could be forgiven the understatement, seem to me to be quite central to these models. But in any event.

MR BEASLEY: Yes. Might be the whole box and dice, I would have thought. Yes.

THE COMMISSIONER: Quite. He has already given detailed reasons to doubt not only robustness but also availability of – the presence of anything necessary. He then says, understandably:

> *…has the potential to discredit the hydrological capabilities not only with the valley but within the whole Basin.*

MR BEASLEY: Yes.

THE COMMISSIONER: Now, that is a very serious organisational critique both of New South Wales and of anybody else who would be minded to build on this rather insubstantial foundation.

MR BEASLEY: It is.

THE COMMISSIONER: And then the recommendation is made by way of so-called opinion, with which I think I could say I do agree and not provisionally; namely, the work associated with the improvements be prioritised and appropriately resourced.

MR BEASLEY: Yes. But that's polite language for saying, "You have got to fix this."

THE COMMISSIONER: It is. This author is more polite than I am, no doubt. And the Authority is recommended to give the New South Wales Office of Water every assistance to see it achieved by the end of 2014. Just to interpolate and forgive my ignorance, what do we know historically did in fact occur?

MR BEASLEY: We don't know whether anything occurred at the end of 2014, and there's no indication from the Water Sharing Plan that there has been any change to the modelling. Absent someone explaining it, I don't know.

THE COMMISSIONER: Well, I didn't pick up any references to later improvements in Mr Bewsher's own later reviews.

MR BEASLEY: No. What's really, I think, concerning about the later reviews is he specifically directed away from what he's talking about in this 2013 report. He's told – has noted this, I'm reading from the 2016 modelling framework review he did for the Northern Basin Review and the SDL adjustments. I tendered that yesterday; I don't know if it has an exhibit number yet. But in any event, page 4:

> *The Terms of Reference of the following modelling components were not the subject of this review.*

And it includes the integrated river systems modelling framework of which the IQQM has been incorporated into it.

THE COMMISSIONER: So when I come back to page 67, conclusions and recommendations.

MR BEASLEY: Yes.

THE COMMISSIONER: And here, I'm afraid I am criticising the author: there are these statements in what is probably the most prominent place for anybody looking to what might be called a take-home message, that it is appropriate that the modelling approved in its current form until December 2014 and that in the opinion of the auditor the model is likely to be sufficiently robust, lack significant bias, for it to be used for the simulation of long-term diversions and annual targets under schedule E in the interim period until the end of 2014. That's where I – that's why I started with the Act, the agreement appended to the Act and its schedule E, because it's all a bit difficult to understand that's being actually recommended here.

And it still leaves me puzzled as to why there would be recommended approval by the Authority for the historical period in (c), and given what's called the existing shortcomings and model improvements, now, that's a reference to improvements yet to be carried out.

MR BEASLEY: That's right.

THE COMMISSIONER: In (d). You really do have to wonder whether we are meant to read (e) – that is, the 189 gigalitre.

MR BEASLEY: That's if you're still on the Plan.

THE COMMISSIONER: My point is: given all of that, surely that is as provisional as the approval of this model.

MR BEASLEY: One would have thought that that logically follows.

THE COMMISSIONER: Well, because it has to be produced by use of the model, and the model – we've been told – shouldn't be used beyond 2014. Anyhow, (f) then talks about a revised cap model and target model.

MR BEASLEY: Yes.

THE COMMISSIONER: And so, with respect to the auditor – and this, I say commendingly, not otherwise - - -

MR BEASLEY: Have a look at revising it.

THE COMMISSIONER: It's clear he's saying there needs to be something by the end of 2014 which would lead to a revision of the long-term capped version and all the annual targets since 1997. And then, in (g), it extends out of Barwon-Darling to Murray Lower Darling in what might be called a commendable attempt to achieve linkage. And again, in hindsight this may be more plaintive than anything else, referring to the result of improvements proposed by the end of 2014. Even so, even before then, the Authority could consider making an adjustment in relation to 1956.

MR BEASLEY: Yes.

THE COMMISSIONER: Colley Farms require an updating. And then in (i) there is language:

Once approved under schedule E.

Which indicates to me that this is being written on the basis that there has yet to be an approval by the authority of any of these things.

MR BEASLEY: Yes. Mr O'Flaherty is following this through while we have been talking. There's a report by the independent audit group back in '05/06 that indicated that the Barwon-Darling IQQM model "Still has to be submitted for accreditation."

THE COMMISSIONER: So that's '04/05?

MR BEASLEY: That's '05/06, so at least then, and in May '05 the Murray-Darling Basin Commission declared the Barwon-Darling Lower Darling cap valley in breach of the cap.

THE COMMISSIONER: So these are not mere – these are not academic things.

MR BEASLEY: No.

THE COMMISSIONER: So what does (j) mean on page 68:

> *The Authority give every assistance to the New South Wales Office of Water to ensure that an improved Barwon-Darling model is available by the end of 2014 given the key role that the model has in simulating hydrologic behaviour –*

and I emphasise the next three words –

> *within the Basin.*

MR BEASLEY: Well, it's - - -

THE COMMISSIONER: Can we follow up whether that – what it is that has occurred that answers that recommendation, please? Not now, obviously.

MR BEASLEY: No, I don't know the answer to that, but we haven't found anything to suggest that anything like that recommendation occurred. But that may – there may be an answer to it. We will have to find that out. There's no evidence that it had at the moment, but - - -

THE COMMISSIONER: Mr Peters may know something about this.

MR BEASLEY: He might. But based on the concerns of the Northern Basin Advisory Committee, there was no reassurance given to them that the model had been updated at all, despite their fairly constant discussions with the MDBA about their concerns that the model for the northern Basin doesn't work, particularly at low flows. All their concerns about the reliability of the modelling. No one said to them, from the Authority, "Don't worry, we've fixed that, we have had a look at Mr Bewsher's recommendations and we've fixed that." So - - -

THE COMMISSIONER: That has been useful. I am wondering, can we proceed to Mr Johnson's evidence.

MR BEASLEY: We can now. I will just tender that - - -

THE COMMISSIONER: Yes. Thank you.

MR BEASLEY: What I'm tendering is a report – a final report dated January 2013 by Bewsher, B-e-w-s-h-e-r, Consulting Pty Limited entitled "Barwon-Darling Valley Independent Audit of Cap Model."

THE COMMISSIONER: Thank you.

<WILLIAM JOHN JOHNSON, SWORN [10.36 am]

<EXAMINATION-IN-CHIEF BY MR BEASLEY

THE ASSOCIATE: Please state your full name.

MR JOHNSON: William John Johnson.

THE COMMISSIONER: Please sit down, Mr Johnson. Thank you for your patience. We have to try and keep things going forward on a broader front.

MR BEASLEY: Mr Johnson, can you give the Commissioner your – work address is fine.

MR JOHNSON: It's Barbigal, 210L Dunedoo Road, Dubbo, New South Wales.

MR BEASLEY: And you've provided the Commission, first of all, with a submission – which I'm not sure is dated – yes, it is down the bottom 30 April 2018.

MR JOHNSON: Yes.

MR BEASLEY: A submission to the Murray-Darling Basin Royal Commission of William Johnson, 30 April 2018. I tender that. And you have also provided the Commission with a signed statement dated 24 July 2018.

MR JOHNSON: Yes, I have.

MR BEASLEY: And that statement is true and correct?

MR JOHNSON: Yes. Yes, it is.

MR BEASLEY: All right. I will tender that statement as well. I wanted to – you've set out your involvement with the Basin Authority, who you were first employed with in 2009, on secondment from the New South Wales Government. You were – originally started as a park ranger; is that right?

MS BRADBURY: Yes, I did, in the 1980s.

MR BEASLEY: And what did your work as a park ranger involve?

MR JOHNSON: I was a National Parks Manager and then, in the late 80s, I then was responsible for managing the Macquarie Marshes nature reserve, which is a Ramsar listed wetland in – on the Macquarie River, and at the same time I was given responsibility to manage an environmental allocation. And my responsibilities then were water management, park management, and also the things associated with that. Neighbour relations, involvement in information gathering and research, and also water management issues. That's when I started working closely with the New South Wales water agency.

MR BEASLEY: All right. When you started with the Basin Authority you say one of your earlier responsibilities was managing the section responsible for identifying environmental assets. Do I take from that that the early work you did for the Basin Authority was identifying some of the – what were determined to be the key environmental assets for the purpose of the ESLT definition?

MR JOHNSON: Yes, it was.

MR BEASLEY: And how long did you work on that?

MR JOHNSON: From memory, I think it was until – from late 2009, early 2010, until the middle of 2011.

MR BEASLEY: And was the work you did there specific to a particular region?

MR JOHNSON: No. It was Basin-wide.

MR BEASLEY: Basin-wide. All right. And then you had some involvement in chapter 8 of the Basin Plan, from – sorry, it must have been from 2011. That's the Environmental Watering Plan?

MR JOHNSON: Yes, the Environment Watering Plan.

MR BEASLEY: What aspects of that were you involved with?

MR JOHNSON: Just with the development of – of the – of the chapter, with - - -

THE COMMISSIONER: Chapter 8.

MR JOHNSON: Chapter 8, with the development of chapter 8, bringing my practical experience with planning and environmental water management to try to translate that into a chapter that would – a plan that would lead to improved management.

MR BEASLEY: All right. And you then became the Director of Engagement for the Northern Basin Review. Director of Engagement – what did that mean you had to do?

MR JOHNSON: Between two thousand and – between the middle of 2012 and late 2015, I actually worked on implementing chapter 8 which was developing the first environmental watering priorities and then working on the strategy. And it wasn't - - -

MR BEASLEY: Was that Basin-wide?

MR JOHNSON: Basin-wide.

MR BEASLEY: Yes.

MR JOHNSON: Both of them were Basin-wide. And it wasn't until late 2015, November 2015, that I became involved in the northern Basin and specifically – a specific part of the engagement of the northern Basin.

MR BEASLEY: All right. But was this a – when it says Director of Engagement, was that involving, like, community engagement, getting them to meetings to have aspects of the review explained to them, or was it broader than that?

MR JOHNSON: One of the – one of the difficulties that the MDBA was finding by late 2015 with the Northern Basin Review was that it had had a great deal of engagement with the irrigation industry, which was very well organised and very well resourced.

MR BEASLEY: Yes.

MR JOHNSON: And was – and had people who were from each valley who – who spent a large part of the time working on it. Other views across the north were much less available and had – had far fewer and far less organised opportunities to participate. A specific part of my job was to provide opportunities for the full range of voices, expressions and concerns across the northern Basin to be brought to the attention of the MDBA. That was started just before Phillip Glyde started, and he started in early January 2016, and an important part of the first four or five months of that year were to travel with Phillip, Phillip Glyde, and – and – and the chairman, Neil Andrew, and other members of the Authority, as well as the Northern Basin Advisory Committee, throughout the northern Basin to discuss the communities' concerns and to introduce them to the new – the new management.

MR BEASLEY: Did you regularly attend the meetings of the Northern Basin Advisory Committee?

MR JOHNSON: I attended them on and off from when it started, for particular purposes. I went to a meeting in Dirranbandi in 2014, but I attended all of them. Another part of my role - - -

MR BEASLEY: So this is still when you are doing the Watering Plan – was to get - - -

MR JOHNSON: Yes, doing that.

MR BEASLEY: Yes, yes.

MR JOHNSON: Because they were interested in that, as well. They had a – they had a particular interest in the Watering Plan and the strategy, so I was doing it anyway. But after I worked on the northern Basin specifically, I attended all the meetings, and a part of my role was to work very closely with – with the Northern

Basin Advisory Committee – with members of the Northern Basin Advisory Committee.

MR BEASLEY: All right. I'm going to come to your submission about the Northern Basin Review in a minute, but before we get there, there's a couple of parts of your – paragraphs of your statement I would just like a further explanation on. I'm drawing your attention to, first of all, paragraph 14, when you say:

> *The modelling used by the MDBA was not dissimilar to the modelling I dealt with in my prior experience as an environmental water manager.*

You would have heard the discussion I had with the Commissioner this morning, before you started giving evidence, about the IQQM model that's part of the Barwon-Darling Water Sharing Plan or – as used for working out the total extractions, and you would have heard our discussion about the modelling framework that has been considered by Bewsher, the Integrated River systems Modelling Framework, which combines all the models for the various valleys. Is that what you are talking about, or can you just inform the Commissioner when you're talking about the modelling you dealt with, what you're exactly – what modelling you're exactly talking about?

MR JOHNSON: I first encountered the hydrology modelling in the early 1990s as an environmental water manager, so I worked very closely with the Water Department, and it was the early days of IQQM.

MR BEASLEY: This is the New South Wales Water Department?

MR JOHNSON: New South Wales Water Department.

MR BEASLEY: Yes.

MR JOHNSON: And – and – and I recall there was just one model in those days. It was – and that – and in the early days, particularly as there - - -

MR BEASLEY: Just one model for the whole state in terms of river system?

MR JOHNSON: Well, just – there was no – no, no, there - - -

MR BEASLEY: No.

MR JOHNSON: There was no whole state model. There were just models for each river.

MR BEASLEY: Each valley. Right, yes.

MR JOHNSON: So each – each valley had its own model.

MR BEASLEY: Yes, okay.

MR JOHNSON: And I – and – and it was early days, and – and particularly early days of environmental water management, and there were no other environmental allocations in New South Wales, except the Gwydir and the Macquarie, and I was involved in managing both of those. And we had to - - -

MR BEASLEY: Why is that? The Macquarie is because of the marshes there. There are Ramsar ..... the Gwydir is where - - -

MR JOHNSON: There were also – it comes back to – it's a big wetland there, too, which is now a Ramsar site.

MR BEASLEY: Is that Narran Lakes?

MR JOHNSON: No, no, that's – it's -it's on the Narran River.

MR BEASLEY: Yes.

MR JOHNSON: The Gwydir Wetlands are important wetlands on the Gwydir River.

MR BEASLEY: Right.

MR JOHNSON: And – and both of them, Macquarie Marshes, Gwydir Wetlands and Narran, all have support, probably some of the most important colonially nesting breeding events. There's a lot of attention drawn to them.

MR BEASLEY: Sure. Yes.

MR JOHNSON: And I was involved in a – in an event in the early nineties, a breeding event, and then it was decided that the wetlands needed some more water, so there was – I was involved in creating the first allocation, working with community and the government, and then we had to model – the models required a function that allowed environmental – that enabled environmental allocations to be – to be recognised. And – and they weren't managed the same way as irrigation allocations, no crop – you don't – crop mix or crop choices. And I worked with modellers in the early nineties to come up with the environmental management modules to put into the model to represent, essentially, that environmental water would be used. And – and the modules - - -

MR BEASLEY: Including the amount of water, the time, duration, or was it not .....

MR JOHNSON: No, the time and duration – the models - - -

MR BEASLEY: No.

MR JOHNSON: - - - weren't able to represent that. It was – really, in the end, it came down to a module that represented my intent which was to use all of the water for the environment.

MR BEASLEY: Right.

MR JOHNSON: All of the water was available, and the – and the module or the component of the model represented that the water that would be used fully. The – well, all the water would be used.

MR BEASLEY: So just following this through, when you say in 14:

The modelling used by the MDBA –

what are you specifically referring to? Are you referring to the integrated modelling?

MR JOHNSON: The – the integrated quantity and quality model.

MR BEASLEY: Right.

MR JOHNSON: It developed there are more models. It developed a lot, and even then, there were – there were – there were improvements and changes, but the foundational model is the same one, I understand.

MR BEASLEY: Right. All right. You then, in 15, say that after the release of the Guide, there was a change in the water recovery targets, and in 16 you say that your view was that the change – we know what the change was; the Guide obviously had a recommended target range to meet environmental water requirements of, in round terms, say, 4,000 gigalitres for high uncertainty of achieving your water requirements, to, in round terms, 7,000 gigalitres for low uncertainty of achieving water level requirements, and then a year later there's the ESLT report that reaches a figure of 2,750 as water to be recovered for the environment. You say in 16 your view was that that change appeared to be the result of the reaction to the way the Guide was received and was not based on how well the modelling represented the rivers of the Northern Basin. What – was that – the view you were expressing in 16, what is that based on?

MR JOHNSON: It's based on my recollection of discussions around the 3,200 leading up to the release of the Guide.

MR BEASLEY: All right. Just stop there. Discussions with who?

MR JOHNSON: Discussions within the organisation.

MR BEASLEY: Right.

MR JOHNSON: The broad conversations within different sections and with many people within – within the organisation and - - -

MR BEASLEY: So these are conversations you are having with what sorts – what people within the MDBA? When I say "what people", I mean from what field of science?

MR JOHNSON: I'm forgetting where they worked, but with people in – in the modelling sections, in the – in the ESLT section, in the environmental watering requirements sections, and in – also in the branches that supervise the river management, River Management Division.

MR BEASLEY: So that's pretty much covering the field of any relevance.

MR JOHNSON: It's pretty – yes, it was not a – it was not a very large organisation, so there were – it was not hard to – it was quite common to be talking with a lot of different people.

MR BEASLEY: So the Guide, the three scenarios that were modelled – despite the range we just discussed of 4,000 and 7,000, the scenarios modelled with 3,000, 3,500 and 4,000 gigalitres. When we get to the ESLT report, the three scenarios were 2,400, 2,800 and 3,200. You've just mentioned that part of the view you were expressing in paragraph 16 was a result of discussions you had with other members of staff of the MDBA concerning a 3,200 gigalitre recovery. Can you just explain that further about those discussions about 3,200 and how that has led to you having the view you expressed in 16?

MR JOHNSON: During – in the preparation for the Guide, there was a lot of work done on environmental water requirements, assessing functions, key environmental assets, and - - -

MR BEASLEY: They had all been – by the time the Guide was published, the 2,442 key environmental assets, the ecosystem functions, the hydrological indicator sites had all been determined and the ecologist had obviously fed information back to relevant people that we think this amount of flow for this duration for this percentage number of years is going to get a positive ecological response for certain species of – whether it's a fish or a bird or a tree. So all that had been done for the Guide.

MR JOHNSON: Yes.

MR BEASLEY: Correct? Yes.

MR JOHNSON: And at the end of, I think two thousand – so I was on separate contracts when I was – for the first years and I – my contract finished at the end of 2010, after the – I attended northern Basin meetings where the Guide was discussed.

MR BEASLEY: Yes.

MR JOHNSON: And then I – my – I started a new contract, I think, in 2011. And then very soon – sorry, I will just check, are you still talking about the 3,200?

MR BEASLEY: I am, yes.

MR JOHNSON: I think the 3,200 was – I'm speculating but I feel, looking back, that it was the best compromise with – with – so it was - - -

MR BEASLEY: No, what I'm directing your attention to – just let me help you. Look at 16 of your statement and you say:

> *My view was the change appeared to be the result of the reaction to the way the Guide was received and not based on how well the modelling represented the rivers of the Northern Basin.*

MR JOHNSON: So the thirty - - -

MR BEASLEY: Now, you said you had – you were having discussions with staff at the MDBA that is part of the reason that you formed that view. What I'm asking you to tell the Commissioner is to give more details about that.

MR JOHNSON: So the 3,200 – that was the volume that was discussed, and the work on the Guide was aimed to provide support for that. So the - - -

THE COMMISSIONER: What does that mean?

MR JOHNSON: Pardon?

THE COMMISSIONER: What does that mean, "aim to provide support for it"?

MR JOHNSON: The 3,200 was a, I think, high uncertainty. I think that was the word. The – it - - -

THE COMMISSIONER: Well, just pausing there, when you say 3,200 was high uncertainty, you are referring in summary form to the expression of various expert opinions, including by the CSIRO and the Authority, that is, its staff, I should say, that the avoidance of the defining concept of compromise of the environment would be achieved with high uncertainty under a regime that is labelled the recovery for the environment of 3,200 gigalitres. Have I got that correct?

MR JOHNSON: Yes. Yes.

THE COMMISSIONER: Right. Thank you. Bear with me. I have become very sceptical of the use of language which can produce a phrase like "achieved with a high level of uncertainty". I think it is very inappropriate for government and its scientists and bureaucrats to use such language unless they can explain what it means in real English. I think in real English it means the avoidance of that compromise

will probably not occur; that is, more likely than not, will not occur. I think that is what it means to say something is on the cusp of – and that's my paraphrase of the description of these expressions – on the cusp of high level of uncertainty. Now, you've heard my scepticism and my at least provisionally deep disapproval of this way of government dealing with people. What is your response? Does the language mean probably we will compromise at that level?

MR JOHNSON: It does mean that.

THE COMMISSIONER: Then I would like to know how can anybody, including yourself – this could be critical of you – how could anyone participate in an exercise by which the bureaucracy produces that kind of language for this really serious endeavour, the Water Act and the Basin Plan?

MR JOHNSON: I can answer that with some different context that - - -

THE COMMISSIONER: Take as much time - - -

MR JOHNSON: All right.

THE COMMISSIONER: - - - and whatever roundabout way you do.

MR JOHNSON: All right.

THE COMMISSIONER: Because this is a question which is at the heart of a lot of my concerns about the fitness of the Authority to administer the Plan.

MR JOHNSON: So I – I came to water management from – from the environmental side. So I was a national park ranger managing a wetland, and I had an environmental background and I managed an environmental flow. I was not – I was not a manager of extractive flows. I was a manager within a regulated system, designed for extraction, to try to manage environmental water for the benefit of the Ramsar wetland. So I did – I – I've always had a slightly different perspective to a – to a traditional water agency. So - - -

THE COMMISSIONER: Do you mean an environmental perspective?

MR JOHNSON: An environmental perspective, that's right.

THE COMMISSIONER: Well, let's – you can shorten that.

MR JOHNSON: Okay.

THE COMMISSIONER: It is not likely that anyone will persuade me that the Water Act and the Basin Plan does not have a perspective.

MR JOHNSON: Yes, it – it – and one of the things at the time with the 3,200 – it was a compromise, and one of the things - - -

THE COMMISSIONER: What do you mean by a compromise?

MR JOHNSON: It wasn't – it's in - - -

THE COMMISSIONER: You mean less than it should have been?

MR JOHNSON: It – it's inevitable in a regulated system that the environment will – the environment will be damaged, and it really just depends on the extent of the damage.

THE COMMISSIONER: Well, take is a premise. Take for consumptive use is a premise of the Water Act. Isn't that correct? It's a legislated fact that it says there has been adverse effects from the use of water.

MR JOHNSON: Yes.

THE COMMISSIONER: The use is largely taken for consumptive use.

MR JOHNSON: Yes.

THE COMMISSIONER: The most obvious integer of which is agricultural irrigation. Do you agree with that?

MR JOHNSON: Yes, yes.

THE COMMISSIONER: So that the Parliament – and this is a remarkable piece of human behaviour, this statute. I mean that very seriously. It stands out in history, where a people, through their Parliament, legislate that they have been doing something which, for environmental reasons and for sustainability, which is a combination of environment, economic and social reasons, should stop and be reversed. So we start with that. The premise is we have been taking too much, adverse effect there needs to be – you know the words better than anyone – the talismanic words in the act, protect and restore. Are you with me so far?

MR JOHNSON: Yes, yes, I am.

THE COMMISSIONER: Right. So I accept completely – because Parliament of Australia didn't legislate on the basis that we would all pack up and leave ..... or stop eating. So I accept the premise of take. The whole notion of the Water Act, and I don't mean this at all frivolously, might be summarised as saying "but not too much".

MR JOHNSON: Yes.

THE COMMISSIONER: We may take – we must continue to take because we are humans with needs for food and fibre, but – and we're a society with a need to generate the extra wealth which comes from export, but not too much. And giving content to not too much is the purpose of those central words in section 6 to which I've already made some reference: namely, that the sustainable diversion limit is reached by ascertaining an environmentally sustainable level of take, the very label of which shows that the premise is there will be take, but that it must be environmentally sustainable. And then we get into critical words, which again I think reflect terribly well on this country politically, socially and scientifically, that we actually have an Act of Parliament like this. I don't know how many other countries do, frankly I don't think any.

And it actually says, using a word which you just used in a very different sense, it actually says that that level is to be ascertained by reference to a state of affairs beyond which – that is take beyond which would compromise various things which are then described and some of them defined, and I would summaries them – without intending to displace the meaning by a paraphrase, I will summarise them by just calling them specified environmental outcomes. The idea of compromising is no doubt something that needs to be construed by lawyers.

But it surely means, in light of the treaties which are part of the constitutional footing for this statute, at least at national level, it requires reference to the maintenance of certain ecological characteristics that pick up expressions from Ramsar. You are familiar with all of this, aren't you?

MR JOHNSON: Yes, I am.

THE COMMISSIONER: Now, what I don't understand, and why I'm sorry I've picked you up with such a lengthy interruption of your evidence, is I have now become used to and not very happy about, the historical reference to compromise in a totally different sense: namely, the kind of compromise that starts with one proposition that says – if you will forgive the simplicity of the example, "The environment needs X," and another proposition saying, "Business would like X on two, so we will compromise at 3X on four." That's a use of compromise, but in – the difference in that case that obviously says, of what the environment needs, it won't get what it needs. Do you understand what I mean?

MR JOHNSON: Yes, I do.

THE COMMISSIONER: And there is a vulgar summary of politics which says it is the art – a self-praising word, if I have ever heard one – of compromise. And I'm sure that's correct. I mean it's not just a cliché, it's also a truism. But it's nothing to be, as it were, proud of in itself if what you are compromising are values which there have been social choices made to treat as standards to be achieved. And that seems to be what the Water Act – I think in an extremely admirable way – has promulgated. It has promulgated standards to be achieved. To put it another way, the political compromise produces the Water Act with its standard. It doesn't permit a

Compromise that is a falling below that standard by way of further compromise, administrative compromise.

The compromise, if you like, came by saying, "We are here now. We are not going to leave and our human needs for food, fibre and export income means there's going to be consumptive use. But we are here now and we hope that we will have descendants and successors for generations to come." The idea that you very often hear from old farming communities, that you will leave the land better than you found it. If I may say so, reversing the experience from 1788. And that is a very strong ideology one hears, that there needs to be an arrest of degradation, and you will be aware better than most people of the various concepts, labels and social movements for what can sometimes be called restorative agriculture. You are familiar with all of that?

MR JOHNSON: Yes, I am.

THE COMMISSIONER: Well now, in that context, I'm afraid I'm really at the point of losing patience with anybody telling me something like 3,200 represents a compromise, to which I say, "If compromise is to be used in this political sense, the Water Act is the compromise." Because it says, in effect, that there can be take for consumptive use, right to the point where you would compromise specified environmental outcomes, right up to that point. So you can take it to the edge, but not beyond. There's your political compromise. In other words, no buffer, we are not guaranteeing as it were, all the fat years will be enjoyed by the environment to their full extent.

MR BEASLEY: Save for ESLT might produce a buffer.

THE COMMISSIONER: And ESD, that Mr Beasley has just referred to, the principles of ecologically sustainable development, including of course the precautionary principle. So bringing it right up to the brink has to be done with a view to the fact that where there is ignorance – and that describes, relatively speaking, to greater or lesser degree, the whole of our understanding of the Basin – you apply a precaution involved in not postponing an expedient simply because you don't know whether it will work. You're familiar with that from the Act as well.

MR JOHNSON: Yes, yes.

THE COMMISSIONER: Well, now, against that rather verbose, but I cannot promise you long gestated provisional views I've got, could you explain to me how anybody at the Authority, including yourself, could ever have thought that if 3,200 was less than, or at that volume of recovery which had a high uncertainty of avoiding the statutory concept of compromise, how on earth it was proper for the bureaucracy to proceed as it did? I think I know the answer.

MR JOHNSON: Yes.

THE COMMISSIONER: Let me volunteer it: I think it may be a reprehensible response to what was perceived – and I will try and summarise it as social or political pressure – whereby relevant so-called communities would not wear, to use the idiom, the extent of recovery that had been regarded, by the expert public servants and consultants who had looked at it, as necessary with a high degree of confidence to avoid the compromise in question. Let me interpolate: the high degree of confidence being appropriate because of the precautionary principle. Now, against that background, can you please – I mean, in a sense, this is an apologia for your own work in this field.

MR JOHNSON: Well, I agree entirely with what you've said. The - - -

THE COMMISSIONER: It's a very sad state of affairs, isn't it, for an expert bureaucracy to have done this?

MR JOHNSON: Yes, it is. Yes, it is.

THE COMMISSIONER: But why, systemically, did they do it??

MR JOHNSON: I think it is a long-running cultural – the nature of water agencies are – I just will go back to 1987, the New South Wales Department of Environment and Planning did a review of the New South Wales Water Resources Commission, and it was abolished and replaced by the Department of Water Resources, and the reason was the Department of Environment and Planning said that the agency had had difficulty moving beyond its role as a rural water supply authority and that – and I always considered that that statement could have been applied 20 years later, that I felt that the agencies never moved beyond - - -

THE COMMISSIONER: Well, that is a pretty disgraceful state of affairs from the MDBA, though.

MR JOHNSON: Yes, it is.

THE COMMISSIONER: Which is not – I mean, it keeps telling everyone that's not what it is.

MR JOHNSON: That's right, it does.

THE COMMISSIONER: So you seem to have explained the bad state of affairs with a bit more detail than I have in your last answer but you still haven't given me any further insight into how the same people that advised on the Water Act itself, the same people who worked so hard and assiduously to produce the Basin Plan itself could, when it came to setting an ESLT, have behaved in this fashion?

MR BEASLEY: Just before you answer that question, I'm not suggesting – I want you to answer it, obviously, but I would like to look at 16 and 17 of your statement.

Just have a look and if you could answer the Commissioner's question in the context of that. So paragraph 16, I have already taken to you about your view.

MR JOHNSON: Yes.

MR BEASLEY: Was the change, etcetera. 17 is again an expression of opinion without perhaps providing more of the facts underlining why you had that – why you considered that efforts to provide a scientific basis was abandoned. The last sentence of 17 is based on a recollection. Now, bearing those matters in 16 and 17, can you answer the Commissioner's question in that context?

MR JOHNSON: In early 2011 the figures that were discussed early in 2011 were suddenly 2,800 and 2,400. There was a recoiling from the public reaction.

THE COMMISSIONER: Which "public reaction"?

MR JOHNSON: The reaction – the violent reaction at the public meetings throughout the Basin.

THE COMMISSIONER: How many people would have been involved in them? Hundreds of thousands?

MR JOHNSON: No, not hundreds of thousands, some thousands.

THE COMMISSIONER: Tens of thousands?

MR JOHNSON: No. Not tens of thousands.

THE COMMISSIONER: And the population of Australia at the time was about more than 20 million.

MR JOHNSON: More than 20 million.

THE COMMISSIONER: My questions are not innocent questions. That was treated as some kind of, what, reliable opinion poll?

MR JOHNSON: I heard it described to me that the cotton – the irrigation industry was the most powerful lobby, most powerful lobby group that – one of us, anyway – had ever encountered. So there's a - - -

THE COMMISSIONER: What, in the whole country, on any issue?

MR JOHNSON: Fisheries, forestry that was how it was described to me.

THE COMMISSIONER: I see. And this is a lobby group whose position was being understood as contrary to enacted law?

MR JOHNSON: Yes, that's true.

THE COMMISSIONER: And where did the public servants get hold of the idea that they were permitted to depart from enacted law in order to oblige what you are calling a lobby group? And I'm not suggesting – I'm not accepting, by the way, that there was ever any lobby group that said, "Let's disobey the Water Act."

MR JOHNSON: No.

MR BEASLEY: Commissioner, can I just – when you say public servants, that is no doubt true, but there's a board of this organisation.

THE COMMISSIONER: I appreciate that. At the moment ..... public servants because of paragraphs 16 and 17, which is the foundation. I will come to the board later but you can talk to the public servants that you observed and worked with. Did people talk to you about, "Well, the Water Act requires the best available science but we think there's some lobby group that requires us to behave otherwise and we're going to do that." Surely no one talked like that?

MR JOHNSON: No, people – people maintained the idea of best available science but the numbers changed. So - - -

THE COMMISSIONER: Well, numbers do change in science. You know that, again, better than anyone. That's because science is not decreed by edict. Everything is open to change and scrutiny, but by scientific method. I have not seen – and the MDBA has not seen fit recently to publish – anything justifying, in scientific terms, the reductions from what had been scientifically modelled and assessed to what was eventually the recovery of 2750 gigalitres a year. Have you seen them? The scientific justifications?

MR JOHNSON: No. They're – no, I - - -

THE COMMISSIONER: I gather from your paragraph 16 that you don't think they exist.

MR JOHNSON: I don't believe there's a scientific justification.

THE COMMISSIONER: Now, you must have spoken to colleagues who at least partly shared your concerns about what you call an abandonment of science.

MR BEASLEY: Or express disappointment is the word you use in 17. So "We are disappointed by the change."

MR JOHNSON: Yes. That's true, I did.

THE COMMISSIONER: And they were scientists and experts.

MR JOHNSON: Some – some were scientists, some were experts. There were people outside the organisation as well who the MDBA had drawn upon for expertise who were also disappointed.

THE COMMISSIONER: Consultants.

MR JOHNSON: Yes.

THE COMMISSIONER: Now, look, I would like you to think about whether you want to answer – at least in public – my next question. I can keep your answers private under my powers, and you can take it on notice and think about this. Can you name people and describe their positions that you are recalling in the second sentence of paragraph 17; namely, people working with the MDBA who were disappointed by the change to the water recovery target? So don't give me names and positions now, and perhaps after the morning break we will return to the question, perhaps during the break you can talk with the Commission staff about whether you would prefer that to remain a private matter, unpublished matter.

It's not so much, if I may put it this way, for your sake as for their sake. You will not have, obviously, consulted with them before answering that question, and the relations between this Royal Commission and the MDBA involve litigation, so I want everything to be as ordered as possible before I go into evidence on that matter. Can I go back, then, to the matters I was raising before. As Mr Beasley has pointed out, your paragraphs 16 and 17 were what excited my concern about this idea of the same cadre of public servants, consultants, experts who advised on the Water Act itself and produced the Basin Plan then – if you will forgive the language – falling in with an ESLT determined at 2,750.

Which is surprisingly less than, and is alarmingly bereft of scientific justification, compared with the figures that had been the subject of published science and opinions. There's one message that one finds in the historical record, and that is that the change followed an increase in the robustness of modelling, but particulars and modelling experts' opinion in support of that are very thin on the ground indeed. Are you able to help in that regard?

MR JOHNSON: Could you – I'm not sure that I follow. I don't quite follow the question.

THE COMMISSIONER: The one explanation for a change in the figures to drop to 2,750 that one finds in the record is a reference, in very general terms, to an improved robustness of modelling.

MR JOHNSON: Yes.

THE COMMISSIONER: Sometimes I think I've understood what they're referring to as being a reference to, if I could put it this way, more locations or sites than simply the respective end of stream analyses, as it were, a more thorough

interpolation and extrapolation exercise. But I'm not at all confident that I have understood that correctly and I've certainly not seen published material.

MR JOHNSON: I personally have no confidence that – in that statement. It – there's an example, for example, in the Macquarie, when I – in the Macquarie, when I first started working in the Macquarie area, it was generally believed to yield about 1,200 gigalitres long-term average a year. It's – as a result of improved modelling, it's now considered to yield about 1,600. Now, of course, that provides a much – that – that provides a much greater scope for extracting use and any existing extracting use then becomes a larger – a smaller proportion of the total. So I have – have always been suspicious of that, and I don't understand the modelling well enough to – to interrogate it to satisfy myself – to satisfy myself as to the truth of that, but I am suspicious of it.

THE COMMISSIONER: So that suggests that an audit, particularly one published in English – an audit of modelling which is truly independent would be a very adjunct to persuading people to the cogency of the plan and its administration.

MR JOHNSON: Yes, it would be. It would be very valuable. And – and - - -

THE COMMISSIONER: That's the nature of these models, that they need revisiting more or less constantly because of the inherent approximation and assumption involved in them.

MR JOHNSON: Yes, they do, and I think another thing they need – they're hydrology models. They're just about water and flows, and – and rivers are much more than that.

THE COMMISSIONER: Yes.

MR JOHNSON: And I've been at many, many meetings where hydrology models are presented and there are people, community people around the room who listen to the talk of this – this – this hydrology model description of the river and it isn't the river that they know. It doesn't represent the river they know. They don't recognise the river they know and people are very – people worry and are concerned and don't trust. They think that a method that they don't understand and doesn't speak to them about their river is being used to make decisions that affect them. And - - -

THE COMMISSIONER: That seems a very reasonable response by people, many of whom would be voters, don't you think?

MR JOHNSON: Well, it is. It's a – it's – it's extremely reasonable. It's the – in my view – my opinion is that hydrology models started off as a useful tool. They became more and more complex, there are more and more models, there are more and more reasons for them, more and more inputs, and fewer and fewer people could understand them. I – 25 years ago, I flattered myself that I had a basic understanding of the single IQQM models, at least enough to contribute to them. I don't – I don't

have that understanding. I haven't had that understanding for many years. I'm in the same position as many of those people. That's not – the hydrology models don't represent the river that I – that I see or know.

THE COMMISSIONER: Could that partly be because, paradoxically, the historical data they use extends back to the end of the 19th century?

MR JOHNSON: Possibly. Also, that it's not clear – when – when that's said, it implies or people are allowed to infer that that's all measured data. A lot of that is actually modelled data. And the other thing beneath the model, the IQQM model, is it's modelled. It's modelled input. It's the Sacramento Rainfall Runoff Model is the model that contributes to the IQQM models. So there are models upon models. And it's my – again, my – my opinion that many managers, when faced with a difficult decision, have deferred to the models and the models have become a much – the models have become a much greater part of decision-making. They're a tool to guide policy making, but they tend to me – they seem to me now to have a far greater – they're used beyond their capacity. They're used beyond their capacity. Rivers were managed before there were models quite effectively.

THE COMMISSIONER: Just on that use beyond capacity, you've given evidence, others have given evidence, that the model in existence to which recourse was being made at the time of the Northern Basin Review for the Barwon-Darling Valley was – is – not appropriate for what are called low flows. Have I understood that correctly?

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Could you just – I'm not a modeller either, but I have no previous expertise in rivers, as you do. Could you try and explain to me what it means to say that a model is not appropriate for low flows?

MR JOHNSON: I will go specifically to the Barwon-Darling and - - -

THE COMMISSIONER: Please. Please.

MR JOHNSON: And the Bourke.

THE COMMISSIONER: Yes.

MR JOHNSON: And people - - -

MR BEASLEY: Just you to help you, some of this is on page 3 of your submission.

THE COMMISSIONER: Yes.

MR JOHNSON: People - - -

THE COMMISSIONER: Please assume that Mr Beasley and I have read all of what you have written.

MR JOHNSON: I'm certain - - -

THE COMMISSIONER: Because we have. But that doesn't mean you shouldn't repeat it. But what I'm looking for in my last question is an elaboration to try and explain to me what the repeated proposition that that model is not appropriate for low flows – what that really means. How can I understand that?

MR JOHNSON: One of the things that I try to do is not to get drawn too much into the discussion of the models. I think it's useful – coming from an outside perspective, it's useful to bring an outside view to it. So there are other ways of looking at the river. Now, low flows, let's say, at Bourke – I – I heard at a public meeting, at a Barwon-Darling Stakeholder Advisory Panel meeting a couple of months ago, an acknowledgement by the New South Wales Department of Industry and Water that low flows are not well represented in the models. We don't – we don't model low flows as well. I also - - -

THE COMMISSIONER: What does it mean you don't model low flows?

MR JOHNSON: I also heard there's no real agreement on what a low flow is. And so people talk about low flows until it becomes expedient to define them, and then they're different things at different times. But – but what it says is that the model doesn't – the model used for Barwon-Darling for a range of – a range of models – I assume there are several models – don't represent the river, hydrologically, very well. And – and I know from an email sent from an MDBA officer to a former member of the Northern Basin Advisory Committee that the figure below which the model is not deemed to represent the river at Bourke is 2,000 megalitres a day. Now, that's - - -

THE COMMISSIONER: Are you able to recover that email for us?

MR JOHNSON: I'm – I'm sure I can, or I know – certainly has – yes, I could recover that.

THE COMMISSIONER: The staff will be in touch with you.

MR JOHNSON: And I also heard that, in another meeting, at a – so - - -

MR BEASLEY: Just don't leave that first meeting where - - -

MR JOHNSON: All right.

MR BEASLEY: - - - someone from the Basin Authority said that the hydrological model did not represent flows in the Barwon-Darling at Bourke well. You say it was a senior officer of the MDBA. You made a note following that meeting?

MR JOHNSON: I didn't – I didn't make – I recall that I didn't make a note following that meeting. That was – for me, the most important – the most significant observation was - - -

MR BEASLEY: Sorry. Did you say you did not make a note?

MR JOHNSON: No, I did – did not make a note on - - -

MR BEASLEY: Right.

MR JOHNSON: - - - at the meeting. But it was in an email. I already had read the email, and it – and – and the email was the most significant acknowledgement. Now, 2,000 megalitres a day – that's quite a substantial flow historically, and – and to – and just out of interest, I and a colleague decided to – decided to see how often that was. How often the Barwon-Darling flow – and I have a - - -

THE COMMISSIONER: Certainly.

MR JOHNSON: I'm just getting a graph which I – it was just a quick – a quick note, and it goes back to, I think, 1942, which is the most recent - - -

THE COMMISSIONER: What – this is levels, is it, or flows below Bourke?

MR JOHNSON: This is – this is flows below 2,000 megalitres a day at Bourke. So without doing any deep analysis. So before 1990, it was – the river was below 2,000 megalitres a day at Bourke 43 per cent of the time. From 1942, I think, to 2015. From – and these are just numbers. Between 1990 and 2000, it was 67 per cent of the time, and between 2000 and 2015, and this is subsequent to irrigation development and – not all – it was 75 per cent of the time. Now, the cause of that is not the point here. The point is that that model doesn't represent that river three-quarters of the time. And – and it cast – to me, casts doubt on the efficacy of the model.

THE COMMISSIONER: But the thing that characterises the waters and rivers of the Basin and particularly the northern connected Basin is variability, isn't it? It's in nature. Isn't that right?

MR JOHNSON: That's – that's true. They're amongst the most variable rivers in the world. They're right at the extreme end of variability.

THE COMMISSIONER: It's not the purpose of a model to produce, in crude terms, an unrealistic average to represent reality, is it?

MR JOHNSON: Pardon? I didn't - - -

THE COMMISSIONER: A model wouldn't be any hydrological model of any worth if it described something that never happened, but which happens to be what I call a mathematical mean, an arithmetic mean.

MR JOHNSON: That's right. That's right.

THE COMMISSIONER: So you don't describe a river that is breaking its banks two months of the year and a trickle in the foot of the channel two months of the year – you don't describe it as being something from Wind in the Willows, do you.

MR JOHNSON: No you don't. No, you certainly don't.

THE COMMISSIONER: Even though the amounts in question might produce just that.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Yes. I've always assumed, and this may be my innocence – I've assumed that of course models try to grapple with variability, don't they?

MR JOHNSON: I think the models do. It seems as though the practical implications of doing that have – have been very difficult for the people who make decisions based on the models. Can I make an observation? At an – again at a – at a meeting of the Barwon-Darling Stakeholder Advisory Panel this year – and I will go back a bit – people - - -

MR BEASLEY: You're on this panel.

MR JOHNSON: I'm on this panel.

MR BEASLEY: Yes, yes.

MR JOHNSON: I'm a member of the panel. People have been extremely concerned about the use of long-term averages for a long, long time. It doesn't – people keep saying – senior – many senior people find it very, very frustrating that highly variable rivers are treated using long-term averages. And - - -

THE COMMISSIONER: You can't grow crops with long-term average.

MR JOHNSON: Well, you can't and you can't protect – you can't protect water and ecosystems with long-term averages as well. And at the meeting, one – there was – this was – this – this issue wouldn't go – won't go away. It won't go away on the Barwon-Darling, and – and people insist on – people are insisting on – on approaching the river the way it is, rather than the way it averages. And one of the irrigator representatives said, "We know long-term averages are misleading. We use them because we have to."

THE COMMISSIONER: What does that mean, "we have to"? I mean, it might be right.

MR JOHNSON: I don't know. I didn't ask.

THE COMMISSIONER: Right.

MR JOHNSON: I assumed – I made an assumption but I didn't ask. Just again, long-term averages obscure all of the practical day-to-day, year-on-year extractions, environmental needs – environmental needs, soakage, seepage, evaporate transpiration, are all put into losses in many cases. I only heard that term last week that the – this environmental flow from – that has got – just crept to Menindee, unfortunately, it only got there because there were so many losses on the way. And – and those flows were the flows that replenished waterholes, saved fish, rejuvenated the riparian.

THE COMMISSIONER: So you're concerned that losses is apparently a category that includes saving fish.

MR JOHNSON: It has been – it has been a bug bear of mine for the entire – and I'm – and – and – and I seem to have made no progress in people – getting people to stop using it. It has been a bug bear of mine for a quarter of a century.

THE COMMISSIONER: Could we - - -

MR BEASLEY: Yes.

THE COMMISSIONER: Could we stop at the bug bear.

MR BEASLEY: Yes.

THE COMMISSIONER: Can I give you something – I will give you two things to think about over the break. The first is the names of your colleagues.

MR BEASLEY: And that includes paragraph 24, I think, not just - - -

THE COMMISSIONER: Yes, it does.

MR BEASLEY: Yes.

THE COMMISSIONER: And the second thing is this: if you could ask someone to show you, unless you either remember it or you have got it with you, item 6, section 22 of the Act, and its definition of the long-term average sustainable diversion limit because I am interested to hear your ideas in relation to possible improvement of the Act in that regard. But just look at it and think about it. We will come back to it after we break until 10 to. Thank you. Thanks. Thank you very much. And we will see you at 10 to.

ADJOURNED **[11.33 am]**

RESUMED **[11.52 am]**

THE COMMISSIONER: Mr Johnson, I'm perfectly happy for you to take my question about the people referred to in your paragraphs 17 and 24 of your statement on notice, including any request you might make for me to keep evidence private, that is, not published. And that can be followed up by dealings between you and the Commission staff, if that's convenient to you.

MR JOHNSON: Yes, thank you.

THE COMMISSIONER: Thank you.

MR BEASLEY: In relation to paragraph 24 you are going to locate the email you referred to.

MR JOHNSON: Yes, I am.

MR BEASLEY: Yes. But a senior officer of the MDBA is named in the email; is that right.

MR JOHNSON: Yes, she sent the email.

MR BEASLEY: Are you happy to say who that was?

MR JOHNSON: Yes. That was Peta Derham.

MR BEASLEY: Yes. Peta is P-e-t-a, is it?

MR JOHNSON: That's right.

MR BEASLEY: Registrar. So it's a woman.

THE COMMISSIONER: Now, the other question on notice I gave to you over the break, sorry for ruining your coffee, was the definition in item 6 of the table in section 22, which is referred to in the definition in section 4 of the long-term average sustainable diversion limit. Which is, to put it mildly, a central concept in the Act. Now, I'm very interested in what you've said about the inappropriateness, the unpopularity, in some circles of long-term averages being used not only to model but also to operate rivers, and the jarring contrast between it and reality that you have heard conveyed by people, which I think you feel yourself; is that right?

MR JOHNSON: Yes. Yes, I do.

THE COMMISSIONER: Do you have any suggestion as to – let me – forgive the length of what I'm about to say, but it will hopefully help you answer the question. We know, from the requirement to have an Environmental Watering Plan, both an overall one for the Basin plus plans applying to each of the respective areas that the way in which water is to be dealt with, correct me if I am wrong, goes far beyond just adding water. Timing, locations, periodicity, variability, are matters which are expressly and implicitly required to be dealt with in those plans. That's correct, isn't it?

MR JOHNSON: Yes, that's correct.

THE COMMISSIONER: And explicitly so as to maintain relevant ecological character, protect and restore biodiversity and, with respect to climate change, it must be the only statute in the world that uses the expression "refugia", to protect refugia.

MR JOHNSON: Yes.

THE COMMISSIONER: These are part of emergency shelters, so to speak.

MR JOHNSON: Yes, they are.

THE COMMISSIONER: Sufficient moisture at the bottom of what appears to be a dried billabong so that, when the rains do come, out come the tadpoles, so to speak.

MR JOHNSON: Yes. That's right.

THE COMMISSIONER: Now, 8.07, this is the chapter that you worked on, is that right.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: 8.07, for example, refers to wetting and drying circles, and inundation intervals, minimising habitat fragmentation. That last is a connectivity question; is that right?

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Now, I have gathered – and I need your comment on this – I've gathered that, not least by reason of those things that I've just tripped through, that it really is a travesty and quite wrong to say that the approach to the environmental watering is – in the Basin Plan is "just add water". Do you agree with me or not?

MR JOHNSON: That's the starting point, but then all of the points you made about periodicity, variability, volume, location, all of those then come into it to get the responses you want from that water.

THE COMMISSIONER: Now, the Northern Basin Review includes, under this slightly odd expression "toolkit" measures, things that are also sometimes described as complementary measures; do you recall that?

MR JOHNSON: Yes.

THE COMMISSIONER: Now, that's complementary, spelt with a middle e, not an i, and so it is completing some exercise by adding to something else. The something else is water, isn't it?

MR JOHNSON: Yes. The something else is water.

THE COMMISSIONER: Complementary measures are not outside the Basin Plan, are they?

MR JOHNSON: Not all of them, no. I think – I think some of the – I think some of the specific works, the concrete and steel, are perhaps – specifically are outside but some of the particular measures, protection of environmental water and - - -

THE COMMISSIONER: When you say they're outside the Basin, they are contemplated, aren't they, for example, as supply measures for the purposes of an adjustment?

MR JOHNSON: Yes. They're contemplated. They're contemplated, but they're not - - -

THE COMMISSIONER: They are not provided for specifically, but they are generically - - -

MR JOHNSON: Yes.

THE COMMISSIONER: - - - in a sense, regulated by them; that is, they can be used to affect and – an adjustment or amendment upon certain criteria being reached, being satisfied.

MR JOHNSON: Yes.

THE COMMISSIONER: So, back to the question of long-term averages, it's in this crucial part of the Act but then the Act – when it draws up the Watering Plans, and the Plan – when the Plan does that, Basin Plan does that, certainly not talking about averages, because it copes with variability and fluctuations and high – wets and dries and biodiversity and ecological character, all of which are positively opposed to the idea of an artificial average. You're nodding; you agree with that?

MR JOHNSON: Yes, that's right. Yes, I do.

THE COMMISSIONER: So do you think we – do you think there should be a revisiting of item 6 in section 22, or will it do, bearing in mind that environmental planned watering does embrace variability?

MR JOHNSON: I'm not sure. My preference would be to see a revisiting.

THE COMMISSIONER: Do you have a suggestion as to where we might go?

MR JOHNSON: No, not really. Just – as - - -

THE COMMISSIONER: Would you – I don't want to put you on the spot. If something occurs to you on reflection, I would be extremely interested to read something you might like to supplement to me on that. If nothing occurs to you, or supposing you have better things to do, so be it, but I would welcome, really, your thoughts on – even conceptually – what might be superior or worth considering as a better approach than the current item 6 section 22 definition.

MR JOHNSON: I would be happy to do that.

THE COMMISSIONER: Thanks very much.

MR JOHNSON: Could I just – just to see if this is what you have in mind, give a short background to - - -

THE COMMISSIONER: Please.

MR JOHNSON: So the idea of regulated rivers, it just means they're made more regular. Highly variable rivers – and the Australians rivers in the Basin have a – Australian rivers, I think, have a large proportion of storage compared to the size of the water in the rivers because they're so – they flow so – the flow is so variable. And it is – and irrigation, particularly permanent plantings and other things, and also the purposes of irrigation were to make the flows more regular to ameliorate the effects of drought.

THE COMMISSIONER: And flooding.

MR JOHNSON: And flooding, that's right. In fact Burrendong Dam, near Dubbo, has a flood mitigation zone for that purpose. And in the early days – and there was no consideration of the values of – well, little public consideration of the values of natural systems. And in fact, there was a moral judgment about them in the Macquarie. The river was a degenerate river. The Macquarie Marshes were a... infested grassland. So there was a moral element to - - -

THE COMMISSIONER: So degenerate from some Garden of Eden state... or what?

MR JOHNSON: Degenerates – no, well, I think the – I think the original moral sense may have come from that, but it was describe that the Macquarie degenerates

downstream... and so when you're thinking about it, you have to consider this implicit moral – this implicit moral standing. And it – and the idea that – there was an idea in policies that water didn't leave a river. In the Macquarie, in the '70s, the Macquarie River Environmental Committee was a group of irrigators, and it was their policy that if possible no water should leave the Macquarie. Certainly, you still hear that water that flows to the sea is wasted water. You hear that frequently. So - - -

MR BEASLEY: Sorry, no water should leave the Macquarie other than for consumptive take; is that what you mean?

MR JOHNSON: Yes. Yes, the water – if possible the water should stay in that valley, and the idea of surplus - - -

MR BEASLEY: So there's nothing left.

MR JOHNSON: Nothing left to go – no, nothing left.

MR BEASLEY: Well, that's fair.

MR JOHNSON: And this was in the 60s and the 70s, but there's still an element of that. And also – also there was a term "surplus flows", which you don't hear these days or rarely hear it, which is basically flows of the river that were surplus to users' requirements. And if there was surplus flows in the river, then the users could have access to them if they wished. Now, these are all '70s and '80s concepts which have somewhat gone underground, but you still see them – symptoms when people talk about "losses" and different things, so there's a culture there. So the rivers were developed for irrigation and with little consideration for anything else. It was to make them more regular.

The – the Murray-Darling Basin is one of the most variable Basins in the world and the natural systems are – have developed based on that, so there's a clash. So if you are going to – you're trying to adjust a system designed to regulate and remove the variability with a system that depends on extreme variability. And that's a very difficult thing to do. So you would need to go – if you're talking about concepts and ideas you, would need to go back to the – at least accept a foundational premise about extraction. And then there would be certain things that you couldn't do.

You couldn't change dams, you would need to regulate flooding, but there would be other things that you could do that would be more – that would be more sympathetic to the natural systems. One of the things – this is about the – and this goes back also to the ESLT document. And I don't want this to sound like an apologia, from our earlier - - -

THE COMMISSIONER: If one is required, you should advance it.

MR JOHNSON: Well, I don't want to – thank you. But this document in 2011, pages 66 and 67, when I read this document, it – the bottom of page 66 and the top of page 67, is that – to me it was a central - - -

MR BEASLEY: Sorry, this is exhibit RCE6. Yes. Go on.

MR JOHNSON: It was a central – a defining moment in a way, and the defining section in this:

> *In modelling the ESLT options MDBA had to take account of social and economic implications in the following ways: setting the ESLT within the constraints and operative rules of the current system, which has been designed for irrigation and other water use.*

So no change:

> *Avoiding third party impacts by protecting the reliability of entitlements.*

Assume that that's extracting entitlements. No change.

> *Managing the held environmental water portfolio according to existing rules in order to retain the productive capacity of the water dependent enterprises.*

No change. And:

> *Assessing the additional water recovery needed, assuming the efficient use of environmental water, effectively optimising water use so as to reduce the scale of change required.*

Little change. And my view then was that if things can't change, then nothing will change.

THE COMMISSIONER: Yes.

MR JOHNSON: And subsequently I spent less time on this and more time on chapter 8 and the environmental water inquiries in Basin-wide Environmental Watering Strategy. I could never – I could never get past those four points.

THE COMMISSIONER: Now – yes. Thank you.

MR JOHNSON: And that, I think, comes back to section 6 and section 22.

THE COMMISSIONER: Item 6 of section 22's table doesn't seem to me to require any of the four dot points that one finds, on the foot of page 66 to the top of page 67 of RCE6, the "ESLT Method and Outcomes" November 2011 MDBA publication. And it doesn't seem to me to permit them, either. And I gather from your nodding

that without, as it were, making a legal submission to me, that's your understanding – that was your understanding, at least until you saw those explanations given.

MR JOHNSON: I don't think I had made the link until I saw those explanations and then I concluded that there was little I – if you don't – and it goes back to your question about how you would manage the system. If you're not going to change the system, and it's the way the system is managed as a regular – for extracting use or to set up, then you will have limited success in protecting and maintaining and restoring water ecosystems.

THE COMMISSIONER: But it seems odd to me that the L in ESLT meaning "limit" and the obligation for water resource plans to add up to no more extraction than the overall SDL, as well as complying with what I call local limits, it seems odd to me to suppose that anything other than that which is referred to in the definition of SDL, including section 23's compulsory reflection of the ESLT, could be considered by the MDBA, as you point out, as plain as a pikestaff at the foot of page 67, top of page 67 of that exhibit, the MDBA took a very different route. Now, that is notoriously the subject of a provisional disagreement by me in my Issues Paper Number 2 in this Royal Commission.

There has been one published legal opinion given to the MDBA, which may or may not support what's to be found on those pages. For what it's worth, I don't think it does support at all, and there are shreds of evidence suggesting there had been quite opposite legal advice received by the MDBA previously which would rather tend to accord with the provisional views I've expressed in Issues Paper Number 2.

MR BEASLEY: Can I just draw your attention to – sorry.

THE COMMISSIONER: Yes. Can I just finish?

MR BEASLEY: Yes, sorry.

THE COMMISSIONER: Can you recall any discussion with your colleagues about there being some kind of change in direction now reflected in that passage to which you've drawn attention in the ESLT report?

MR JOHNSON: No, I don't recall any conversations.

THE COMMISSIONER: Thanks.

MR BEASLEY: At the bottom of 66, the sentence that Mr Johnson first read out:

> *In modelling the ESLT options the MDBA had to take account of social and economic implications.*

So that's an assertion that the social and economic implications are part of the model, I would have thought.

THE COMMISSIONER: Well, it might be, but I've learned not to place too much weight on the precise language used by the Authority.

MR BEASLEY: It's not consistent with what Mr Littleproud – sorry, it's not consistent with the addendum – the submission I should say, attached to Mr Littleproud's letter to Mr – the Minister here of 2 July - - -

THE COMMISSIONER: No.

MR BEASLEY: - - - because the assertion in the box in that is that the 2,400 and 3,200 gigalitre range was based "On ecological outcomes and risk" with no mention of social or economic implications.

THE COMMISSIONER: That's – that is a document – the Clayton's submission, as I've called it in the past. That is a document which I am likely to infer comes from at least in combination of MDBA and ministerial office advice to the Minister. That is I wouldn't, for a moment, suppose the Minister devised that for himself.

MR BEASLEY: No.

THE COMMISSIONER: And I repeat: if the MDBA wishes to dissociate itself from that boxed advice, which as you point out doesn't accord very well with the ESLT report, then they need only write to see – to let me know, so that I can reconsider whether to draw that inference. But at the moment that would appear to be the overwhelmingly better inference: namely, that the MDBA is content to have those possibly inconsistent statements about the critical history of the record, with the consequences that may have for an assessment of the appropriateness of the MDBA as the administrator of this Plan.

MR BEASLEY: That – the – you would need a model to work out the various options that could have produced that box. It could have been someone advising from the MDBA that hadn't read the ESLT report; it could have been someone from the MDBA that had read the ESLT report, but it was reported to someone in the Minister's office that didn't understand what was being told to them; it could have been drafted by someone in the Minister's office that hadn't read the ESLT report. You could probably go on and on.

THE COMMISSIONER: All those permutations are not flattering of what I will call the Executive, but you are right, some of them - - -

MR BEASLEY: Well, given it's on a website, it's publicly published.

THE COMMISSIONER: Some of them may leave the MDBA out of it, but - - -

MR BEASLEY: Sorry. It's published.

THE COMMISSIONER: - - - bearing in mind it is referring to an MDBA process, it seems very odd that the responsible Minister would make a statement about the historical process by the Authority without the Authority being content with its being correct. That's why I would infer that it is informed at least, if not completely dictated, by the current administration of the MDBA.

MR BEASLEY: A strong inference, yes.

THE COMMISSIONER: Yes. I'm sorry, Mr Johnson, but we are trying to deal with Terms of Reference I am required to respond to, which affect the MDBA, which – how shall I say – has not published everything that is historically informative of its own processes. Now, if you are able, as I say on reflection, to propose something which would avoid the anomalies and undesirable consequences to which you have referred today, from the concept of long-term average, then I would be very grateful. Thanks.

MR BEASLEY: I wanted to ask you about the comment you made at the bottom of page 3 of your submission. And I want to make sure that it's understood. This is where you are talking about the toolkit measures for the Northern Basin Review, which I think were generally known what they are: protection of environmental flows, proper coordination of environmental flows and the like. Do you have that page of your submission there?

MR JOHNSON: The submission.

MR BEASLEY: Yes. Not your statement; submission. The bottom of page 3:

> *Much is made of the toolkit measures.*

MR JOHNSON: Yes.

MR BEASLEY: You say in the last two sentences:

> *these mechanisms, that is protecting environmental water, assuring compliance, works to improve conditions of fish –*

etcetera – all of the aspects of the toolkit measures:

> *…these mechanisms are explicit in the Basin Plan and implicit in the calculations relating to environmental outcomes.*

Just pausing there and the words "implicit in the calculations relating to environmental outcomes", is that a reference to what you tell us – what you tell the Commissioner at paragraph 22 of your statement – if you can cross-reference to that – where you say you were informed by Mr Walker, who was the Director of the Northern Basin Review, that environmental flows in the Barwon-Darling are not

assumed to be shepherded on an event by event basis, but that the protection of environmental flows is done in the model.

And I read that as being an input in the model by ensuring the long-term average diversions do not change. Is that you telling us that protection of environmental flows is already part of the – an input to the modelling? And so having a toolkit measure that says, "Environmental flows should be protected," and reducing water further from that, is what you call double counting?

MR JOHNSON: Yes.

MR BEASLEY: Right.

MR JOHNSON: To the best of my understanding, that's right.

MR BEASLEY: All right. So my understanding is correct in what you intend to convey about that.

MR JOHNSON: Yes.

MR BEASLEY: All right. Over the page, at the top of page 4, still on the Northern Basin Review, you express the opinion that the review is inconsistent with the objects of the Act and you mention some of the international agreements that Australia has entered into. Then you – in the two bullet points I want to just make sure that the source of your understanding is the same as mine. You say in the first bullet point:

> *The scientific findings for the Ramsar listed Narran Lake, which found that more water was required more frequently for protection of waterbirds –*

if we can have the Northern Basin Review folder. I just want to see if this is what you had in mind when making that statement. So if that could be opened for the witness, please, at tab 2. So this is the Basin Authority's report entitled "Environmental Outcomes of the Northern Basin Review", October 2016, which is exhibit RCE50. And if you go to page 50, you will get the environmental results concerning the Narran Lakes in relation to these various scenarios of a recovery of water of 320 gigalitres, 350 and 415 and 345 and 390. And you note on page 51 that only – at any of those recovery amounts, only two of the flow indicators are met for the Narran Lakes. Is that the sort of thing you had in mind in expressing the view that there's not enough water being recovered for this wetland?

MR JOHNSON: I'm not sure that I have the – is that the – is this the page here with the table? I've got a heading on page 50, 'Interpreting the Modelling Results'.

MR BEASLEY: You might be in the wrong tab. No, you're on the wrong - - -

MR JOHNSON: Tab 2.

MR BEASLEY: Tab 2. Yes. So go to page 50 of that. Tell me when you've got to page 50.

MR JOHNSON: Yes.

MR BEASLEY: At the bottom, do you see 'What are the Narran Lakes Environmental Results'? Do you see that heading?

MR JOHNSON: Yes, I do.

MR BEASLEY: And it talks about various scenarios of water recovery actually from 278 gigalitres right through to 415, and that only – and that only two of the four flow indicators are achieved in relation to any of those recoveries. Is that the sort of thing you had in mind in relation to the comment you've expressed that I drew your attention to in your submission?

MR JOHNSON: Yes, it is. It – it also moves on to page 52, and – and - - -

MR BEASLEY: Yes. And can I also draw your attention to page 116, same report, because – do you have that?

MR JOHNSON: Yes, I do.

MR BEASLEY: And it has got some bullet points down the bottom concerning the Narran River and Narran Lakes again. Narran is N-a-r-r-a-n. Scenarios – the second to last bullet point:

> *The scenarios that performed best include a high recovery volume for the Narran River. This is important as recovering water from Narran River, especially water harvesting licences, has been shown to provide the best inflow outcomes for the Narran Lakes.*

Next bullet point:

> *Based on the average frequency results above, it is likely that some water birds, eg, straw-necked ibis, will only have one opportunity to breed in their lifetimes. At this breeding reoccurrence, some water bird populations are likely to continue to decline, particularly if ongoing research shows that other suitable breeding areas are usually synchronised with Narran Lakes.*

Was it that sort of information that was – that sort of analysis from these various model scenarios that was the cause of your concern that has been reflected in your submission?

MR JOHNSON: Yes. Yes, they are.

MR BEASLEY: All right. And similarly, we talked in your submission about Gwydir – sorry, Macquarie Marshes in the next bullet point. I think that's, you will find, if we go to page – let me see – 55, you will see what are the – do you have a heading page 55 of the report? Yes, of the report? If you go to 55, you should see a heading 'What Are the Gwydir Environmental Results'?

MR JOHNSON: Yes, I do.

MR BEASLEY: All right. And you see under any of the scenarios for water recovery, whether it's 278 through to 415, four of the flow indicators are not met. Sorry, four of the nine are not met. So four of – nearly half of the flow indicators are not met, whether it's a - - -

MR JOHNSON: Yes.

MR BEASLEY: - - - 278 gigalitre recovery for the environment or whether it's right up to 415 gigalitres recovery for the environment.

MR JOHNSON: And on page 54, Gwydir River flow indicators - - -

MR BEASLEY: Yes.

MR JOHNSON:

> *These are based on previous information compiled for the valley with no new information developed.*

MR BEASLEY: Yes, and that's one of the points you make, too, isn't it, in your submission.

MR JOHNSON: Yes, that's right.

MR BEASLEY: That there was no further research done in relation to something as significant as a Ramsar wetland.

MR JOHNSON: And the same for the Macquarie Marshes.

MR BEASLEY: Yes.

MR JOHNSON: Yes, that's right.

MR BEASLEY: Yes. All right. I would now like to take you back to what you've said on the first page of your submission to make sure that I understand what you're telling the Commissioner. You say you – this is the bottom under the heading 'The Structure of New South Wales Water Resource Plan', so I'm on page 1 of your submission. You say you understand that:

In New South Wales under the Basin Plan, water resource plans will be "umbrella plans" providing a framework for subsidiary plans. The subsidiary plans will include water sharing plans, long-term environmental watering plans and salinity management plans.

Now, what's that understanding based on?

MR JOHNSON: It's based on some years ago a comment by a department of – a now officer that that would be the case. I think I used – they used that term, "umbrella plans".

MR BEASLEY: Yes.

MR JOHNSON: Also informal comments in – from New South Wales Office of Water people that MDBA would be – would be reviewing the Water Resource Plans, not Water Sharing Plans. And also recently at the Barwon-Darling Stakeholder Advisory Panel that that – that's the structure. There will be a water resource plan which will contain a number of other plans.

MR BEASLEY: Now, the reason I'm concerned about this is in paragraph 33 of your statement, you've said that you recall conversations with Tony McLeod for the MDBA, who described a future Water Resource Plan accreditation as a "tick and flick" process. Were those conversations when you were an employee of the Basin Authority?

MR JOHNSON: Yes, they were. And there may not have been conversations as – a – a number of conversations. But that tick and flick was a widely – the – it was – cause a bit of a flurry, and there was quite a lot of concern through from some people. And – and it was said then - - -

MR BEASLEY: Well – yes, keep going.

MR JOHNSON: - - - that he hadn't quite meant – hadn't really meant that.

MR BEASLEY: Because, I mean, the concern in relation to tick and flick is that the Water Resource Plans – the process is, in relation to them being accredited, it's the Minister that accredits them on the recommendation of the Basin Authority that occurs; correct?

MR JOHNSON: Yes, that's correct.

MR BEASLEY: But they concern compulsory content that's both described in the Water Act and in the Basin Plan. So section 55 is the relevant provision of the Water Act. But that doesn't really tell us much. We've got to go to the Basin Plan. And it's chapter 10 of the Basin Plan. So if you go to – that will be on page 90 of the folder you've just been given. And that sets out all of the things throughout this chapter that have to be included in a Water Resource Plan. The concern that springs

to my mind in relation to your understanding that there will be a – New South Wales will have Water Resource Plans but they will have all these subsidiary plans underneath them, so to speak – is the New South Wales proposal, as you understand it, that the Water Resource Plan may not have all of the compulsory content set out in the Basin Plan, but all of that will be in the Water Sharing Plans?

MR JOHNSON: Yes, that was a – that's a – that's a concern.

MR BEASLEY: All right. Of course, we don't know precisely what's going to happen yet because we haven't seen these documents. And that brings in a further concern, does it, that the reviewing of the Plan, if only the Plan is looked at, if the real content is not in the Resource Plan but in the Water Sharing Plans underneath it, then that process will hardly be satisfactory.

MR JOHNSON: That's – that's true.

MR BEASLEY: All right. I wanted to ask you also about what you've said at the bottom of page 4 and the top of page 5 of your report concerning – this is partly concerning protection of environmental flows. You mention the Matthews final report at the top of page 5 of your submission. Those reports have not yet been tendered. There's an interim report and a final report. The interim report is titled Interim Report, Ken Matthews AO Quote "Independent Investigations to New South Wales Water Management and Compliance", 8 September 2017. The final report is called, also, "Independent Investigation to the New South Wales Water Management and Compliance", subheading "Advice on Implementation", 24 November 2017. I will tender both of those reports. But my reading of the report is that Mr Matthews has recommended that the Water Sharing Plan implement individual daily extraction limits. I couldn't see anything about a recommendation for total daily extraction limits.

MR JOHNSON: It may not. Perhaps I was being hopeful.

MR BEASLEY: Yes. Well, I think if we look at page 44 of the interim report, where Mr Matthews – well, back at 43 he has got a heading in his interim report 5, Protection of Environmental Water, and on page 44, he makes what he calls a recommendation for an interim solution regarding Barwon-Darling and the protection of environmental water. And his first bullet point is implementation of individual daily extraction limits, which were already foreshadowed by the New South Wales government when the Barwon-Darling Water Sharing Plan was first introduced, and a number of other recommendations but doesn't recommend the implementation of total daily extraction limits. Do you see that?

MR JOHNSON: Yes, I – I noticed that, yes.

MR BEASLEY: Yes, all right.

THE COMMISSIONER: By "total", we mean the aggregate of individual limits, do we?

MR BEASLEY: Yes.

MR JOHNSON: Yes.

MR BEASLEY: That's in a zone of the river; correct?

MR JOHNSON: Yes, that's right.

MR BEASLEY: Yes.

MR JOHNSON: The total data extraction limits were part of the Water Sharing Plan but this - - -

MR BEASLEY: Not implemented?

MR JOHNSON: No.

MR BEASLEY: No.

MR JOHNSON: No, Mr - - -

MR BEASLEY: Now, can you explain to the Commissioner why, beyond having individual daily extraction limits, having total daily extraction limits for a zone of the river provides better protection for environmental flow?

MR JOHNSON: Offhand, I don't think I can.

MR BEASLEY: All right. Do you want to take that question on notice?

MR JOHNSON: Yes.

MR BEASLEY: All right. At page 26 of your statement – sorry, paragraph 26, I should say, you talk about a disagreement in consultation approach for the Northern Basin Review that you had with Mr Williams, who was the General Manager of the Northern Basin Review Taskforce. What does General Manager of the Northern Basin Review Taskforce mean?

MR JOHNSON: The MDBA sometimes responded to difficult matters by creating a taskforce.

MR BEASLEY: Right.

MR JOHNSON: And – and Brent Williams was the general manager of the taskforce.

MR BEASLEY: And how did that – his position – what role did he have in relation to the work you were doing as the Engagement Officer?

MR JOHNSON: He wasn't – he wasn't my manager.

MR BEASLEY: Right. What was the disagreement concerning the consultation approach?

MR JOHNSON: I was never quite sure, but I think it was – some of the specifics were that – that people didn't know what I was doing.

MR BEASLEY: What people?

MR JOHNSON: Well, I didn't know what people.

MR BEASLEY: Right.

MR JOHNSON: Because Phillip Glyde certainly knew what I was doing because I was spending a lot of time with him.

MR BEASLEY: Right. Well, he's the Chief Executive - - -

MR JOHNSON: Well, that's true.

MR BEASLEY: - - - so that's a good start. Yes.

MR JOHNSON: And that I was not bringing information back to the centre.

MR BEASLEY: Not bringing information – what information, first of all?

MR JOHNSON: Information about the – that I was – that – that we were getting from the northern – from our engagement in the northern Basin.

MR BEASLEY: Right.

MR JOHNSON: Again, Phillip Glyde and – and the Chairman and - - -

MR BEASLEY: You were not bringing it back to staff at the MDBA. Is that the allegation or - - -

MR JOHNSON: Well, yes, I didn't – didn't pursue it. I assumed that was it.

MR BEASLEY: Well - - -

MR JOHNSON: I did ask him did he not think that the engagement was going well.

MR BEASLEY: Right.

MR JOHNSON: And he said, well, yes, it was, but he failed to see the role that I had played in it.

MR BEASLEY: I'm just – this may be irrelevant. I'm just - - -

MR JOHNSON: I think it - - -

MR BEASLEY: It is?

MR JOHNSON: Well, it may – I don't know; I can't – can't say.

MR BEASLEY: I mean, it's in your statement, so that gives me an indication that it should be relevant, if it's in there. But you can tell us if it's not relevant. I'm just wondering whether the disagreement in relation to consultation approach has anything to do with the concerns you have about the Northern Basin Review and how it was conducted?

MR JOHNSON: No.

MR BEASLEY: Was it a personality clash, was it, or - - -

MR JOHNSON: Possibly. I didn't think that – I – I thought that we were getting – well, we were getting good information from a range of views, from people who hadn't had an opportunity to put their views before. And – and the consultation was not - - -

MR BEASLEY: Who were the people that hadn't had a chance to put their views before? What sort of people are you talking about?

MR JOHNSON: People who hadn't – people who tended not to have been invited to peak bodies groups. People who felt as though their submissions hadn't been taken account of. People – for example, we had a meeting with the low flow irrigators at Bourke, including the last orange grower who has – who said he was going to remove his trees and subsequently has, who didn't want to come to the big meeting – we had a meeting over breakfast. They didn't – four or five people didn't want to come to the big meeting.

MR BEASLEY: Is this because they feel – no, don't - - -

MR JOHNSON: Intimidated.

MR BEASLEY: All right. By larger irrigators or - - -

MR JOHNSON: Yes, partly by that, partly because there was a – yes, partly by that.

MR BEASLEY: And was the criticism of you that you were - - -

MR JOHNSON: No.

MR BEASLEY: - - - engaging with them but not reporting back?

MR JOHNSON: Well, I can only assume that it was because I was engaging with them and not reporting back.

MR BEASLEY: Right, okay. Was that – but you said you worked closely with Mr Glyde during the course of the Northern Basin Review.

MR JOHNSON: Yes, and – and Mr Neil Andrew and the Northern Basin Advisory Committee, and I think every member of the board came on at least one of the trips.

MR BEASLEY: And you were reporting regularly to Mr Glyde and Mr Andrews about what you were doing in terms of your role as the Engagement Officer.

MR JOHNSON: Well, we were doing it together.

MR BEASLEY: All right. Well, I take from your – when I've asked you about this disagreement that you don't actually know what the - - -

MR JOHNSON: It – it - - -

MR BEASLEY: - - - details of the problem were.

MR JOHNSON: It – no – no, it was hard. I – I – I have to say I didn't make very many inquiries at that stage. I felt that - - -

MR BEASLEY: Were you, in any way – the matters that you've raised with the Commissioner about your concerns about the Northern Basin Review regarding, for example, the modelling as one example, and the difficulties of that in relation to such a highly variable system that we're talking about in the northern Basin, were these matters that you were raising with your employer and with Mr Glyde and Mr Andrews and other people at the Basin Authority throughout the course of this process as well?

MR JOHNSON: Yes. Yes, they were, in some emails, and – but also in the conversations we were having as we travelled around. I remember – and quite apart from the technical shortcomings of the modelling – and the town of Wee Waa strikes me as – it stays with me particularly.

MR BEASLEY: Yes.

MR JOHNSON: We had a meeting with the Wee Waa Chamber of Commerce, dinner, there must have been 25 or 30 people there. And their concerns, particular concerns, were – just a little bit of context.

MR BEASLEY: Yes.

MR JOHNSON: Is that for the downstream contribution from the Namoi to the Barwon-Darling, the water – it made sense, even though it hadn't been specified, that it would be recovered from as close to the Barwon-Darling as possible.

MR BEASLEY: YEs.

MR JOHNSON: So that's in the Wee Waa area and there was a figure, they were given a figure and a recovery, I think about 16 gigalitres and they said, "Well, that's about 10 per cent of the water we use in this area." The point was made, quite apart from whether they agreed with that or not, but the purpose of that recovery was to contribute to the environment of the Barwon-Darling. And I remember two people particularly, and one of them said at that dinner, "Why recover the water from us when it's simply going to be taken a couple of miles down the road?"

And so – and that was the consequence of water recovery and one water resource planning area and losing that status and being, as one of the Authority members said, "Increasing the security of supply of irrigators in the Barwon-Darling." That, to me, was a foundational flaw. You couldn't get past that and be credible.

MR BEASLEY: Right. And - - -

MR JOHNSON: And saying – and saying that it will be protected through the cap, which, through long-term averages, in the long-term, when pressed people would say, "Well, it will be protected in the long-term." People will get more water in the short-term, irrigators will get more water in the short-term, but in the long-term it will be protected. Now, that was not – this was – that was not a – was not a satisfactory position, particularly as people are suffering or benefiting in the short-term.

MR BEASLEY: All right. And the concerns you've mentioned in your submission, for example in relation to the Narran Lakes or Macquarie Marshes about the Basin Review and the impacts it might have on those wetlands and lakes, was that something you were raising with – at the time with either in the course of your engagement with community members or the Advisory Committee and with the staff – other staff of the Basin Authority?

MR JOHNSON: Less specifically. That had been my background. My background was environmental water management in two – the Macquarie Marshes, which was a Ramsar wetland and the Gwydir which became one, as with Narran, and that is a specific area of interest and expertise, particularly with ibis and colonial waterbirds. I raised it. It was a concern of mine over many years. I worked with the people who were doing – particularly the waterbird work, I worked with Richard Kingsford over the years and I worked with the – the – the project officer who was doing this work and had quite a lot of conversations with him and with other people.

MR BEASLEY: All right. Did you express any dissatisfaction to your employer about the Basin Review during the course of the Northern Basin Review?

MR JOHNSON: I don't think – perhaps – I don't recall. Perhaps mild dissatisfaction. I did suggest on a number of occasions that we needed to take a different approach and also - - -

MR BEASLEY: I will just pause there, a different approach meaning what?

MR JOHNSON: Well, we needed, for a start we needed to be – we needed to be straightforward and direct with people. We needed to be honest with people about – we needed to be – to accept what people were saying. If people were saying to us, "Well, this is happening." And we are saying, "Don't worry it will all be all right in the end." Then people didn't – people knew we weren't listening, weren't responding. I didn't - - -

MR BEASLEY: Do I take it from that the – and tell – don't let me put words in your mouth. It's not a trial. A trial out there, but not here. You – the disagreement that you're having with Mr Williams, tell me if I'm wrong, but is it – was he resistant to a more straightforward approach?

MR JOHNSON: No, I don't think so. I don't think he was. No. I think it was – I think it may have just been – no, I don't think it had any bearing on it.

MR BEASLEY: All right.

MR JOHNSON: With regard to those conversations, I spoke to a number of people and I provided with you a text of two emails that I sent, that I had distilled my concerns into those emails and - - -

MR BEASLEY: Have you?

MR JOHNSON: Pardon?

MR BEASLEY: I'm looking furiously through my folder.

MR JOHNSON: It's in my – it's in a document of supporting – I didn't send the emails, I just provided.

MR BEASLEY: Right.

MR JOHNSON: So additional information. So I had one conversation, I framed some questions for Frank Walker and he then responded.

MR BEASLEY: Right.

MR JOHNSON: And I also – I also articulated some concerns to Phillip Glyde's Executive Officer.

MR BEASLEY: Are these – are these – are these emails – when you – the questions that you framed in the email, what are they concerning?

MR JOHNSON: No. I - - -

MR BEASLEY: You haven't brought them with you?

MR JOHNSON: I have brought them with me. They were concerning – there are a number of questions that I sent to Frank Walker and David Galeano, who at that stage was the Head of the Northern Basin Review, and there had been – I had seen some notes and minutes from a Northern Basin irrigators meeting and I went through that and I – and I noted comments.

MR BEASLEY: Yes.

MR JOHNSON: In that – from those meetings. And then I asked Frank and David what they meant. For example, it was indicated that flows were not assumed to be shepherded in the model but were protected. I said, "Are we saying that flows are protected in another way? If so is the other way the long-term water sharing plan limit through compliance and limitations?"

MR BEASLEY: Right.

MR JOHNSON: And then Frank Walker responded. And I had a number, maybe 10 questions or more.

MR BEASLEY: Right.

MR JOHNSON: And then I sent - - -

MR BEASLEY: What's the date of this email?

MR JOHNSON: The date of that email is 30 January 2016.

MR BEASLEY: Right. So – and when did you leave the organisation?

MR JOHNSON: I left on 7 July 2016.

MR BEASLEY: Okay. All right. Are these – so these emails are relevant to some of the matters you've raised in your submission, though?

MR JOHNSON: Yes, they are. I think they're highly relevant. It was me having developed an understanding of what was happening and getting those – checking that understanding.

MR BEASLEY: Are you happy for us to have those emails?

MR JOHNSON: Look, you can have the emails. I just have a Word document but I can track down the emails. You can certainly have the text of them.

MR BEASLEY: All right. Sorry. I'm told we do have them, it's just that I don't.

MR JOHNSON: My questions are highlighted.

MR BEASLEY: Yes. So he agreed that we needed – you needed to clarify what he's saying about the model concerning protection of environmental water flowing along the Barwon-Darling. What's NBIWG? Northern Basin - - -

MR JOHNSON: Northern Basin Irrigators Working Group, I think. I'm not sure.

MR BEASLEY: Right. I see. There was an irrigators working group. Okay.

MR JOHNSON: And part of the – my role was to provide opportunities for people who were not formally part of the irrigation industry to engage with the MDBA.

MR BEASLEY: Your question:

> *Does this mean that the model was adjusted to show that increased inflows did not lead to increased diversions and that environmental water was protected, even though diversions did increase and the environmental water was not protected?*

MR JOHNSON: Yes.

MR BEASLEY:

> *Diversions increased above cap in the modelling which should not have occurred –*

is the response:

> *…if the model properly reflects the individual cap accounting arrangements established by the water sharing plan. So the issue was why the model does not fully reflect the water sharing plan. I am trying to get further info from Matt.*

Who's Matt?

MR JOHNSON: I think it is probably Matthew Coleman.

MR BEASLEY: Is he a modeller, is he, or a - - -

MR JOHNSON: Yes, yes.

MR BEASLEY: Right. WJ question:

Does it mean that real growth in diversions is prevented from showing the model by adjusting the model?

Response:

Correct. But the question is why was the adjustment needed?

Question:

Are we saying or suggesting that growth in diversions is not happening in reality?

Walker response:

The Water Sharing Plan individual cap accounting range prevent individual entitlements from taking any more than their share of the long-term average cap. So there cannot be any growth above cap if the Water Sharing Plan is complied with. Okay.

Question:

Did MDBA make adjustments or is MDBA using the model that was adjusted by New South Wales?

Response:

MDBA made the adjustment. Dan Connor from New South Wales DPI questioned why MDBA needed to do this as it does not align with how the water sharing plan works. We need to clarify what's going on.

Question:

I'm not sure what that means. Does it mean that growth in diversions in the Barwon-Darling as a result of increased environmental flows from the tributaries has increased the reliability of supply to irrigators in the Barwon-Darling?

Walker:

I can explain this in detail with a graph that Matt used at the 19 January meeting.

The 19 January meeting, sorry, was the meeting of the Irrigators' Working Group, was it?

MR JOHNSON: I think it must - - -

MR BEASLEY: Yes.

MR JOHNSON: Yes, that's the one I - - -

MR BEASLEY: Question or comment:

When I worked in New South Wales, it was always understood in government and in the informed community that the cap did not stop growth in use, and longstanding and routine breaches of the cap in the northern Basin are widely known.

Response:

I would like to discuss this further. I thought the main breaches of cap in the northern Basin occurred in the Barwon-Darling –

Sorry:

Mainly or only occurred in the Barwon-Darling. There's a distinct difference between cap, cap accounting and the way each state has implemented cap through their water – State Water Plans. State Water Plans are meant to prevent growth in the cap accounting. Was a means of checking whether the Plans were doing their job. One of the problems in the Barwon-Darling was that New South Wales did not have a Water Sharing Plan in place and we're trying to control a bolting horse, ie, systems still in strong growth mode, after agreeing to the cap without all the tools in place.

Comment, Johnson:

This highlights the point that Wilcannia did not and that one of the complaints of people downstream of Bourke is that the water is not reaching them.

That was a complaint made by people to you, was it?

MR JOHNSON: Yes.

MR BEASLEY: Yes.

MR JOHNSON: Widely – widely made.

MR BEASLEY: Yes.

MR JOHNSON: Yes, that's right.

MR BEASLEY:

We will need to be able to explain why this is so and not just by saying there has been a drought. That answer takes us straight back to the view that water meant for the Barwon-Darling is being extracted upstream at Bourke.

Response:

Not sure if Geoff has consciously left out Wilcannia. The modelling shows there will be increased flows in Wilcannia.

That will be a great comfort to people in Wilcannia. Comment by Bill Johnson, bullet point:

Why is the government recovering water from tributaries to contribute to a couple of the irrigators in the Barwon-Darling?

What does that mean?

MR JOHNSON: Why – why – I guess it was – what does it mean. It means what it says: that the government was – was recovering water in the tributaries.

MR BEASLEY: Yes.

MR JOHNSON: And it was - - -

MR BEASLEY: Who were the couple of irrigators?

MR JOHNSON: Those irrigators were the – predominantly were Darling Farms - - -

MR BEASLEY: Yes.

MR JOHNSON: - - - Joe Robinson and Peter Harris. They are the biggest irrigators upstream – of Bourke and upstream.

MR BEASLEY: So cotton growers.

MR JOHNSON: Yes.

MR BEASLEY: Yes.

MR JOHNSON: Yes:

What is the justification for any recovery when there is no confidence in mechanisms to enforce the cap and no effective compliance is in place?

Comment:

How can we be confident that the objective of the Basin Plan and the Basin Watering Strategy will be met through the cap accounting arrangements in the Barwon-Darling Water Sharing Plan? Can we see the water audit monitoring cap reports?

Walker response:

Fully agree this is not a marginal issue. Let's discuss further a way forward.

Did you have those discussions?

MR JOHNSON: No, not – not satisfactorily.

MR BEASLEY: Right. Well, does that mean there was not a discussion or there was a - - -

MR JOHNSON: I don't think there were – I wouldn't - - -

MR BEASLEY: - - - less than satisfactory discussion?

MR JOHNSON: It wouldn't be anything I would call a discussion.

MR BEASLEY: Yes. Okay. All right. And you said you're happy to give us those emails?

MR JOHNSON: Yes.

MR BEASLEY: All right. We will get them and tender them. I will just hand that back now. In both your submission and your statement, you express some concerns about floodplain harvesting in New South Wales, and at page 7 of your submission, you talk about the New South Wales Government's – I think it's both legislative regime and parts of its floodplain policy, but you also mention a consultation meeting at Dubbo on 16 March 2018. You see that on the top of page 7?

MR JOHNSON: Yes.

MR BEASLEY: What was that consultation meeting? Was it specifically about floodplain harvesting or was it about broader water management?

MR JOHNSON: It was about the – it was – it was to discuss the New South Wales water reform action plan, and there were four - - -

MR BEASLEY: All right. So this is in relation to the recommendations by Mr Matthews, was it?

MR JOHNSON: Yes, that's right.

MR BEASLEY: Right. All right.

MR JOHNSON: And there were four policies to be discussed. One was greater – I forget the title but greater transparency. Another was improved metering.

MR BEASLEY: Yes.

MR JOHNSON: And another was better management of environmental flows. Now, those policies have not been prepared. The fourth was the New South Wales – the implementation of the New South Wales floodplain harvesting policy, which was introduced saying, well, this – this is not about a new policy. This is about implementing an existing policy, which had been, I think, targeted consultation 2008, further consultation 2010, approved by the New South Wales government 2013.

MR BEASLEY: Yes. You've got a document there. What's the document?

MR JOHNSON: The document is - - -

MR BEASLEY: That's off the – this - - -

MR JOHNSON: This – this document is Implementing – this is the document I got at the time, "Implementing the New South Wales Floodplain Harvesting Policy".

MR BEASLEY: Yes. That's just a little brochure-type document from the website of the relevant government department. It's probably DPI, is it?

MR JOHNSON: Yes.

MR BEASLEY: Yes.

MR JOHNSON: Yes, that's right.

MR BEASLEY: Yes. But I just want to take you to the comment that was made by the officer of the department. Are you happy to tell us who it was?

MR JOHNSON: Yes. It was Dan Connor.

MR BEASLEY: Who's he?

MR JOHNSON: I understand that he is responsible for implementing the floodplain harvesting policy.

MR BEASLEY: I see. Okay. And he said that floodplain harvesting – words to the effect, I assume, floodplain harvesting, has been "grossly underestimated in New South Wales".

MR JOHNSON: Yes, he did say that.

MR BEASLEY: Now, did you make a note of that meeting?

MR JOHNSON: Yes, I did.

MR BEASLEY: All right. Can I show you this, please? This is the note of this meeting. If you just have a look at that. Is that the note you made that you've used to refresh your memory in order to set out the parts of your statement that are at paragraphs 35 and onwards?

MR JOHNSON: Yes, it is.

MR BEASLEY: All right. And that has a – I'm struggling with your handwriting. It has got a reference somewhere to "grossly underestimated", doesn't it?

MR JOHNSON: Yes. Yes, it does.

MR BEASLEY: Can you got – can we get a highlighter. I will get you to mark that on that document for me, please. Just use that to highlight the text.

MR JOHNSON: In these notes, if it was verbatim, I put inverted commas around it.

MR BEASLEY: Right.

MR JOHNSON: So the quote was that it's about implementing a largely existing policy.

MR BEASLEY: Yes. All right. And does that whole bundle I've just given you of your handwritten notes – are they all the notes – that's only notes at this meeting?

MR JOHNSON: Yes.

MR BEASLEY: Okay. All right. You're highlighting other things, as well. Is it - - -

THE COMMISSIONER: Mr Beasley, I wonder - - -

MR BEASLEY: This is my last topic.

THE COMMISSIONER: Right. But I've got other questions

MR BEASLEY: Right. Okay.

THE COMMISSIONER: Which won't be finished in 10 minutes.

MR BEASLEY: Right. Well, then we should come back at 2.

THE COMMISSIONER: I think we should. So if Johnson needs more time for his colouring in, he can do it out of session.

MR BEASLEY: Let me see what he has done and I will - - -

MR JOHNSON: I've just highlighted.

MR BEASLEY: So that says Dan Connor:

> *The amount of water estimated in FPH, which would be floodplain harvesting has been grossly underestimated.*

Is that what the words say?

MR JOHNSON: Yes. Yes, that's right.

MR BEASLEY: Right. Okay. And you've also highlighted some three words and a sentence that says the FPH, floodplain harvesting, is about implementing a "largely existing policy."

MR JOHNSON: Yes, that's right.

MR BEASLEY: And the other bit you've – other bit you've highlighted is – says, does it, DC, which would be a reference to Mr Connor:

> *– no measurement of floodplain harvesting in New South Wales.*

MR JOHNSON: Yes, that's right.

MR BEASLEY: Then you've got a red circle around note, which says the word "note" with three exclamation marks. What does that mean?

MR JOHNSON: It was partially an expression of my – not surprise, but possibly dismay, or even the fact that it had been said so explicitly, which is unusual.

MR BEASLEY: All right. Thank you, I will tender this bundle of notes. So to identify, it's notes made – sorry, when did you make the notes? That day?

MR JOHNSON: I made the notes during the meeting.

MR BEASLEY: During the meeting.

MR JOHNSON: Yes.

MR BEASLEY: Notes made by Mr Johnson during the course of a consultation meeting in Dubbo on 16 March 2018. Handwritten notes.

THE COMMISSIONER: Thank you.

MR BEASLEY: I tender that.

THE COMMISSIONER: Thanks.

MR BEASLEY: You've got a – well, this is the tender copy, though, because it has got the highlighting.

THE COMMISSIONER: Yes.

MR BEASLEY: All right. So 2 o'clock?

THE COMMISSIONER: Yes, 2 o'clock.

MR BEASLEY: Thank you.

THE COMMISSIONER: Mr Johnson, we will resume here at 2.

MR BEASLEY: 2.45, Mallen-Cooper – sorry, blame the junior for the interruption.

THE COMMISSIONER: We will resume here at 2. There may be another say 20, 30 minutes. I want to pick your brains, frankly, on a couple of matters. Thank you.

ADJOURNED **[1.02 pm]**

RESUMED **[2.00 pm]**

MR BEASLEY: I just have one more question, Commissioner.

THE COMMISSIONER: Of course.

MR BEASLEY: Mr Johnson, if you go to the second page of your submission, under the heading Reduced Capacity and Slow Progress in New South Wales, where you talk about your role as a member of the Stakeholder Advisory Panel for the Barwon-Darling Water Resource Plan, the last bullet point there, you say that:

> *The Stakeholder Advisory Panel is working on the assumption that Barwon-Darling water use is within the cap.*

But then you say:

> *Although an MDBA memo of February '14 asserts the only reason for this is that New South Wales has changed the model to make it so.*

Was that a memo that you saw?

MR JOHNSON: Yes. It was, I think, obtained by The Australia Institute through a freedom of information application.

MR BEASLEY: All right.

MR JOHNSON: You may have it.

MR BEASLEY: We – you can say – when you say "we", that's possible. I don't. That's why I was asking you. Anyway, I will track that down. I was going to ask you if you have it, but I had better ask people next to me or behind me whether we have it. That's the conclusion of the questioning that I have, Mr Johnson and Commissioner.

THE COMMISSIONER: Thank you. We've been talking about the Barwon-Darling. Do you understand that there is a designated river valley that's described as the Barwon Upper Darling system and the Lower Darling river system from the furthest upstream of the Menindee Lakes to the further upstream to the Wentworth pool? All of that that I've just - - -

MR JOHNSON: Yes.

THE COMMISSIONER: It's just one river valley?

MR JOHNSON: It is one river valley.

THE COMMISSIONER: And in your work on the Stakeholder Advisory Panel are you just looking at part of that rather than the whole, are you?

MR JOHNSON: We're just looking at the upper part of it, to the upstream end of the Menindee Lakes.

THE COMMISSIONER: And yet do I understand you correctly that the Water Resource Plan, required by the middle of next year for that valley, will be just one plan for the whole of the valley, not just the part of it in relation to which you are on the Advisory Panel?

MR JOHNSON: It's my view that the Water Resource Plan that we're working on is for the section from, I think, near Walgett to the upper extension of the Menindee Lakes system. So I think there are two plans. There are two – certainly there are two Stakeholder Advisory Panels one for the Barwon-Darling and one for the Lower Darling.

THE COMMISSIONER: Now, the description I was reading from is from appendix 1 to schedule E to the Basin Agreement, which is schedule 1 in the Water Act, which designates for New South Wales a river valley in those terms. When we look at the

obligations with respect to cap on diversions, which is set out in schedule E to the Agreement, there's an obligation on the – under clause 11 for the Government of New South Wales to develop analytic models for determining the annual version target for each designated river valley within its territory. That's 11(2). That sounds to me as if it means one model for the whole designated valley, which is the Barwon Upper Darling and the Lower Darling. That's what it sounds like to me.

MR JOHNSON: Yes.

THE COMMISSIONER: Has that been your understanding?

MR JOHNSON: No, it hasn't been my understanding for the purposes of the Barwon-Darling Water Resource Plan. I don't - - -

THE COMMISSIONER: Is there something I am missing, some statutory or administrative detail that - - -

MR JOHNSON: Look, I don't think so. I don't understand why that's the case, because the Lower Darling water comes from – it can only come from the Barwon-Darling.

THE COMMISSIONER: That's when it comes at all. Yes.

MR JOHNSON: I don't understand that.

THE COMMISSIONER: Right. Again, in 12, that is, clause 12 of the agreement, there's a requirement for the Government of New South Wales to calculate the annual diversion target for each year of each designated – for each designated river valley within its territory. So again that description of the river valley, of Barwon Upper Darling and Lower Darling, seems to dictate the way in which it has to be investigated, analysed and determined, it seems to me. Do you know of anything to the contrary of that?

MR JOHNSON: No, I don't know of anything, no.

THE COMMISSIONER: Right. Well, now, chapter 8 of the Basin Plan, as required by section 22 of the Act, mandates the preparation and publication of environmental watering strategies. You're familiar with that, I take it - - -

MR JOHNSON: Yes.

THE COMMISSIONER: - - - from your work on chapter 8.

MR JOHNSON: Yes.

THE COMMISSIONER: Yes. And, if I may say so, those are the – particularly the long-term watering plans that Basin States have to prepare – they are a critical

ultimate expression of the Basin Plan regulating conduct to achieve the environmental outcomes in the Act. Isn't that right?

MR JOHNSON: Yes, I believe that's right.

THE COMMISSIONER: They are where the rubber hits the road in terms of the Australian innovation in river regulation.

MR JOHNSON: Yes, I believe that.

THE COMMISSIONER: And are you – first of all, were you involved in any way at any point in the preparation of the Basin-wide environmental watering strategy by the Authority?

MR JOHNSON: Yes, I was. My section originally was established to prepare Basin environmental watering priorities and the Basin environmental watering outlook, and a – and because it came – because the annual priorities came before the strategy, there – we had to – we had to devise some broader principles. And those principles in the original priorities ended up in the strategy. And then my section worked closely – worked – worked closely and spent most of its time in the – in the year leading up to the release of the strategy, working on the strategy.

THE COMMISSIONER: Now, the strategy – do you recall when it was finally published?

MR JOHNSON: I think it was published in 2014, the end of 2014.

THE COMMISSIONER: Under 8.16(1) it has to be published within 24 months after the commencement of the Basin Plan. The Basin Plan commenced, I think, on 24 November 2012, which would mean the end of November 2014 was when the environmental watering strategy was due. It could have been delivered beforehand, but that's - - -

MR JOHNSON: Yes.

THE COMMISSIONER: - - - the last time. And that accords with your recollection, does it?

MR JOHNSON: Yes, it does.

THE COMMISSIONER: Now, under 8.17(2), the Authority can review and update it at any time. Are you aware, since late November 2014, of any review by the Authority of that strategy to date?

MR JOHNSON: No, I'm not. No, I – I – I don't know that there has been a strategy – I believe there hasn't been a review.

THE COMMISSIONER: And that perhaps is explained by the fact that under 8.17(1), there is a maximum period of five years between when it's first made and the first review and thereafter between reviews.

MR JOHNSON: Yes.

THE COMMISSIONER: And so five years will be late November 2019.

MR JOHNSON: Yes.

THE COMMISSIONER: Now, a review of an environmental watering strategy, even if it is an exercise that decides that no change needs to be made, is a rather weighty scientific exercise, is it not?

MR JOHNSON: Yes, it is. Yes.

THE COMMISSIONER: How long did it take for the environmental watering strategy to be made the first time around?

MR JOHNSON: From the – and recall that I made the point that the environmental watering priorities included some broad principles within. The priorities – the annual priorities.

THE COMMISSIONER: There are so-called objectives and priorities that will be caught up in the strategy.

MR JOHNSON: Yes, and there was some principles that we needed to work on some principles before we could really develop a set of priorities that may be – at least have a consistent – a consistent basis.

THE COMMISSIONER: I'm glad to hear it. Principles first, priorities later.

MR JOHNSON: Yes. Yes, that's right. And the strategy didn't exist until 2014 – there was some difficulty – but using that as a context, I would consider that the beginning – the strategy, the work on the strategy began in about September 2012, when I – when I put together a team.

THE COMMISSIONER: Did you say September?

MR JOHNSON: September 2012, when I put on a team to start working on the priorities. We – the priorities were – had to be – the priorities had to be completed within, I think, at the end of the – by the beginning of the subsequent water year after the Basin Plan was made. And we knew that it was going to take longer than six months, and so we started on the priorities before the Basin Plan was made, about September 2012. And that was when the first thinking about the strategy came into place as well.

THE COMMISSIONER: Now under 8.15, there's some relatively detailed compulsory matters to which the Authority must have regard, including what I will call consultation, when making the environmental watering strategy. Do you have any knowledge, from your time with the Authority, as to whether it's expected that they will be re-enlivened for a review or not?

MR JOHNSON: Those processes?

THE COMMISSIONER: Yes.

MR JOHNSON: I don't know that they will be re-enlivened. There was – I would consider that the consultation for the Basin water extraction priorities was quite comprehensive. I don't know that it has been – that the review has been – that those processes have been re-engaged for the purposes of the review.

THE COMMISSIONER: So whether or not the views of local communities or Indigenous values will be had regard to in relation to a review of the Plan, you don't know?

MR JOHNSON: I don't know. I haven't – I haven't seen any evidence of it. And I'm sure I would have seen evidence of it, because it is not – there are only a certain number of people in the community who are engaged. They're very busy, and they're taken up with many other things. So I – there has been some work through the New South Wales Office of Environment and Heritage, who has been – which has been consulting for the – they're preparing the long-term environmental watering plans, but I haven't – I'm not aware of any consultation by the MDBA with regard to the review of the Basin Environmental Watering Strategy.

THE COMMISSIONER: Well, then tell me, if – as 8.17 suggests – the review of the Basin-wide strategy is to be completed by the end of November 2019, and this is now July 2018, work should pretty much be in hand already, should it not?

MR JOHNSON: An effective review would have required that to be in hand for at least six months, in my view.

THE COMMISSIONER: Already six months to date.

MR JOHNSON: Yes, already six – in my view.

THE COMMISSIONER: And do you know one way or the other whether work is in hand for that review?

MR JOHNSON: No, I don't. I can only presume it isn't. I would expect to have heard, or have heard through the processes in the context that I have, if it had been underway.

THE COMMISSIONER: Yes. Well, because it's a Basin-wide strategy, then it would impact on the northern Basin, wouldn't it?

MR JOHNSON: Yes, certainly.

THE COMMISSIONER: The Advisory Panel would presumably know something about that.

MR JOHNSON: Yes. And other community groups, I have no doubt, would have heard from it.

THE COMMISSIONER: Well, now - - -

MR BEASLEY: The environmental watering strategy is dated 24 November 2014. It hasn't had a review since.

THE COMMISSIONER: No. That's what the records seems to suggest.

MR BEASLEY: And my only editorial comment would be to call it a strategy might be using hyperbole, but look at it later.

THE COMMISSIONER: Well, assuming it is a strategy, having been made in time, it needs now to be reviewed by, at the latest, November 2019, is what I read – how I read the Plan. Now, what about long-term watering plans? They were to be completed, I think, as events have occurred by November 2015.

MR JOHNSON: The State long-term - - -

THE COMMISSIONER: Yes.

MR JOHNSON: I'm – I'm not sure of the date.

THE COMMISSIONER: Well, it's 8.21(1)(a). It's to be – it must be given by the State to the authority not later than:

> *no later than 12 months after the Basin-wide environmental watering strategy is first published.*

So that would be the end of November 2015.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Are you aware of that having been done successfully by all the Basin states or not?

MR JOHNSON: No, I'm not aware of it. I know that at the moment there are environmental watering plans being prepared for rivers in the northern Basin and the plan is that they are in time for the making of the Water Resource Plans.

THE COMMISSIONER: Well – because that wouldn't fit within the time provided under 8.21(1)(a) unless something happened, that I confess I'm not aware of. Doesn't mean it didn't happen. 8.21(1)(a) says:

> *A Basin state must give a long-term watering plan for a Water Resource Plan area to the Authority no later than 12 months after the Basin-wide environmental watering strategy is first published.*

So that would be, as I say, November 2015.

MR JOHNSON: Yes.

THE COMMISSIONER: So you're not aware of that having happened?

MR JOHNSON: No, I'm not.

THE COMMISSIONER: Do you think that it happened?

MR JOHNSON: I can only think that it hasn't happened.

MR BEASLEY: South Australian government has.

THE COMMISSIONER: Yes.

MR BEASLEY: In other states .....

THE COMMISSIONER: Meaning that there has been noncompliance with 8.21(1)(a), so far as you understand, outside South Australia.

MR JOHNSON: Yes. Yes, that's right. And certainly my comments are restricted to New South Wales.

THE COMMISSIONER: Now, as I understand the way chapter 8 is written, then under 8.22(1) there's a requirement expressed in various ways for the review and updating by a Basin state of long-term watering plans, including if a Water Resource Plan is accredited. That's meant to happen sometime after mid next year, is it not?

MR JOHNSON: Yes, it is.

THE COMMISSIONER: Or about – I think by mid next year.

MR JOHNSON: Yes.

THE COMMISSIONER: So 8.22(1)(a) contemplates that there will have been a long-term watering plan in existence which will be reviewed by a Water Resource Plan being accredited.

MR JOHNSON: Yes. That's – that's true.

THE COMMISSIONER: Has that happened in New South Wales?

MR JOHNSON: Has - - -

THE COMMISSIONER: Is there already a long-term watering - - -

MR JOHNSON: No, no. I'm not aware that there is a long-term Environmental Watering Plan. That's for review - - -

THE COMMISSIONER: Should I take it that the euphemism "resources" is the reason why that has not happened? Well, there are only two possibilities, aren't there?

MR JOHNSON: Look – pardon?

THE COMMISSIONER: They can't do it because they don't have money, and public servants shouldn't work for nothing, or, "I won't do it because I'm not obeying the law." That seems to be the only two possibilities, aren't they?

MR JOHNSON: Yes, I think it's more likely to be resources.

THE COMMISSIONER: Which is a euphemism for people haven't allocated the money.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Which is public money to comply with the law.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: An old-fashioned view, which I think is still current and fresh, is that a core and non-negotiable of those in charge of administering state budgets is you pay for that which has to be done by law first, before you pay for anything else. Wouldn't you agree?

MR JOHNSON: Yes, I would – I do agree.

THE COMMISSIONER: This sounds like it is something that has to be done.

MR JOHNSON: Yes.

THE COMMISSIONER: So that resources can never be an excuse unless there really is no money.

MR JOHNSON: That's right.

THE COMMISSIONER: And it's not true of any state in the federation that there is no money.

MR JOHNSON: No, no.

THE COMMISSIONER: Particularly New South Wales.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Which I think has a surplus.

MR JOHNSON: Yes. That's right.

THE COMMISSIONER: Well, that suggests a rather serious shortcoming on the basis of the largest state of the Basin states.

MR JOHNSON: Yes, it does.

THE COMMISSIONER: A matter which one would have thought would be relevant for other Basin states in whatever positions they may take on the Ministerial Council and any other of the forums in which the national approach to the Basin is being devised.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: And information about another State's compliance would therefore be critical to other Basin States' consideration of what they ought to do at those various forums, including the Ministerial Council.

MR JOHNSON: I'm sure that it is. I'm – I'm sure that that's true.

THE COMMISSIONER: In division 4 of chapter – of part 4 of chapter 8 of the Plan, we then come to something which is called Annual Environmental Watering Priorities.

MR JOHNSON: Yes.

THE COMMISSIONER: Starting with 8.23. So that we're getting even closer to, as it were, the pointy end of the Plan using water to achieve the environmental outcomes that the Act requires; is that right?

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Well, now, I'm sorry for not having worked this out for myself. When does that start or when did that start as an obligation?

MR JOHNSON: The priorities?

THE COMMISSIONER: Yes.

MR JOHNSON: The priorities are required, as I recall, to be prepared at the start – by – by the start of the first water year, which is 1 July, or the end of the current water year, 30 June.

THE COMMISSIONER: But which calendar year are we talking?

MR JOHNSON: Well, after the Basin Plan was made. So the Basin Plan was made in 2012. The priorities are required to be completed by - - -

THE COMMISSIONER: Thereafter.

MR JOHNSON: - - - 30 June twenty – the next water year, 30 June 2013.

THE COMMISSIONER: So has that been done?

MR JOHNSON: Yes, the priorities have been done each – they were done on time, and they've been done each year since.

THE COMMISSIONER: And that is something that requires compulsory regard to the Basin-wide environmental watering strategy.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: That's 8.25(2)(a).

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Well, now, I don't quite understand the sequencing. Under 8.25(3), there are two obligations. One is about a register of held environmental water under the rules of the Water Resource Plan, and the other is rules in a transitional Water Resource Plan, interim water resource plan or Water Resource Plan relating to planned environmental water. They don't have to be complied with until there's a Water Resource Plan. I mean, not surprisingly, each of them refers to a Water Resource Plan. I don't know why the draftsman thought that was necessary, but the clue is the first three words of 8.25(3) is:

To avoid doubt.

Now, that rather indicates to me that all of that otherwise, as you've just said – the whole regime was intended to be operating from the beginning of the commencement of the Basin Plan.

MR JOHNSON: Are you saying that, given that the priorities were to come after, you would assume that the - - -

THE COMMISSIONER: Well, no. Given that there's special attention placed to those things that need a Water Resource Plan, and the plan - - -

MR JOHNSON: Yes.

THE COMMISSIONER: - - - draftsman kindly says we don't have to do that if you haven't got a water plan yet. But otherwise you do have to have done these things before you have a Water Resource Plan, which is mid-2019.

MR JOHNSON: Yes.

THE COMMISSIONER: That's right, isn't it?

MR JOHNSON: Yes.

THE COMMISSIONER: How can that have been done for the northern Basin, that is, these priorities, if the information is so deficient that the model doesn't deal with low flows?

MR JOHNSON: The – I don't believe that the information – the environmental information in the northern Basin was as deficient as has been – as is often said.

THE COMMISSIONER: Right.

MR JOHNSON: It was a bit of a southern Basin bias because the Southern and the northern Basin are quite different, and many people in the Murray-Darling Basin Authority were not familiar with the northern Basin and didn't understand it very well. And it was a convenient position to say, well, we're going to review the northern Basin figures because we will get more information. Now, the – the information that we used for the priorities were – were based much more on ecosystems, where they were, their requirements, and much less on – on modelling. We identified at a Basin-wide perspective where the important actions that – that – that we advised environmental water holders to take in the subsequent year in – based on water availability, water forecasts – so – so held water, water forecasts, the condition of systems, and so the modelling – the modelling was not a big – was not the biggest part in that. And in – we had – certainly we had more than enough ecological information to – to develop those priorities.

THE COMMISSIONER: Now - - -

MR BEASLEY: Can I just interrupt - - -

THE COMMISSIONER: Yes.

MR BEASLEY: - - - regarding you taking the witness to 8.21(1)(a):

> *A Basin State must give a long-term watering plan for a Water Resource Plan area to the Authority (a)* - - -

THE COMMISSIONER: Yes.

MR BEASLEY:

> *…no later than 12 months after the Basin-wide environmental watering strategy.*

THE COMMISSIONER: Yes.

MR BEASLEY: Yes. If you drop down to (d) - - -

THE COMMISSIONER: Yes.

MR BEASLEY: - - - it has got:

> *Within another timeframe agreed to by the Authority in the Basin state.*

THE COMMISSIONER: Yes.

MR BEASLEY: And there has been agreement to push it back.

THE COMMISSIONER: To when?

MR BEASLEY: There's six done. There's 14 that have been pushed back to 1 July next year.

THE COMMISSIONER: 2019. Same time as the Water Resource Plan.

MR BEASLEY: Yes. So the one – there's a long-term watering plan for the Victorian Murray, the Northern Murray, the Wimmera Mallee, Warrego-Paroo, SA River Murray, Eastern Mount Lofty, and there's 14 that are scheduled to be published with the Water Resource Plans.

THE COMMISSIONER: So there are some for the northern Basin that have been done and some that haven't been done.

MR BEASLEY: Well, Warrego Paroo is definitely northern Basin.

THE COMMISSIONER: Northern Basin.

MR BEASLEY: I'm not that anything else there that I said is northern Basin. I think the rest are southern Basin.

THE COMMISSIONER: Thank you.

MR BEASLEY: Yes, yes, and Warrego-Paroo we have a Water Resource Plan accredited.

THE COMMISSIONER: Yes, that's the one.

MR BEASLEY: That's the only one. Yes, so - - -

THE COMMISSIONER: Well, that's great, thank you. Part 6 of – sorry, division 6 of part 4 of chapter 8 sets out the principles to be applied in environmental watering, and you're familiar with them, aren't you?

MR JOHNSON: Yes. Yes.

THE COMMISSIONER: It ends the list of principles by referring back to objectives in part 2. As I say, I'm not commending this style of drafting, but you have to follow it through. Part 2 is the overall environmental objectives and I've already, I think, drawn to your attention to some of the language in 8.05(2), the protect and restore ecosystems, maintaining ecological character, protecting and restoring biodiversity, etcetera. Protecting and restoring connectivity. I look in vain in any of those provisions, that is, the objectives in part 2 and the principles to be seen in division 6 of part 4 of chapter 8. I can't find anything about diminishing the intended environmental outcome of the environmental watering in order to accommodate an economic or supposedly social imperative. I'm right there?

MR JOHNSON: Yes, you're right. I – that – I believe – without having it, I – I believe that that – those – that's not in there, and

THE COMMISSIONER: I'm just wondering how it works, then. But when it comes to actually putting into practice by the required formal stipulation, that is, these are the – this is environmental watering, what's to be done. In putting that into place, everything is, if I may put it this way, entirely environmental. But from what you were telling me before the adjournment in relation to this compromise, this non-statutory sense of compromise, you are doing so with amounts of water which are thought to be inadequate for the purpose, which seems - - -

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: - - - drastically, drastically wrongheaded, to me.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: And I gather that's one of the theses that you were trying to develop in both your evidence and your submission, to - - -

MR JOHNSON: Yes. There's a – there's a – there's a tension at the heart.

THE COMMISSIONER: Well, not at the heart – not as I read the Act and the Plan. They seem to - - -

MR JOHNSON: No, no.

THE COMMISSIONER: With respect, I mean, they really do represent a stunning example of formal, legislated stewardship of the environment for present and future generations.

MR JOHNSON: Yes. In my submission, I felt as though I may have commented outside my area of expertise about the legislation, but I made a couple of points that I felt that the profound problem lay in the implementation of the Plan, and not so – and not entirely in the – in the – in the Act or the Plan itself, but that the implementation had been compromised.

THE COMMISSIONER: Now, principle 3 in 8.35 has, in paragraph (f) - - -

MR JOHNSON: Principle 3?

THE COMMISSIONER: Principle 3 has in its paragraph (f), a matter - - -

MR JOHNSON: Yes.

THE COMMISSIONER: - - - which is part of the stipulation the way in which environmental watering "is to be undertaken". And I read those words I've just quoted as being mandatory. And the matter in question that I've drawn to your attention is that environmental watering is to be undertaken in a way that incorporates strategies to deal with not only a variable but also a changing climate.

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: The words are really unmistakable: the difference between variability which is the most famous thing about our continent and its water, and there's a distinction between that and changing. That is, if you like, there are different ranges within, or different phenomena that constitute, the variability which appears to have been a constant of our climate for a very long time, even as the climate has changed. So variability is not the same as change, is it?

MR JOHNSON: No, it's not, and in fact change may increase variability or it may be the same variability under a drier regime, so it's certainly not the same.

THE COMMISSIONER: Does that mean that the Basin Plan itself deals with climate change by doing nothing specific? Simply observing that there will be adjustments from time to time, mostly annually, to actual enjoyment of water rights by reference to what I'm going to call the weather, but at the same time there is a requirement for the environmental watering to incorporate a strategy to deal with changing climate. What does that mean? That there's – that you incorporate a strategy not to do anything except to deal with a variable climate?

MR JOHNSON: I think that's what it means. I know that one of the justifications for that was that – in the MDBA was that the water allocation system in Australia was already well equipped to deal with the variable climate. Now, that – except – and the – because there are – there's general security and variable water allocations according to water availability. The comment then was it has been overegged.

THE COMMISSIONER: What has been overegged?

MR JOHNSON: The allocation system. The principle was to allocate as much water as possible to extracted use, to the extent that in some cases - - -

THE COMMISSIONER: That may still be the principle under the Water Act; that is the sustainable diversion limit is up to the point where, to take more would compromise the environmental outcomes.

MR JOHNSON: Well, I don't - - -

THE COMMISSIONER: That's what I mean by you take it to the brink.

MR JOHNSON: Yes. Well, I don't think that the water allocation system, certainly in New South Wales, has been adjusted to take into account the broad – the – a potentially changing climate. I think it has been apportioned, "Well, we will take this and give that to the environment and we will continue allocating water the way we used to." In some of the rivers in the Basin, water is considered in the available water determinations that in fact hasn't even – actually hasn't even evaporated out of the Indian Ocean yet. There's a minimum estimate of the amount of water that will fall over the next two years, and that's included in the calculations now. That - - -

THE COMMISSIONER: There's nothing wrong with that in principle.

MR JOHNSON: Well, there is, and in fact when I was working in – this was in the southern part of the Basin. In the northern part of the Basin there was a manager there who actually, quite part from doing that, he in fact kept, in ..... dam a 100 gigalitre unallocated reserve which he didn't – which he wouldn't allow to be used for anything except to – as a risk – it was a risk mitigation strategy. So the difference – the difference in the two – this was back here maybe 10, 15 years, I don't know if it still happens, but there were two different approaches in New South Wales: one where a minimum estimated rainfall over the next two years would be incorporated into the current available water determination, and then in the northern Basin where

an unallocated reserve was kept. So it's very much a – very much – it was very much almost a personal approach.

THE COMMISSIONER: And it's subjective.

MR JOHNSON: Very subjective, yes. Subjective.

THE COMMISSIONER: Well, now the idea of estimating the minimum rainfall for the next two years, presumably that's however always subject to nasty surprises.

MR JOHNSON: Well, yes.

THE COMMISSIONER: And the winding back of actual allocations in light of those experiences.

MR JOHNSON: Yes. That's right. That's right. And certainly in the Millennium Drought there were a number of Water Resource Plans – water sharing plans in New South Wales that either were not made – I withdraw the word, not – they were made but weren't enacted, the Lachlan for example, because – and the Macquarie, which was then suspended, because it's based on a historic drought record which is a very flexible thing in itself. It varies depending on the month it starts, it depends on how many months you use. So it's highly variable. And there were new droughts of record all over the Basin in the Millennium Drought. And so they were caught and there was – there was a – in the Macquarie, I think in about 2007 or 8 – 7, water that had been allocated that wasn't – that wasn't in the dam and people were making calls – actually, I made a call on it for the environment, and it wasn't there.

THE COMMISSIONER: Well, in your statement you, in paragraph 5, you refer to – you talk about your preparing of adaptive environmental management plans for the Macquarie Marshes and the Gwydir Wetlands, and that they had regard to the effects of climate change, and the management options that consider the reduction of water availability are included in those plans.

MR JOHNSON: Yes.

THE COMMISSIONER: Could you explain that to me more, because I can understand the English of a strategy addressing climate change, but I've decided after thinking about it that I really don't have much idea as to how a strategy addresses climate change. I've seen the statutory reference to the provision of refugia that I drew to attention this morning, but that's only a colourful tiny detail of the matter. How does the strategy, or how did those plans you talked about in your paragraph 5, how do they address climate change as opposed to variability?

MR JOHNSON: I'm just looking – I have the Macquarie Plan here, published in 2010 and this was the last thing I did before I joined the MDBA. And one of the expectations was to identify water requirements, volume, timing, duration, frequency and security for meeting ecological outcomes. So in – there was a section in this

called Climate Variability and Climate Change in the Macquarie Valley, section 3.4, and I used the CSIRO 'Sustainable Yield' document published in 2008 which had three scenarios, possible scenarios, arranged. So they said extreme wet, there was an extreme wet possibility; there was an extreme dry possibility; and there was a best estimate that by 2030 there would be an eight per cent decrease in surface water availability, four per cent decrease in – so their best estimate was a decrease by 2030. So - - -

THE COMMISSIONER: So how do you manage for that?

MR JOHNSON: Well, I was writing this plan for managers. I had been a manager and I was writing a plan for managers, so I didn't presume to tell the managers how they would manage.

THE COMMISSIONER: But you have been a manager, so - - -

MR JOHNSON: Yes, I have.

THE COMMISSIONER: - - - you tell me what do you think, as a manager with experience, what do you do with the information that in – by 2030 we could expect some appreciable dry; what do you do with that?

MR JOHNSON: We had already been seeing a decline in water availability and a diminishing of the area of the Macquarie Marshes. And this plan also describes them – describes the elements of it, describes – we actually do a healthy wetland based on a whole range of wetland indicators, including vegetation and waterbirds and invertebrates. So we described – and we ..... where there were patterns and we – and we – there were patterns of contraction and we also identified flow regime that was – flow regime over about a 25 year period – well, actually longer than that since Landsat, late '70s, that – a flow regime that represented vegetation types and we noticed that certain ecological types were diminishing as the flow regimes changed.

So we based our best – or the best estimate, we looked at the CSIRO best estimate. We assumed that we were already seeing a terrible – actually quite drastic diminishing in the area of the system, and the Macquarie Marshes is made up of about 11 central sort of semipermanent wetlands that when it – as it – when the Macquarie Marsh – where there's a big flood, it's one big system made up of a number of different types, and as it diminishes the areas in between dry up and then you get a number of maybe seven or eight, maybe – maybe up to 11, areas that people call core wetlands, which is a bit of a loose term, but it serves the purpose. And we decided in this that if we were already seeing a loss of the ecological character of the system, certain areas that had been one type had disappeared.

I – I had a range of scenarios and determined that with the amount of water that we had available and the forecast for water availability and the particular requirements of wetland types, that people would need to make decisions about some areas being abandoned, making decisions to abandon some areas, and you needed to make

choices about which ones – how could you – which ones you could abandon and still maintain the ecological character of the Macquarie Marshes, which was its Ramsar value.

THE COMMISSIONER: Maintaining - - -

MR BEASLEY: That's the point of a watering strategy, though, isn't it? That ultimately you can have a fantastic strategy, but if the climate changes such that there's less water, you might have to set your sustainable diversion limit at a higher level to get more water for the environment.

MR JOHNSON: Yes, that's right. And to go to that – this is a - - -

THE COMMISSIONER: The SDL goes down, doesn't it?

MR BEASLEY: Sorry.

THE COMMISSIONER: That's all right.

MR JOHNSON: Yes, and this is the - - -

THE COMMISSIONER: The recovery, yes.

MR BEASLEY: Recovery goes up, SDL goes down; yes.

MR JOHNSON: Something I particularly object to, with the northern Basin Review is this term "over-recovery" on the Macquarie and the Gwydir. Just to ..... these – these led to – these plans led to a section 32 listing, the Australian Government listed it under the Ramsar Convention and then led to a response strategy which said we are actually recovering more water. And one of the things that I object to, extremely strongly in the Northern Basin Review is the idea, through what seems to me to be a manipulation of factors, that the water in the Macquarie is – has been over-recovered. And I don't see – I can't see that that's a tenable position.

MR BEASLEY: Can I just read to you from a CSIRO report about the ESLT report. It's a report that is exhibit RCE9. If climate projections are somewhere accurate, the median one, the CSIRO about a 10 per cent reduction in run-off, then there's no alternative but this, is there:

> *If climate change impacts do unfold as projected, lower SDLs would be required to maintain the level of environmental protection offered by currently proposed SDLs.*

That's right, isn't it?

MR JOHNSON: Could you repeat that please.

MR BEASLEY:

If climate change impacts unfold as projected, lower SDLs – that is more water for the environment – would be required to maintain the level of environment protection offered by currently proposed SDLs.

MR JOHNSON: Yes, that's right.

MR BEASLEY: Yes. So you can have a great strategy - - -

THE COMMISSIONER: When we say more water for – more water for the environment. I think we need to make that clear.

MR BEASLEY: Yes.

THE COMMISSIONER: The drying of relevant parts of the Basin is thought to reduce the inflows and SDL that remains numerically constant will mean that consumptive use increases as a proportion of the water produced by those reduced inflows whereby the SDL needs to be reduced in order that the environmental water either be maintained or itself be reduced, but not by so much as would occur if the consumptive use was not affected by the dry.

MR JOHNSON: Yes, that's right. And I made that - - -

THE COMMISSIONER: It may be that everyone gets less water.

MR JOHNSON: Yes.

THE COMMISSIONER: That's what we all fear about climate change.

MR JOHNSON: Yes.

THE COMMISSIONER: And so the environment will get less water, hence the sacrifice notion you told me about, but meantime the SDLs ought also be reduced, and again it comes back to this central concept, lest you compromise the environmental outcomes which themselves incorporate the notion that climate change will alter the environment.

MR JOHNSON: Yes.

THE COMMISSIONER: But not so as to compromise it in relation to the key outcomes.

MR JOHNSON: And I made that point about, in this document in 2010, that as – because of the nature, the dams are built on the most reliable water supplies and as it dries the – everyone gets less water, but the environment gets a smaller volume, a smaller proportion of a smaller volume.

THE COMMISSIONER: Unless you reduce the SDL?

MR JOHNSON: Yes, that's right. That's right. Unless you take - - -

THE COMMISSIONER: This is the notion of the environment bearing a larger risk - - -

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: - - - of reduced inflows, whether from variability or climate change, to which so many witnesses have drawn my attention.

MR JOHNSON: And I would say that with regard to climate change I believe that some parts of the irrigation issue, particularly the larger – the larger companies or groups are now subsequently better equipped to deal with climate change than they were before, but at the cost of smaller irrigators and the environment being less well equipped.

MR BEASLEY: So when the principle that the Commissioner has taken you to, when it says that – 8.35(a) Roman (f) says:

> *environmental watering is to be undertaken in a way that (f) incorporates strategies to deal with a variable and changing climate.*

Eventually, climate change might be such or run-off might reduce to an extent where you run out of strategy and you just need more water for the environment.

MR JOHNSON: Yes, that's right. That's right.

THE COMMISSIONER: Now, I was interested to read in the appendix with the attachment to your submission about the thoughts and observations prompted by your inspection in August 2017 of Coomunga property?

MR JOHNSON: Yes.

THE COMMISSIONER: I just want to ask you a few things. Have I correctly understood it in this fashion: that something that falls within the general category of floodplain harvesting appears to have been conducted by the construction of diversions, banks and levees in such a way as to bank water up on to a neighbour's property in greater volume and for longer time than would otherwise have been the case?

MR JOHNSON: Yes. In this case, yes.

THE COMMISSIONER: As well as, I suppose, in the nature of restored water – as well as depriving a further downstream neighbour of any appreciable part of that flood flow at all.

MR JOHNSON: Yes, that's – that's exactly what happened.

THE COMMISSIONER: So if I understood the scheme correctly, it's an upstream neighbour gets too much and a downstream neighbour doesn't get enough – is the crude way in which a grievance might be expressed. Have I - - -

MR JOHNSON: Yes, that's right.

THE COMMISSIONER: Are you aware of any community or neighbourly discourse to the effect that that constitutes a common law nuisance?

MR JOHNSON: It's – yes, well, not widely but my – I have a cousin who is a barrister in Bourke – moved to Bourke. And he discussed that. He said it may constitute a nuisance. I - - -

THE COMMISSIONER: Has that yet become a common trope in discussion about this?

MR JOHNSON: No, it – no, it hasn't; that's the - - -

THE COMMISSIONER: Can you explain why that would be? Why I say that is water nuisance, just speaking from my own personal experience as a barrister not in Bourke, is something that neighbours are pretty quick to – that is, it seems to accord with an instinctive cultural understanding in our society of water. You're not allowed to bank it up on to my water and you're not allowed to stop me getting the water that would come with nature. So if you interfere with water flow, you do so at your peril of somebody taking you off to the Supreme Court.

MR JOHNSON: Yes, it's – one of the first people I met in – when I went to the Macquarie had just that happen to her. Her neighbour came to her one day and said "I've put up this bank and it's going to cut you off." And it did. But there seems to be no recourse to - - -

THE COMMISSIONER: There is. You can go to the Supreme Court.

MR JOHNSON: I know - - -

THE COMMISSIONER: I know that's an unrealistic barrister's comment because you've got to pay lawyers to do so. But what I mean is these cases are not unknown in the Supreme Court. They do happen.

MR JOHNSON: Yes, I can't – I can't – I don't understand why, myself. I couldn't speculate about culture.

THE COMMISSIONER: Well, now, that leads me to the next thing.

MR BEASLEY: What happens if there's an approval .....

THE COMMISSIONER: Well, that's right. That brings me to the next thing. I started off just talking about common law and equities intervention in support of it. Then we come, as Mr Beasley noted, to what is now regulated by statute in many cases, namely, what you're allowed to do to your land. And there's this expression "authorising the tort". And it's quite difficult to construe a statute as actually authorising you to commit a nuisance, but sometimes that does occur. I'm not aware of any such provision that governs what the ..... have been concerned about, but no doubt we will look closer at that. To your knowledge, has there been any systematic application of planning regulation to monitor and control what I can do on my land that may affect the water retention or deprivation of my neighbour's land?

MR JOHNSON: There have been many, many plans, but to my knowledge, there has not been a very rigorous application of those plans. It seems to be – it appears to me that there's very little that is done to – this again in New South Wales and again, the northern part of the Basin – very little that's done to ensure that those plans are complied with. And we had trouble, when I worked with the National Parks and Wildlife Service, which is not a powerless bit of legislation, it was difficult to – it was difficult to get changes made once actions had been taken upstream. And I think it – and it was always put to me that the 1912 Water Act made it very difficult.

So a lot of this is under the 1912 Water Act, and I think there's retrospectivity provision in that Act which – which – which I – and I'm going back to a conversation that happened a long time ago now, but that the government had to demonstrate effect, I believe, of those actions. It was up to the government to do it, I believe. And in my experience, the agency didn't really have the will to do that.

THE COMMISSIONER: Thank you. Now, is there anything else you want to tell me of any kind? I know I've made requests of you for subsequent assistance, for which I am really obliged. Is there anything else?

MR JOHNSON: I just wondered – we had a – you bear with me. We had a conversation earlier about the – the consultation in the northern Basin, which I was thinking that there had been no disagreement. But, on reflection over lunch, I think there was – may have been some areas of disagreement, and it may have been just checking some notes and looking at – thinking about it. I – there was a sense that – internally, not from – I didn't get this from the Authority or the Northern Basin Advisory Committee or from Phillip Glyde, but I got it from the engagement section and from Brent Williams, that – that my approach was not – didn't have enough process, and – and that – and also there were a – there were a couple of things that – about an endeavour to build long-term relationships, which I was – said by different people that that was idealistic and unrealistic.

My view – if we – if the MDBA was to have a role – have a credible role in the Basin, it needed to build long-term relationships, and subsequently I had heard part of the problem was that I had gone – gone native in the north, and I just recall that. And I just put that down to the fact that - - -

MR BEASLEY: Colonel Kurtz.

MR JOHNSON: Pardon?

MR BEASLEY: Colonel Kurtz of the north will - - -

MR JOHNSON: Well, that's right, yes. And - - -

MR BEASLEY: The horror.

MR JOHNSON: And certainly I was in – when I started, to the extent that I had some – was dubious about the commitment, I nevertheless – I've always felt that you actually need to have a go at something, and if it doesn't work, then you made an effort to do it. So I took the whole of the work seriously, and we did pick up a lot of information about concerns in the northern Basin, and that the Authority was diverging from a – from engagement with the community. So – so there may – just thinking about it, it's possible that there – yes, I think there were some disagreements with – with Brent Williams.

MR BEASLEY: Thank you.

THE COMMISSIONER: Can I express my gratitude for your attendance and your assistance. It means a lot and - - -

MR JOHNSON: It's my pleasure.

THE COMMISSIONER: I'm very grateful.

MR JOHNSON: And someone will be in touch with me about those. I've written down those requests, but - - -

THE COMMISSIONER: Yes.

MR JOHNSON: The particular request about my thoughts - - -

THE COMMISSIONER: They will be in touch.

MR JOHNSON: All right. Thank you.

THE COMMISSIONER: And good luck dealing with them.

MR JOHNSON: Thank you very much, Commissioner.

THE COMMISSIONER: Thanks.

<THE WITNESS WITHDREW [2.58 pm]

MR BEASLEY: Dr Mallen-Cooper is here, Commissioner, so - - -

THE COMMISSIONER: Thank you.

MR BEASLEY: Come up and have a seat ..... just while Dr Mallen-Cooper is taking his seat, can I tender a document from the New South Wales Office of Environment and Heritage. It's called 'Native Fish of the Darling River – Managing Water For Fish and Connectivity'. The reason for the tender, apart from the fact that we have Dr Mallen-Cooper here, is this seems, at least, to be relevant to concerns expressed by the Basin Authority in its analysis of the Menindee Lakes supply measure. You will see second paragraph in the first page which:

> *Research has shown that Golden Perch that are spawned in the Darling River contribute enormously to populations in the mid-Murray, including Edward-Wakool and Goulburn Rivers –*

etcetera. Over the page and particular relevance to the proposed supply measure which will keep Lake Cawndilla empty a large percentage of the time:

> *Lake Cawndilla – part of the Menindee Lakes system – now provides one of the only viable release points for Golden Perch to enter the Darling Anabranch and the rivers of the southern Basin.*

THE COMMISSIONER: Only for a short time.

MR BEASLEY: Yes. Hence, no doubt, the concerns expressed.

THE COMMISSIONER: Well, there may be no cause for concern. There may be other viable release points.

MR BEASLEY: Well - - -

THE COMMISSIONER: Which, no doubt, EIS will establish.

MR BEASLEY: Well, I guess, where it says "one of the only" means there must be another one.

THE COMMISSIONER: Yes.

MR BEASLEY: But it's of sufficient concern to the Basin Authority that it suggested - - -

THE COMMISSIONER: I suppose you are putting to me the far-fetched proposition that the precautionary principle might be evoked by that.

MR BEASLEY: Well, I'm not the one that has suggested that over 20,000 hectares of Golden Perch population might be at risk as a result of that supply measure. That's the Basin Authority's view. So I will endorse them for that.

THE COMMISSIONER: Very well.

MR BEASLEY: So I tender that.

THE COMMISSIONER: Thank you.

MR BEASLEY: And Dr Mallen-Cooper can be sworn now.

<MARTIN MALLEN-COOPER, AFFIRMED [3.01 pm]

<EXAMINATION-IN-CHIEF BY MR BEASLEY

THE COMMISSIONER: Please sit down, Doctor, and thanks for bearing with us, and I'm sorry about your vicissitudes in travel.

MR BEASLEY: We've already gone over that it's my fault your plane was cancelled, so we don't need to cover that ground. I apologise. Dr Mallen-Cooper, you've provided the Commission with a submission dated 30 April 2018. Do you have a copy of that?

DR MALLEN-COOPER: You've given me a copy here, yes.

MR BEASLEY: I have.

THE COMMISSIONER: Tab 1.

DR MALLEN-COOPER: Yes, tab 1.

MR BEASLEY: Yes. That's my doing. And behind tab 1 is tab 2, unbelievably, and that contains your curriculum vitae. And you have a PhD of Fishway and Freshwater Fish Migration in South-eastern Australia from UTS in Sydney?

DR MALLEN-COOPER: Yes.

MR BEASLEY: And without going through all of the matters outlined in your CV, amongst other things, you've done a number of projects for the Basin Authority itself in relation to fish passageways.

DR MALLEN-COOPER: Many, yes.

MR BEASLEY: And you are the author or co-author on many publications concerning, amongst other things, the effect of flow or still waters or the hydraulics of water on fish.

DR MALLEN-COOPER: Correct.

MR BEASLEY: All right. Thank you. Can I take you to your submission, please?

THE COMMISSIONER: I take it your expertise extends far beyond simply working out how you can help fish over artificial obstructions.

DR MALLEN-COOPER: It sure does. It's – it's fish ecology, and fish ecology across the Basin and, well, I worked across Australia, actually. At the moment I do a lot of work in the Mekong.

THE COMMISSIONER: Yes, I saw.

MR BEASLEY: What's the – the work in the Mekong is concerning the proposal to put in hydro schemes, is it, and how that might affect fish.

DR MALLEN-COOPER: Yes. Large hydropower dams and in that case fish provides food security in – as an example, in Cambodia up to 80 per cent of protein comes from freshwater fish, so the stakes are very high.

THE COMMISSIONER: So this is hydro with full dam or hydro flow – run of river.

DR MALLEN-COOPER: This is run of river.

THE COMMISSIONER: Right.

DR MALLEN-COOPER: On the main stem of the Mekong, so effectively - - -

THE COMMISSIONER: So it's how the fish, what, deal with the intake into the turbine.

DR MALLEN-COOPER: First they have to go upstream, get past the – the dam, then they have to come downstream via the turbines, and - - -

MR BEASLEY: That sounds risky.

DR MALLEN-COOPER: It is very, very risky. Very high stakes. Very risky.

THE COMMISSIONER: It makes swimming among the surfboards look safe.

DR MALLEN-COOPER: Yes.

MR BEASLEY: And so the stakes there are not just for fish survival, but based on what you've said, human survival if 80 per cent of the proteins comes from the fish. It would have a big impact if the fish disappeared.

DR MALLEN-COOPER: It certainly will.

MR BEASLEY: Could I ask you – I should say I tender – I'm going to tender some other documents, but I tender Dr Mallen-Cooper's submission to the Murray-Darling Basin Royal Commission dated 30 April 2018. I also tender appendix 1, which is his CV containing his various projects.

THE COMMISSIONER: I'm happy, if you want to, to tender the whole of the brief, which includes the 11 documents - - -

MR BEASLEY: Well, I was going to go to most of them, so that sounds like a good idea.

THE COMMISSIONER: Why don't we tender all of them because I've read them and I've been assisted by all of them.

MR BEASLEY: All right. Why don't I do this, then? I will tender what is described as the Dr Martin Mallen-Cooper brief - - -

THE COMMISSIONER: Thank you.

MR BEASLEY: - - - which includes his submissions, CV and other published works. It also includes published works by other - - -

THE COMMISSIONER: Other people, yes.

MR BEASLEY: - - - people. Yes.

THE COMMISSIONER: Yes.

MR BEASLEY: Could I just – I just want to make sure I understand the meaning, first, of a couple of principles you talk about in your submission before moving onto your concerns about both schedule 6 of the Basin Plan and some of the infrastructure that might be built in relation to an SDL adjustment, an SDL project I should say. On page 4 of your submission, having discussed the concept that the Murray River has always been largely a flowing river, at the bottom you say that:

> *The data suggests strongly that the hydraulic impacts of the lower Murray have a far greater impact than previously realised and very likely a greater impact in changes in hydrology. The corollary is that water from the Basin Plan is extremely unlikely to recover these lost species in the lower Murray River also the hydraulics of the river are addressed as well.*

Just to get that terminology straight, by hydrology am I right that that's a reference to simply the movement of the water in the river stream, whereas hydraulics is talking about the physical characteristics of flowing water, things like depth, velocity, turbulence, those sort of things.

DR MALLEN-COOPER: Second part is right, but hydrology is just discharge and volumes, yes.

MR BEASLEY: Right.

THE COMMISSIONER: Measured over time and space?

DR MALLEN-COOPER: Generally measured at one point, actually. Volume can be stored. So it's – hydrology is - - -

THE COMMISSIONER: It's not a question in terms of a rate.

DR MALLEN-COOPER: It's usually a rate, megalitres per day, cubic metres per second; it's usually a rate at one point over a certain period of time.

THE COMMISSIONER: So volume and time.

DR MALLEN-COOPER: Yes. But - - -

THE COMMISSIONER: But gives you a rate.

DR MALLEN-COOPER: It gives you a rate, but not over space, usually.

THE COMMISSIONER: I see. Yes.

DR MALLEN-COOPER: Yes. At one point.

THE COMMISSIONER: It's one point. You say at such and such, and the word you use is discharge.

DR MALLEN-COOPER: Discharge.

THE COMMISSIONER: Some people say flow of a certain amount.

DR MALLEN-COOPER: Exactly.

THE COMMISSIONER: Thank you. Whereas hydraulics is the dynamic performance, which therefore has spatial dimension; is that correct?

DR MALLEN-COOPER: Correct. It is – it's often described as having water velocity, turbulence, yes.

THE COMMISSIONER: Which, by definition, has a spatial element.

DR MALLEN-COOPER: It has, exactly.

MR BEASLEY: And depth as well, is part of - - -

DR MALLEN-COOPER: Depth, yes.

MR BEASLEY: Now, the two fundamental concerns that you raise in your submission that we will go through in detail, but the first is that there are fish that respond to – and I think the term is lotic, flowing – they benefit from a flowing river and there are other fish where – that benefit from lentic or stilled conditions.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: How do you prefer to pronounce that? Lotic and lentic?

DR MALLEN-COOPER: Yes. But that's - - -

THE COMMISSIONER: No, that's all right. I was just wondering how you .....

DR MALLEN-COOPER: Yes. It's lotic and lentic, but let's use flowing water and still water.

THE COMMISSIONER: Yes. Flowing water and still water.

MR BEASLEY: I would much rather do that.

DR MALLEN-COOPER: Yes. For clarity.

MR BEASLEY: That sounds like a good idea. And the problem caused by a regulated river is that it – for the fish whose habitat – preference for habitat is flowing water, a regulated river with weirs, or if something like a regulator is used to artificially water a floodplain, you've changed the natural flow of the river. I know that's a simplistic way of describing it.

DR MALLEN-COOPER: Yes.

MR BEASLEY: Please fill it out, but that's the fundamental problem.

DR MALLEN-COOPER: Now, look interestingly, I think there's ambiguity about the word "flow".

MR BEASLEY: Yes.

DR MALLEN-COOPER: So yes, so if you add a weir or a dam you can have the same flow with the same discharge, but you are creating - - -

MR BEASLEY: Different characteristics.

DR MALLEN-COOPER: A still water habitat. Yes.

MR BEASLEY: Yes.

THE COMMISSIONER: It's not literally still because water enters at the upstream extremity - - -

DR MALLEN-COOPER: Correct.

THE COMMISSIONER: - - - and spills over the weir, or through the discharge at the lower end, but it is the same way a bath overflows rather than a shower runs.

DR MALLEN-COOPER: It's correct. If we use lentic, we will be right, but the bath analogy is a good one.

THE COMMISSIONER: Now, your figure 1 graphically captures this, so that between Lock One and Mildura, going upstream, we should regard that as being, in effect, still water or lentic, notwithstanding that there is, of course, movement literally of water from Mildura to Lock One and eventually, if we are lucky, into the ocean; that's correct?

DR MALLEN-COOPER: Yes, that's correct.

THE COMMISSIONER: And partly it's a function, I suppose, of the depth of the weir pools that means that for you as an ecologist that's still water, notwithstanding it's not literally still. Have I understood that correctly?

DR MALLEN-COOPER: Look, it's just a function of water velocity, so it's a cross-section of the river and the depth and then a certain discharge will give you a certain velocity. So you're correct in saying there is some very, very low velocity there, obviously some movement of water, but ecologically a very different habitat.

THE COMMISSIONER: ..... for the fish and other species involved, it's obviously so different from even the regulated upstream reaches that can still be regarded as flowing water, it's so different that they become extinct.

DR MALLEN-COOPER: Correct. And as I put - - -

THE COMMISSIONER: We do know they were there once, do we?

DR MALLEN-COOPER: Well, absolutely. So there are records of trout cod, and Murray crayfish, and other species that are now not in the Murray River in South Australia. But upstream, where there's flowing water habitats, those species persist.

THE COMMISSIONER: Even though the river is highly regulated?

DR MALLEN-COOPER: Exactly.

THE COMMISSIONER: So in other words we don't need to operate on a counsel of despair that, once we regulate – and we must regulate – then we have to say goodbye to the species.

DR MALLEN-COOPER: Not necessarily.

MR BEASLEY: It's how you operate and manage the water despite the regulation?

DR MALLEN-COOPER: Correct. And there's – as I put in my submission, this is not currently part of the Basin Plan, which is about hydrology, which is about discharge.

MR BEASLEY: Just coming to that, let's go straight to your concern did schedule 6 of the Basin Plan and the ecological elements of the scoring method. Can Dr Mallen-Cooper be given a copy? You might have a copy of the Basin Plan there.

DR MALLEN-COOPER: Yes.

MR BEASLEY: So if you go to – you will actually find it on page 220. So if you go to 220, I want you to tell me if my understanding is wrong. And correct me, please, if it is wrong, but your concern in relation to section 605, we have 605:

> *(1) The ecological elements of scoring method will be science based, independently reviewed, fit for purpose. Preference curves will be used in the method.*
>
> *(2) Science based, independently viewed, fit for purpose metrics for weighting environmental significance of the flood dependent area will be used in the method.*

Your concern, as I understand it, is that that ignores the dependence that some fish have for both their reproduction and survival on the hydraulics of the actual river channel as distinct from the flood dependent area?

DR MALLEN-COOPER: It's more fundamental than that. It actually – the wording ignores the river channel because it's "flood dependent area".

MR BEASLEY: Yes.

DR MALLEN-COOPER: So it ignores the river channel and hence the biota in there.

THE COMMISSIONER: Section 605(2) refers to the flood dependent area. Does that equate for all purposes to what happens when the banks are broken?

DR MALLEN-COOPER: That is how it's interpreted. I think you could - - -

THE COMMISSIONER: Flood doesn't mean flow; flood means breaking the banks of the channel?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: That's a question, by the way.

DR MALLEN-COOPER: Yes. Yes, that's right. A flood is inundation of, yes, the banks; correct.

THE COMMISSIONER: But 605 is not confined to that, is it?

DR MALLEN-COOPER: It – it says "flood dependent area". So that doesn't include the river channel because the river channel - - -

THE COMMISSIONER: 605(2) doesn't. I take your point, but then 605(3) refers back to (2).

DR MALLEN-COOPER: Correct.

MR BEASLEY: This is a matter you've had discussions with the Basin Authority about on many occasions; correct?

DR MALLEN-COOPER: Look, as a practitioner on the ground I've been involved in many of these floodplain projects, but not in the decision-making. So in the sort of effect on the grounds, yes, I've been involved in risk assessments.

MR BEASLEY: Your concerns about ignoring the hydraulics of the river channel and the impact that that can have on the reproduction or survival of certain fish is a matter that you've raised with the Basin Authority on many occasions.

DR MALLEN-COOPER: Yes. And it's hydraulics of the floodplain as well. So a natural flood has a dynamic, you know, range of flowing water and still water, on the floodplain, and it's connected to flows upstream and downstream. So there's – it's a very, very complex hydraulic environment and if we follow section – well, as the states have followed section 605, it's ignoring hydraulics on the floodplain as well as ignoring the river channel.

MR BEASLEY: And you've suggested to them that that places a severe limitation at least in relation to considering ecological equivalency in relation to fish?

DR MALLEN-COOPER: Yes. But not at a policy level; at a practitioner's level.

MR BEASLEY: Yes.

DR MALLEN-COOPER: Yes, I've been quite transparent about the risks involved and how that can be operated.

MR BEASLEY: And the response you've had from the Basin Authority has been what?

DR MALLEN-COOPER: Look, most of the time I've been dealing with the states actually.

MR BEASLEY: All right. Well, the - - -

DR MALLEN-COOPER: The state authorities. And so their response has been to receive, you know, my reports and advice, and we're probably yet to see some of that advice in practice.

MR BEASLEY: Right. All right.

THE COMMISSIONER: Now, if I go back to Section 604, we have this notion of flow regime characteristics which, for the purpose of this assessment of the environmental equivalents of supply measures, is defined to involve the frequency with which flow events occur and the length of dry spells. Do those two things, in combination, capture the hydraulics to which you are referring or not?

DR MALLEN-COOPER: No, they don't, because the flow regime is universally within the Basin Plan interpreted as hydrology; as discharge.

MR BEASLEY: Isn't that – isn't that what's to be measured or assessed, though, and the scoring method starts at 605.

THE COMMISSIONER: Yes. I'm just wondering – I'm trying – see, this is all for the purpose of working out whether a proposed supply measure is such as to justify a reduction in the recovery for the volume for the environment. An ESLT adjustment. And it can do so, by law, only if there are equivalent environmental outcomes. And that rather evaluative exercise is sought to be regulated, I suppose, by the so-called default method, which includes this scoring notion to which, among other provisions, 605 – to which you've drawn our attention – goes. Now, because what might be called intuition or purely subjective judgment is sought to be, if not eliminated, minimised, and hence the language of metrics.

Is it possible that the point which you criticise, namely the ignoring of hydraulics and the exclusive attention to hydrology, nonetheless serves this purpose: that by choosing metrics based upon flood dependent areas it, by way of – and I think the greater including the lesser, literally – that is the flood including that which is not big enough to be a flood. I'm trying to work out how this might be justified. Is it possible that could be a proxy for environmental equivalence? I gather from your evidence the short answer is no.

DR MALLEN-COOPER: So in my submission I'm talking about aquatic biota.

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: So – and I think some of these SDL projects will provide watering of vegetation and so there will be benefits in that regard, and these vegetation would not have been watered under, you know, without the regulator, as an example.

THE COMMISSIONER: The black box up the bank - - -

DR MALLEN-COOPER: As an example.

THE COMMISSIONER: - - - a flood event will attend to.

MR BEASLEY: It may not reach the back box, but - - -

THE COMMISSIONER: The crayfish in the channel is a bit different.

DR MALLEN-COOPER: Correct.

MR BEASLEY: And 6.04 that the Commissioner took you to, just so we're clear, frequency with which flow events occur and length of dry spells, that's not asking for a measurement or assessment of hydraulics, is it?

DR MALLEN-COOPER: No, it's not.

MR BEASLEY: And it's not going to tell you anything about the benefits of a natural spring pulse as distinct from an artificial flooding?

DR MALLEN-COOPER: That's exactly right.

MR BEASLEY: Or from – the response from a natural flood coming downstream.

DR MALLEN-COOPER: That's right.

MR BEASLEY: As distinct from artificial watering. And it doesn't tell you anything or ask you to assess anything about the issues of the response that certain fish have to the things like velocity and turbidity that we discussed before.

DR MALLEN-COOPER: I think it – I have another criticism, which I put in my submission, is it tends to be site-based actions. So there's ignoring spatial scale. So it's not looking at the river ecosystem, it's looking at a particular site and the benefit at that particular site. Now - - -

MR BEASLEY: By that you mean the regulator will have a – be able to spread water out a certain area but that's completely different to considering the response in an entire river system to a natural spring pulse or a natural - - -

DR MALLEN-COOPER: Correct.

MR BEASLEY: - - - flood event. Is that - - -

DR MALLEN-COOPER: Correct. So it's - - -

MR BEASLEY: Yes.

THE COMMISSIONER: Could a single site, nonetheless, be an appropriate proxy?

DR MALLEN-COOPER: For plants, it could be.

THE COMMISSIONER: But not for crayfish. Don't – look, don't tie yourself to crayfish.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: But not for the aquatic biota?

DR MALLEN-COOPER: Yes. But so let's say river channel specialist biota.

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: It could be mussels. Yes, it would not work for them. But it may work for plants. Now – and I think there is a path forward acknowledging, you know, some of these risks and benefits. And I put it in my report for the Chowilla regulator, which I've included in here, that it provides a special risk and it provides an opportunity where you can switch that mechanism off. You can pull out the Chowilla regulator, you can reinstate it. So you could, if you provide a good monitoring, minimise the risks and benefit the trees. But you need high quality monitoring. And then, if in that particular case there was increases of carp and native fish declined, well then you could switch off the regulator, so to speak, and not operate it.

MR BEASLEY: That was the prediction in relation to the Chowilla regulator wasn't it? That you are going to have a big spike in carp, and you're going to have a reduction in certain of the native species, and that was the prediction before the regulator went in, and after the regulator has gone in that has been backed up by actual observation; correct?

DR MALLEN-COOPER: It's correct. So I did a risk assessment with seven other scientists and using existing fish biology and our knowledge of, you know, life cycles. This was very predictable from our knowledge, and I used – you know, some

very experienced people and, yes, again if you have this inundated floodplain which is – you know, still water, not sort of dynamic flooding event, it will encourage carp. It was very predictable and is exactly what happened and it will not encourage, you know, those native species that need – you know, flows over hundreds of kilometres.

MR BEASLEY: And I think there are native fish that don't respond well to the presence of a lot of carp; is that right?

DR MALLEN-COOPER: Very much so.

MR BEASLEY: Yes. All right. Sorry, I interrupted you, Commissioner, are you - - -

THE COMMISSIONER: No. I just wanted to make sure I fully grasped the shortcoming you identify. Perhaps I can finish off this way: what do you suggest should be done instead?

DR MALLEN-COOPER: In terms of the - - -

THE COMMISSIONER: Default method.

DR MALLEN-COOPER: In terms of the sustainable diversion limit adjustments or environmental regulators?

THE COMMISSIONER: No. In terms of ascertaining the equivalence of environmental outcomes which is the subject matter of schedule 6.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: What do you – could it be redrawn, you think, so as to accommodate your concern?

DR MALLEN-COOPER: Yes. I think it could. So I suggested you incorporate hydraulics.

MR BEASLEY: That might be the heading of 'The Way Forward' in your submission.

DR MALLEN-COOPER: Yes.

MR BEASLEY: Where you've dealt with some of this. Yes.

THE COMMISSIONER: Yes. No, I've read all that. So you think that it's not beyond – you don't think there needs to be a root and branch revisiting; it's a matter of supplementing or adding something?

DR MALLEN-COOPER: Yes. I think it went down a certain path, focusing on floodplain biota. I think the concept of ecological equivalence, to balance that with flow for river on biota, it's an unusual one, but I think the method could be modified.

THE COMMISSIONER: The Red Gums had better press than the .....

DR MALLEN-COOPER: Well, I mean it's interesting – it's interesting because, you know, in South Australia, in the Murray, trout, cod and Murray crayfish, you know, were common a long time ago. They're gone. 100 per cent gone. Now, if River Red Gums were 100 per cent gone, we would be really worried.

THE COMMISSIONER: They have better press.

DR MALLEN-COOPER: That's right, they are getting better press, and you can't see what has gone.

THE COMMISSIONER: I understand. Well, now, it's to be recalled that this is a method for measuring the lawfulness of a proposed reduction of recovery for the environment; that is the so-called SDL adjustment. And the criterion in question is the equivalent environmental outcome, but it's equivalent not with anything pristine or pre-development or non-regulated, it's equivalent with what we call the bench bar position, which includes a fair amount of regulation and development. So, in relation to hydraulics, if there had been these weir pools from which former endemic biota are now extinct in the benchmark position and that remains the position in – after the proposed adjustment, then there's equivalence.

There's no improvement. There's no recovery and restoration, to use other language of the Act and the Plan, but in terms of the particular exercise, which is the schedule 6 environmental equivalence of a supply measure proposed to justify an SDL adjustment, you're not – I don't think the task does require ecological improvement. Other things do, like the whole of the Act. But and SDL adjustment, in itself, by talking about environmental equivalence, I think it conceptually involves the notions of things not getting worse but not needing to get better.

DR MALLEN-COOPER: And – and using less water.

THE COMMISSIONER: And using less water.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: The whole purpose of the SDL adjustment is to reduce the amount of water which initially was assessed, supposedly, by reference to what was necessary in order to avoid environmental compromise. I'm paraphrasing.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: You will recognise the language. The equivalence, therefore, is between what is supposed to be the consequence of what I will call the originally stipulated recovery for the environment, the reduction in consumptive use, and the proposed amendment to that, which is a lesser reduction in consumptive use. And the idea, if I may say so, is that as long as you get the same outcome, what might be called in parsimony, a reticence – a resistance to using more water than you absolutely need for that environmental outcome is what seems to inform these parts of the Act and the Plan. But, as I say, it has this criteria that it must be environmental equivalence. So I'm wondering how – if we could put your concerns about hydraulics into schedule 6 would it make much difference where we started with a weir pool and we're going to end up with a weir pool?

DR MALLEN-COOPER: Huge – huge.

THE COMMISSIONER: Can you explain that for me.

DR MALLEN-COOPER: Yes. Well, I think – I think I have a few comments. First of all, the benchmark probably is based solely on hydrology for a start. So - - -

THE COMMISSIONER: Yes, hydrology in a setting.

DR MALLEN-COOPER: In a setting.

THE COMMISSIONER: In a setting with regulation and development.

DR MALLEN-COOPER: Correct. So it doesn't include hydraulics. So, if you like there's an underlying ecological model which is not incorporating hydraulics, although aquatic ecology is driven by hydraulics, so that's an underlying model that should be there and it's not. That's the first point. Now, the second, if you take a benchmark if – as being existing weirs, wow, you have a great SDL project because then you can have recreate hydraulics by lowering the weirs and removing the weir and then improving aquatic biota, potentially, with this water. If you take the weirs as your benchmark.

THE COMMISSIONER: If you take the weirs as a benchmark and look at a proposed supply measure, which - - -

MR BEASLEY: Isn't it – wouldn't it be better to look at the part of the river that has no regulator and then compare it to when it has got a regulator and what the change is from that?

THE COMMISSIONER: But that would be to look at it from the point of view of, as it were, trying to undo the damage we've done, and I don't read the Act and the Plan as trying to do that at all. It's trying to halt the process of damage rather than to reverse damage.

DR MALLEN-COOPER: So you're certain it's about halting?

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: And that's your reading of the beginning of the Act?

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: Okay. So I felt there was a different objective there.

THE COMMISSIONER: That is, the river is going to remain regulated.

DR MALLEN-COOPER: It remains regulated.

THE COMMISSIONER: And consumptive use.

DR MALLEN-COOPER: And consumptive use.

THE COMMISSIONER: That's what I – that's all I mean, that that is not going to be unwound.

DR MALLEN-COOPER: That's correct. Yes. But I think the objective - - -

THE COMMISSIONER: But we have been taking too much is a colloquial paraphrase of what the statute says.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Slightly – a slightly Anglican prayer of general confession, there is no healthiness, we have erred and strayed from our ways like lost sheep, etcetera. So we have done the wrong thing and we are going to do something about it is what the Act actually says, but it doesn't say, "We are going to reverse the damaging effects that we, just by being there, have had. We're not going to do that. We're going to, however, limit our effect to the point where taking more would compromise the environmental outcomes to which the Act refers." So as I said to another witness this morning, really, it comes down to this, doesn't it – this is my current reading and no one has persuaded me to the contrary yet – I'm still open to persuasion to the contrary – that we must take some water. For the purposes of taking the water we must regulate to an extent, but not too much

And that the whole of the Act is about saying, "We have taken too much, we can't continue to take too much, here are the governmental ways in which we're going to try and repair that position." And at the heart of it is working out what is too much. Now, that is a question of statutory definition. And it's fixed by an SDL which as an ESLT and then there's an adjustment process. And in a sense, because it's meant to be scientifically informed, adjustment ought to be – I imagine – the outcome of continuous scientific work, which will almost certainly include different data, some would rather hope better data, different analyses, perhaps better analysis, and so improved approaches which, in the nature of science, could go in either direction.

That is, require a reduction in the SDL or permit an increase in the SDL. Now, against that general background, when you look at this – these provisions for the default method of determining supply contributions, supply measure contributions to an adjustment, we are comparing, aren't we, a position of regulation and consumptive use without that supply measure and regulation and consumptive use with that supply measure, and saying we can't – we can't increase the SDL by reducing the water for the environment unless you can show that you're supplying water produces that equivalent environmental outcome to the position without it. Is that how you understand it?

DR MALLEN-COOPER: Yes. But I would have thought the objective is to get improved ecological outcomes.

THE COMMISSIONER: There's definitely - - -

DR MALLEN-COOPER: Not just - - -

THE COMMISSIONER: - - - the expression "protect and restore".

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: You're right. But I'm not quite sure whether the adjustment mechanism, the SDL mechanisms is in a place where that has to be done. That seems to me that's where the ELST plays a role and where watering plans play a role.

DR MALLEN-COOPER: Yes. That could be interpreted specifically for the SDLs correctly; that's right. It could be interpreted that way.

THE COMMISSIONER: The SDL must be set, by definition, at a level beyond which there would be compromise. And that's a loaded expression that has a lot of arguable evaluation ..... that would compromise the defined and specified environmental outcomes. And you're saying – understandably, with respect – that those outcomes include some repair of harm as well as simply ceasing the process of harm. I think that's the point you're trying to make?

DR MALLEN-COOPER: Correct.

THE COMMISSIONER: Thanks. Hence the importance of the word "restore" in the Act. Well now, it seems to me to follow then that your – the burden of your evidence, which is very interesting with great respect – the burden of your evidence travels well beyond simply the default method for calculating the contributions of supply measures. It's a pervasive observation you make about an approach to ELST, SDL, watering plans and operating rules.

DR MALLEN-COOPER: Yes, that's correct.

THE COMMISSIONER: Operating rules seem to be really important for hydraulics.

DR MALLEN-COOPER: Yes, they are. Yes.

THE COMMISSIONER: Thanks.

MR BEASLEY: This ecological elements of scoring method is – it's very odd. I mean, what the Basin Authority says is we've got - - -

THE COMMISSIONER: Well, to you and me as lawyers, yes.

MR BEASLEY: You've got a plan that proposes, as a yearly average, 2,750 gigalitres of water gets put back in – gets returned to the environment, but then we have this system where we can build – not build, we will implement 36 projects, some of which are regulators, like Chowilla, and we now only have to return about 2,100 gigalitres to the environment.

THE COMMISSIONER: To achieve that equivalent outcome.

MR BEASLEY: Based on the scoring method. Now, the scoring method may, based on the modelling, all come out with environmental equivalency. I don't know.

THE COMMISSIONER: Can I ask about that, Doctor. Yes, ...

MR BEASLEY: It seems insane if real results are of a regulator, you get 97 per cent of carp in a floodplain.

THE COMMISSIONER: Doctor, can I ask you this, and paying close regard to what Mr Beasley just said, Section 607(a) is this term of art, "limits of change", and it's required for each region of the Basin that there be no reduction in the benchmark environmental outcomes scars, although some reductions in individual elements may be permitted if they are offset by increases in other elements. And then just for your edification, if you turn over to the end of that provision Section 607, you see (d) is followed by a note:

> *These limits have changed for the purpose of modelling SDL adjustment and do not necessarily represent environmental watering or management targets.*

I know you didn't write those words. Do you know what they mean?

DR MALLEN-COOPER: No.

THE COMMISSIONER: I've gathered that it's by way of saying, "Look, nothing in Section 607 should deflect from the environmental watering or management targets which remain as targets." But, rather, have to do with how you score for the purpose of environmental equivalence. And that's why I wanted to ask you about – can you

help me with what does it mean, in practice how would you go about inquiring about whether reductions in individual elements have been offset by increases in other elements? Offset presumably means in environmental terms, doesn't it?

DR MALLEN-COOPER: I'm really not sure about that.

MR BEASLEY: Well, presumably, it's a score.

THE COMMISSIONER: I mean, more yabbies, less Murray cod - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - is not an offset, it is?

DR MALLEN-COOPER: I'm not sure what the intent is.

MR BEASLEY: Well, can I give you this example. The Menindee Lakes – the concern the Basin Authority itself has raised about Menindee Lakes is that the SDL measure might result in this – losing 8,000 hectares of Golden Perch nursery habitat in Lake Cawndilla over 65 per cent of the time, and losing another 15,000 hectares of Golden Perch nursery habitat in Lake Menindee for over 20 per cent of the time or likely to be longer. How does that get offset?

THE COMMISSIONER: What could offset that? I mean, that's not a rhetorical question. I mean, you are, with great respect, a real expert in this area. How would you offset the loss of Lake Cawndilla as one of the only reliable release points for Golden Perch?

DR MALLEN-COOPER: I - - -

THE COMMISSIONER: You would have another one to do the same thing, would you?

DR MALLEN-COOPER: I don't think – you - - -

MR BEASLEY: Is there a realistic way of doing it?

DR MALLEN-COOPER: No. No, I – that example, I – I don't think there is an offset. Okay. So I – I think rather than the word offset - - -

THE COMMISSIONER: If you opened a new lake.

DR MALLEN-COOPER: You could open a new lake. You could create a new floodplain lake.

THE COMMISSIONER: Even that might not be an offset.

DR MALLEN-COOPER: Yes, actually - - -

THE COMMISSIONER: Because it would be in a different place, etcetera. But - - -

DR MALLEN-COOPER: No, you - - -

THE COMMISSIONER: But that's the sort of thing you would be looking for, would you?

DR MALLEN-COOPER: Yes .....

THE COMMISSIONER: Do you ecologists seriously think in terms of offsetting no more Murray Cod but a whole lot more yabbies?

MR BEASLEY: Loss of a species, surely.

DR MALLEN-COOPER: No, and – absolutely not. I – look, I - - -

THE COMMISSIONER: I presume you wouldn't waste any of your time thinking about - - -

DR MALLEN-COOPER: Offsets.

THE COMMISSIONER: - - - an offset in those terms.

DR MALLEN-COOPER: No.

THE COMMISSIONER: No.

DR MALLEN-COOPER: No.

THE COMMISSIONER: So how would you think about offset without regarding it as a waste of time?

DR MALLEN-COOPER: Okay. If I use the Chowilla regulator as an example, and – and - - -

THE COMMISSIONER: Yes.

MR BEASLEY: Well, I was going to take you to that. So they monitor it.

THE COMMISSIONER: Yes.

MR BEASLEY: And they find three cod that they find - - -

DR MALLEN-COOPER: Yes.

MR BEASLEY: - - - in the floodplains. 90 per cent of the catch is carp.

DR MALLEN-COOPER: Yes.

MR BEASLEY: How do you offset that?

DR MALLEN-COOPER: So – so I – I would suggest that the path forward on that is to – there's a balance there. The trees need water. You are getting a negative. You are getting, you know, a higher risk with increased carp. So you – you monitor the trees, the tree health and the seed bank, and you monitor that and you do not use the regulator until you absolutely need to. And then, in addition, to offset this increase in carp, you increase populations of native fish by other means so they can prey upon the small carp.

MR BEASLEY: How would you do that?

DR MALLEN-COOPER: You would probably improve hydraulics in the lower River Murray.

THE COMMISSIONER: You mean it's interesting that he should ask you. I have about my person a handbook on hydraulic improvement, yes. I understand.

MR BEASLEY: It sort of makes - - -

THE COMMISSIONER: So in that case, however, you need to find that offset in the measure, otherwise it won't satisfy Section 6.07(a). So there's only an offset by increase in other elements if that's part and parcel of the measure.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: And I think in the discussion when we had this, you know, eight scientists, we talked about exactly this for the Chowilla. The ..... as an example, which will occur in the other SDL sort of environmental regulators – yes, they would produce more carp and more – more – you know, introduce fish and – and some common native fish will do well, but those fish that are declining will be at greater threat. So, yes, how do you compensate for that or balance that or offset that? Well, yes, you must improve native fish populations in some other respect.

THE COMMISSIONER: Yes. So these – I find very - - -

MR BEASLEY: You said do that by improving the hydraulics of the river.

DR MALLEN-COOPER: Yes.

MR BEASLEY: How do you do that?

DR MALLEN-COOPER: Well, if – an example in the lower Murray is reducing the height of the weirs, and - - -

THE COMMISSIONER: How would that affect the operation itself of the Chowilla regulator?

DR MALLEN-COOPER: I – I actually think there's a harmonious path forward here, where you would operate Lock Six and Chowilla regulator both as environmental regulators. As an example, so you have up them, you know, up in spring, probably not that high, so there was, you know, flowing water habitat upstream, and then you bring them both down.

THE COMMISSIONER: Can you bring them both down and still the river be used to deliver some irrigation water?

DR MALLEN-COOPER: It has no impact on delivery.

THE COMMISSIONER: Doesn't it? Right.

DR MALLEN-COOPER: Zero. In fact, it probably will save some water in evaporation.

THE COMMISSIONER: I'm committing the error of confusing hydrology and hydraulics.

DR MALLEN-COOPER: Yes. It's an – it's an easy one to make.

THE COMMISSIONER: Yes. Thank you. Well, that's a comfort.

MR BEASLEY: Just going back to your submission, then, on page 5, you've suggested that there are these three fundamental ecological principles missing from the ecological equivalence scoring method. Sorry. Ecological elements methodology, you call it. 1) we've discussed; that is the fundamental division between fish that like flowing water and fish that like still water. Then 2) and 3), spatial scale and connectivity, and 3, integrity of flow – I just want to make sure that we have a proper understanding of that. What do you mean precisely by spatial scale and connectivity? Is that – there's some explanation of it, I think, on the second paragraph of page 6, but, what, is it failing to properly consider that some fish have a habitat that extends hundreds of kilometres and others have their whole life cycle in a very small area?

DR MALLEN-COOPER: Correct. It's – it's – it's as simple as that, and there has been numerous, you know, tagging studies and radio tracking studies that have shown fish moving hundreds of kilometres and – whereas some fish can just reproduce in a small wetland. So there's different – different scales of life cycles.

MR BEASLEY: All right. And integrity of flow – you've explained that in the third paragraph but I'm just wondering whether, if you go to the work you did for the Basin Authority behind tab 5, which is a paper entitled 'Background Paper – Rethinking the Natural Flow Paradigm in the Murray-Darling Basin' – on page 22 of that report, I think you've set out in 5.3.3 the concept of integrity of flow as including both what you've said there about longitudinal integrity of flow and lateral integrity of flow. Is there anything more we need to know other than what's in those paragraphs?

THE COMMISSIONER: Which page was that, sorry?

MR BEASLEY: 22 of the report behind tab 5.

THE COMMISSIONER: I'm sorry, I was looking at tab 3.

MR BEASLEY: Yes.

THE COMMISSIONER: Thanks.

DR MALLEN-COOPER: Look, I – I – I think that that explains it very well, and – and, you know, most ecologists would certainly agree with that. I – I'd also say that some of these principles of longitudinal integrity of flow are partly being discussed and – and adopted. I mean, there is a sense that, you know, that we can't just deliver water to individual sites.

MR BEASLEY: Yes.

DR MALLEN-COOPER: So there is some adoption.

MR BEASLEY: All right.

THE COMMISSIONER: But integrity is this notion of non-artificial intervention. A lack of artificial intervention, is it?

DR MALLEN-COOPER: Yes, any fragmentation.

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: Any fragmentation. You might park on the floodplain and then release it, or you might park in a dam or you might, you know, pump it out. So in any – any disturbance will, you know, fragment that hydrograph down the river.

MR BEASLEY: And, to use your word, compromise the integrity of the flow because of that regulation, whereas – as distinct from without that a natural spring pulse is a flow with integrity and the fish will have a positive response to that spring pulse.

DR MALLEN-COOPER: Yes, correct.

MR BEASLEY: In the same way that they also respond when they sense that there's a major flood coming from upstream.

DR MALLEN-COOPER: Look, there's a number of species that are highly responsive to, you know, increases of flow. I mean – I mean, fish have a very, very good sense in their – their environment. They can sense an increase in velocity. They have – obviously sensing water temperature and they have a fantastic sense of smell. So if there's inundated ground, one of those three or all three are kicking in, and that's when a lot of fish migrate.

MR BEASLEY: And that's a completely different scenario to that – that natural scenario we have just discussed of a spring pulse, which I think you describe in one paper as the heartbeat of the river, I think - - -

DR MALLEN-COOPER: I did.

MR BEASLEY: - - - and a natural flood event – it's a very different scenario to an artificial flooding of a wet plain using a regulator or whatever.

DR MALLEN-COOPER: It is – it is completely different, and – and that's not being acknowledged sufficiently when we talk about sites because we're desynchronising hydrology. So, if you like, the managed inundation might be considered an artificial flood, but it's desynchronised from the river, which is quite low and low flow. So, therefore, the fish in the river do not know, you know, there's a flooding floodplain.

THE COMMISSIONER: Could I ask a couple of questions about – I'm not sure that I've understood everything at all. In your 'Way Forward', number 6 you use the expression "the natural flow paradigm". Where do I find an explanation of it?

DR MALLEN-COOPER: I – I can get you the original paper that describes that.

THE COMMISSIONER: That's not in one of the references? Because I've read them.

DR MALLEN-COOPER: It's – no, no, but it's - - -

THE COMMISSIONER: No.

DR MALLEN-COOPER: It's – it's well known. I think the author is Poff.

THE COMMISSIONER: Would the mind if the Commission staff is in in touch with you so I can understand that.

DR MALLEN-COOPER: Yes. Yes.

THE COMMISSIONER: But in – take a risk. See whether you can tell me in a sentence or two.

DR MALLEN-COOPER: I can.

THE COMMISSIONER: What does it mean?

DR MALLEN-COOPER: The unaltered natural flow provides the template for rehabilitation and restoration of rivers.

THE COMMISSIONER: So it's, as it were, the light on the hill in terms of protect restore.

DR MALLEN-COOPER: Mmm.

MR BEASLEY: There's no - - -

THE COMMISSIONER: Even though we know we are going to continue to regulate and to make consumptive use.

DR MALLEN-COOPER: Yes, it provides – it provides the template and, in fact, for regulated rivers provides a template. So, you know, given the natural flow, which is what a lot of the ecology and the .....

THE COMMISSIONER: A natural flow means unregulated?

DR MALLEN-COOPER: Unregulated, so no storage, no pumps, completely - - -

MR BEASLEY: I'm just wondering whether if, in the paper that I took you to, tab 5, the 'Rethinking the Natural Flow Paradigm' - - -

THE COMMISSIONER: Yes.

MR BEASLEY: - - - in the Murray-Darling Basin – whether page 9 deals to some extent with the – I mean, the heading is 'The Natural River Channel.' I read that as being part of a description of the natural river paradigm.

DR MALLEN-COOPER: Actually, I – no, it's – it's not quite.

MR BEASLEY: Right.

DR MALLEN-COOPER: It's – so it's – a natural flow paradigm is – is – is a, you know, a – a famous paper that it describes, yes, the natural flow meaning discharge and hydrology. However, within that paper those authors acknowledge other processes including hydraulics, but somehow that has got simplified to only hydrology.

THE COMMISSIONER: I suppose because it's so much easier to measure.

DR MALLEN-COOPER: Actually, you know what is surprising is all the gauging stations, all the hydrology, is based on velocity.

THE COMMISSIONER: Is that - - -

DR MALLEN-COOPER: It's not based on discharge. You measure velocity first.

THE COMMISSIONER: So it could be adapted to assist in hydraulic monitoring.

DR MALLEN-COOPER: The – the primary data is velocity times cross-sectional area - - -

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: - - - of the river, and then you get discharge, so interestingly, you have primary data already.

THE COMMISSIONER: So I was wrong. Yes. Righto. Well, thank you.

MR BEASLEY: Commissioner, I'm just wondering – we're going to be a while longer – whether the reporter needs a break.

THE COMMISSIONER: Of course. Well, yes. Sorry, yes. Time flies when you're having a good time. Yes, let's have a break. But how much longer can we go?

MR BEASLEY: That – I don't know the answer to that.

THE COMMISSIONER: Well, let's take - - -

MR BEASLEY: We can go - - -

THE COMMISSIONER: Shall we take a 15 minute break?

MR BEASLEY: I think so, yes.

THE COMMISSIONER: If you don't mind, Doctor, we will - - -

DR MALLEN-COOPER: Okay.

THE COMMISSIONER: - - - take a break and resume, please.

MR BEASLEY: All right. So - - -

THE COMMISSIONER: So we will resume at 10 past.

MR BEASLEY: All right. Excellent. Thank you.

ADJOURNED **[3.53 pm]**

RESUMED **[4.04 pm]**

THE COMMISSIONER: Can I just continue to ask questions about page seven of your evidence to me – your submission to me.

DR MALLEN-COOPER: Page 7 of - - -

THE COMMISSIONER: Page 7.

DR MALLEN-COOPER: - - - tab 1?

THE COMMISSIONER: Tab 1

DR MALLEN-COOPER: Yes – yes – yes. Natural flow paradigm. Correct?

THE COMMISSIONER: You quote from yourself and a colleague from something that's in press. It has been peer reviewed.

DR MALLEN-COOPER: Peer reviewed and now published.

THE COMMISSIONER: Now published?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Have we got it?

DR MALLEN-COOPER: You have a galley proof in your submission, but on - - -

THE COMMISSIONER: So that's the one that is – I'm just trying to think – that's tab 3.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Thank you very much.

MR BEASLEY: That's a research article.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: No. Thank you very much. Good. Excellent. Now, what you are proposing in that, namely the creation of lotic habitats perhaps in

anabranches where they may not have been an original feature, so as to create new lotic refugia, seems to be the kind of thing that is sometimes called a complementary measure. That is something you can do - - -

DR MALLEN-COOPER: No.

THE COMMISSIONER: - - - alongside or as well as or perhaps instead of water restoration in order to restore an ecological value. Is that right? So the same amount of water but differently diverted, put into a channel like an - - -

DR MALLEN-COOPER: Well, actually, yes – yes, actually. Yes.

THE COMMISSIONER: Like an old anabranch is now going to become a lotic habitat.

DR MALLEN-COOPER: Yes, it could be called a complementary measure. It could have an - - -

THE COMMISSIONER: The word "complementary" is entirely tendentious.

DR MALLEN-COOPER: Okay. Okay, fine.

THE COMMISSIONER: It's not a technical term.

DR MALLEN-COOPER: Fine.

THE COMMISSIONER: It's found in the evidence before me.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: It seems to complement, I think, restorative environmental flow. I can't – it's not a technical term. I have had brought to my attention in a number of pieces of evidence, but what you're talking about here doesn't necessarily mean that water needs to be taken from consumptive use for that ecological use. It may require it, but it doesn't necessarily mean it. Have I captured that idea correctly?

DR MALLEN-COOPER: Yes, correct. That is correct, yes.

THE COMMISSIONER: Now, here's something that's puzzling me: how – are you aware of how, within the Water Act in the Basin Plan, that kind of thing gets to be done?

DR MALLEN-COOPER: Look, I - - -

THE COMMISSIONER: And by whom and with what outcome?

DR MALLEN-COOPER: I don't know all of the Basin Plan. So it may be there, but it's not in there to my knowledge.

THE COMMISSIONER: So this is part of a new approach, but you're not suggesting that it can be done without altering the Basin Plan. It might require alteration of the Basin Plan.

DR MALLEN-COOPER: It might, but it might not.

THE COMMISSIONER: And that's really my word, I have to work out whether the Basin Plan.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Could mandate this kind of approach other than by way of a supply contribution. As a supply contribution, it only has meaning if it permits an adjustment to the SDL - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - believe it or not. In other words, doing something for the sake of restoring a habitat in the way you propose in item 6 - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - is not of itself something that merits an adjustment to an SDL.

DR MALLEN-COOPER: It could come - - -

THE COMMISSIONER: It might.

DR MALLEN-COOPER: Yes, it might.

THE COMMISSIONER: But only if you could show that less water - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - than was originally determined for the SDL, will be used because by this device, you will get either equivalent or enhanced environmental outcomes.

DR MALLEN-COOPER: It would work well, actually, under the SDL. If we didn't have floodplain dependent area, or flood dependent area. It would work well under SDL, because - - -

THE COMMISSIONER: Would it actually justify recovering less water for the environment if you were to make old anabranches into hydraulic paradises?

DR MALLEN-COOPER: Yes. I think you would have to quantify what the reduction of environmental flow, what impact that had, and if that reduced – you know, Murray Cod populations by 400, then you would say this anabranch will create 400 Murray Cod. So if you could quantify that, it could be used in that mechanism - - -

THE COMMISSIONER: You still have to produce a hydrological difference. That is in order to adjust the SDL, which is hydrological, you would have to say, "And you won't need to take as much water for the environment if you do this anabranch hydraulic exercise, because there will be better fish for less water - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - than without that measure." That's a mental construct that you can see working for this kind of approach?

DR MALLEN-COOPER: It would work. Yes, look, it has potential to work that way, yes.

THE COMMISSIONER: I may be missing something in the – between the lines of the various proposals for 36 projects, but I don't think anything resembles this, does it?

DR MALLEN-COOPER: No, not at all. And it's partly because people are following what is written about – you know, floodplain area. So they keep following floodplain area as their guiding theme and not about the high level objectives of the Basin Plan and or aquatic biota and water dependent biota. So that water dependent biota is a common phrase, but then somehow we end up on a floodplain area with those offsets. I think the other – the other concept here is much of ecology for the Basin Plan, yes – is the underlying concept is the natural flow paradigm and if we have – you know, we follow aspects of the natural flow paradigm, or aspects of natural flow regime, that will benefit the environment. This is saying something quite different. We don't necessarily have to be constrained by that. And what surprises me is the presence of some threatened species in areas that are hydrologically impacted but not hydraulically impacted.

THE COMMISSIONER: So this is your item 7, I think, seems to pick this up, isn't it, where you use the expression:

> *Complementary measures of habitat and connectivity are required as well as flow.*

Now, the next sentence I need some help:

Hydraulic habitats described above –

That's in 6, I think.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER:

…should be integral with flow.

What does that mean, "should be integral with flow"?

DR MALLEN-COOPER: It's still saying hydraulics depend on – you still need flow.

THE COMMISSIONER: Yes. But are related to infrastructures such as weirs, so a weir will affect hydraulic habitat by converting it from lotic to lentic.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: So will overlap with complementary measures. So that means hydraulic habitats will overlap with complementary measures; what does that mean?

DR MALLEN-COOPER: I probably need to rephrase that. But, you know - - -

THE COMMISSIONER: Would I understand it appropriately if we just ignored the last sentence of 7? You've already told me elsewhere that hydraulic habitats are related to infrastructure, such as it is.

DR MALLEN-COOPER: Yes. Look, I – yes, correct. That's right. I've said it elsewhere.

THE COMMISSIONER: That's all right.

DR MALLEN-COOPER: Yes. Clearer, yes.

THE COMMISSIONER: I just wanted to make sure that I'm grasping it all.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Now, 9 – by the way, the appendix 4 reference in 8 is a reference to aquatic reserves. Which one is that? What is that annexed to? I just want to get the reference right for the record, that's all. Do any of us know what - - -

DR MALLEN-COOPER: Yes. It's on page 26 of tab 5.

THE COMMISSIONER: Tab 5, thank you. This is management of weir pools; is that right? No, I'm talking about - - -

DR MALLEN-COOPER: Eight.

THE COMMISSIONER: Your item 8 makes a reference to appendix 4.

DR MALLEN-COOPER: So appendix four is establish aquatic reserves based on hydrodynamic scale and connectivity.

THE COMMISSIONER: See – it says see appendix 4.

DR MALLEN-COOPER: Yes, see appendix 4 which expands on that statement.

MR BEASLEY: Go back to page 2 of the submission.

THE COMMISSIONER: I just want to – I'm just trying to get the reference.

MR BEASLEY: And you will get it. If you go to page 2 of the submission, there's appendices, appendix 4.

THE COMMISSIONER: Got it.

MR BEASLEY: .....

THE COMMISSIONER: Thank you. No, thank you, so that's one I've read.

MR BEASLEY: And that's tab 5.

THE COMMISSIONER: Appendix 4 is tab 5 is the answer I was looking for.

DR MALLEN-COOPER: Yes.

MR BEASLEY: The first page of it says it's appendix 4.

THE COMMISSIONER: That's all right. That's fine .....

DR MALLEN-COOPER: And the intent of that is that, you know, you say about halting any further loss of ecological values.

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: The intent is a vision for the next 50 to 100 years that we have some reaches of the river which support good native fish populations. We should nominate them for aquatic reserves because there are always future threats of climate change, etcetera, or other environmental regulators which will then disrupt that connectivity and that hydraulic integrity.

THE COMMISSIONER: I understand. Now, number 9, managing weir pools, and appendix 2 is tab 3.

DR MALLEN-COOPER: No, that's figure 2. Appendix 2, yes, tab 3, yes. Yes, okay.

THE COMMISSIONER: No appendix 2 is tab 3.

MR BEASLEY: It's my fault how this folder was put together.

THE COMMISSIONER: No, it's my fault entirely, I didn't read the front sheets properly. Now:

> *Lowering or removing a weir is potentially one of the largest and most effective river rehabilitation projects because it will provide tens or hundreds of kilometres of flowing water habitat and then –*

with Donald Trump style underlining –

> *with no extra environmental water*.

So you missed out your exclamation mark. Well, now, what's the down side?

DR MALLEN-COOPER: Yes, okay. There are obviously risks. You need to scope these out. The downsides – I've talked to many people about this, downsizing – quite obvious. First of all - - -

THE COMMISSIONER: Though not to me, so you had better explain.

DR MALLEN-COOPER: Yes. First of all, the weirs are in for navigation; the locks and weirs from Locks one to 11 and 15.

THE COMMISSIONER: Well, that's why they were put in. It's now pleasure navigation, is it?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Well, I shouldn't say that. It's tourist business as well, but - - -

DR MALLEN-COOPER: It's tourism. So some of the locks are very important for tourism. However, if you go upstream to Echuca, where the river is flowing, there's also house boats and tourism. So but - - -

THE COMMISSIONER: If you remove or – lower or remove a weir, it will only impede navigation as it is ..... called in the Constitution, depending upon draft of the boat, flow conditions and depth. Isn't that - - -

DR MALLEN-COOPER: That's exactly right.

MR BEASLEY: Skill of the operator of the boat, probably.

DR MALLEN-COOPER: That's right.

THE COMMISSIONER: It's tradition that they're all drunk but anyhow. So that may not matter. Well now, so there's management of what I will call an alteration of navigation conditions, is one – the answer to my question downside. What else is there?

MR JOHNSON: Salinity. So as you bring down the weir pool, it will draw in groundwater and increase salinity. If you like, in effect, we have – the weirs have been, since 1930 we have an 88 year salt bank, if you like, stored in the sides of the river. It will take many, many years for that to come down. And we have to manage, of course, the water supply.

THE COMMISSIONER: Just let me get this right. When the in-channel height is kept artificially higher by a weir, the inflow of the groundwater with its salt load is reduced or prevented.

DR MALLEN-COOPER: Yes – yes – yes.

THE COMMISSIONER: Just for – if you will forgive the expression, hydraulic reasons.

DR MALLEN-COOPER: Yes, hydraulic pressure.

THE COMMISSIONER: And there's the familiar phenomenon of dig a hole and watch the water fill its bottom is what happens if you lower the in-channel level by lowering or removing a weir. Then there will be, as you say, the generations of development on the river which has been banked by way of salt. It will just resume the ancient and continuing progress for which we need, of course, flow through to the ocean. So that so-called interception expedients won't answer that problem because it's immediate and longitudinal on both sides of the river, I assume, this expected salt ingress, if you do away with the, what would you call it, 88 years of raised levels. Righto. Now, the way to deal with that, then, is to ensure that there's enough flow to transport the salt.

DR MALLEN-COOPER: Correct. You would – you can definitely deal with it.

THE COMMISSIONER: Could you do that without increased flow?

DR MALLEN-COOPER: You'd have to model that. I'm not sure.

THE COMMISSIONER: I wish you wouldn't say that.

DR MALLEN-COOPER: Well, you could just adaptively manage it. You could just start to lower the weir pool, measure salinity; if there was an issue, you bring the weir pool back up. I – I would expect there's a – if you start to go down this path, this is a multi-decadal management strategy.

THE COMMISSIONER: Right.

DR MALLEN-COOPER: You – you would need to be very actively managing it.

THE COMMISSIONER: No, so, but this is the very essence. So we've got salt as the second one. What else?

DR MALLEN-COOPER: Irrigation. So irrigation pumps are – are fixed at a certain level at the weir pool, and if you bring the weir pool down, the inlets may be exposed and increased pumping costs.

THE COMMISSIONER: Why are they increased pumping costs?

DR MALLEN-COOPER: Because – because now the river is much lower and they – they have to pull that water up the bank.

THE COMMISSIONER: So simply the - - -

MR BEASLEY: Overcoming gravity.

DR MALLEN-COOPER: Gravity.

MR BEASLEY: The power. Yes.

THE COMMISSIONER: Yes. It's - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - simply the vertical lift.

DR MALLEN-COOPER: Yes, that's right.

THE COMMISSIONER: Right. So as to the infrastructure, a grateful public might pay, but then the question is to whether we would sign up for the ongoing increased power.

DR MALLEN-COOPER: Exactly. Exactly. So – so - - -

THE COMMISSIONER: Probably need to build a coal-fired power station.

DR MALLEN-COOPER: Could be – could – it might be solar; you never know.

THE COMMISSIONER: Righto. Anything else?

MR BEASLEY: I don't think – that won't happen in South Australia. It's all renewable here, rather.

THE COMMISSIONER: Anything else?

DR MALLEN-COOPER: Yes, so – so there are concerns about amenity because there are certain boat ramps that will be at a fixed level and they will be exposed.

THE COMMISSIONER: The grateful public will pay for that as well.

DR MALLEN-COOPER: Yes. And – and, also, there is a concern expressed from some, you know, people on the river that it will expose muddy banks.

THE COMMISSIONER: Well, it will because that's what happens in nature, isn't it?

DR MALLEN-COOPER: Well, all you need to do is go upstream of Mildura and – and see what the river looks like. So what will happen in the first flood is that all that mud will be taken downstream and what will be left are sandy beaches, actually. Matter of fact, if you go downstream of Lock Four, there's a bit of flowing water there, and you will see what the river would start to look like. So, in actual fact, you get increased amenity because you get sandy beaches to camp on.

THE COMMISSIONER: The Riviera of the south. Thank you. Anything else?

DR MALLEN-COOPER: Look, they're - - -

THE COMMISSIONER: These are downsides of - - -

DR MALLEN-COOPER: They're – they're the major downsides.

MR BEASLEY: Côte d'Azur.

DR MALLEN-COOPER: And – and - - -

THE COMMISSIONER: So I gather from what you are telling me that you reckon these are manageable.

DR MALLEN-COOPER: Absolute – they are definitely manageable. But – but they're – but they're not short-term manageable, and – and they would take significant investment and engagement with the community, and – but that the salinity is a big one, and that will take a long-term plan.

MR BEASLEY: I've seen a beach on the Murrumbidgee at Wagga. What looks like a beach there?

DR MALLEN-COOPER: That's right. Yes.

THE COMMISSIONER: I shouldn't have said anything.

MR BEASLEY: Sorry, I had to get that in, but - - -

THE COMMISSIONER: Can I take you to - - -

MR BEASLEY: Surprised me.

THE COMMISSIONER: - - - page 8, please. I just wanted to check that I understand your graphic. This is your figure 2. What does the bar chart mean on the right?

DR MALLEN-COOPER: That's frequency of velocity, and it's just showing a range of velocities that occur with a natural river channel from high to low. Just a spread of velocities.

THE COMMISSIONER: This is, as it were, a conventional notion. This is just for illustrative purposes.

DR MALLEN-COOPER: Conceptual only.

THE COMMISSIONER: And it tells us that with the natural, if I can call it that – the natural or unregulated elevation, you will get a range of velocities, quite a wide range of velocities spread throughout, or spread continuously at different frequencies but with the weir, you do have a range but it's nearly constant.

DR MALLEN-COOPER: It's – it's compressed and it's low velocity.

THE COMMISSIONER: Yes. Thanks. That's all on those.

MR BEASLEY: I wanted to ask you about the papers you've provided to us. One, the appendix 2 behind tab 3, which is the research article, 'History, Hydrology and Hydraulics – Rethinking the Ecological Management of Large Rivers.' I think the first item from your research that you draw to the reader's attention in this paper at page 10 of 23 is that contrary to the widely held belief, it's extremely unlikely that the river naturally ceased to flow in historic droughts, and if it did, would only be for a few days, not months on end. And then – and so the river always provided that flowing habitat for the particular fish that respond to that sort of habitat.

DR MALLEN-COOPER: Correct.

MR BEASLEY: Yes. And you then go on to discuss – and picking up that point at page 14 of 23 under the heading 'An Ecohydraulic Model of a Perennial Dryland River' what is ecohydrology?

DR MALLEN-COOPER: Ecohydrology, did you say?

MR BEASLEY: Well, just looking at that paragraph under 5.8, we have got these terms used. Ecohydraulics. What's that?

DR MALLEN-COOPER: Yes, so that – that's a combination of ecology and hydraulics.

MR BEASLEY: Right. And ecohydrology is the same, but - - -

DR MALLEN-COOPER: Ecohydrology is discharge - - -

MR BEASLEY: Yes.

DR MALLEN-COOPER: - - - and – yes – ecology.

MR BEASLEY: Yes, okay. And spatial scale is again a representation of longitudinally down the river channel and latitudinally - - -

DR MALLEN-COOPER: Yes.

MR BEASLEY: - - - into the floodplain; correct?

DR MALLEN-COOPER: Yes, correct.

MR BEASLEY: Right. The premise of the model that you suggest is that under natural conditions, the river was a hydrodynamically diverse at all flows amongst its entire length with flowing habitats a permanent feature of the river even in severe drought. So that's the result of your research. And then the concern you raise in this paper at page 16 of 23, in the last paragraph there is:

> *Contemporary restoration initiatives in the MDB aim to use environmental water allocations more effectively by artificially inundating floodplains with regulating structures –*

such as the one at Chowilla:

> *Strategy may –*

and this is your point – it:

> *...may improve the localised abundancies and health of terrestrial floodplain flora.*

So, like, red box, black box, whatever:

But the risk of focussing on site-specific hydrological or floodplain inundation targets is that the extent and integrity of flowing habitats is reduced and meso-scale –

that's one to 10 kilometres, is it?

DR MALLEN-COOPER: Mmm.

MR BEASLEY:

…flowing habitats with fragmented hydrology increase.

DR MALLEN-COOPER: Yes, lentic habitats.

MR BEASLEY: Yes.

DR MALLEN-COOPER: Yes.

MR BEASLEY: The latter will favour generalist native and non-native fish species and disadvantage the specialised fish that like flowing waters.

DR MALLEN-COOPER: Yes.

MR BEASLEY: Especially those with macroscale life histories. Now, macroscale, what, that's hundreds of kilometres, is it?

DR MALLEN-COOPER: I've – I've defined it. I've said hundreds of the kilometres, yes.

MR BEASLEY: Yes.

DR MALLEN-COOPER: Yes.

MR BEASLEY: All right. So that's really getting to the discussion we were having about the concerns you have about – sorry, the risks you identify and the predictions you make in relation to those risks concerning the use of artificial inundation of a wetland. Yes.

DR MALLEN-COOPER: Yes.

MR BEASLEY: And I think the part of your submission that the Commissioner asked you about, which is at 6, point 6 on page 7 of your submission, is picked up on page 17 of 23. At the top of that page:

Integrating ecohydraulics into river rehabilitation presents major new opportunities that in many cases use little or no additional water. For example, lowering the water level in weir pools creates lotic habitats upstream

with no change in discharge. This could be implemented permanently or seasonally and mostly does not require new infrastructure. Recognising ecohydraulics also increases the importance of preserving existing lotic habitat.

And then you've got that quote that's at item 6 on page 7 of your submission concerning what you say the most productive restoration part might be, such as decupping a site, etcetera. And in your conclusion to this paper at page 18, you're making the point that you hope that from this paper, you raise the profile of the importance of considering hydrodynamics, as we have discussed, in considering the responses to the fish that require flowing river.

DR MALLEN-COOPER: Exactly.

MR BEASLEY: Yes. All right.

THE COMMISSIONER: By the way, in the acknowledgements you thank the Murray-Darling Basin Commission for freely providing extensive modelled and gauged hydrological data. Is that the Commission or the Authority?

DR MALLEN-COOPER: That is the Authority. Well, originally the Commission, actually.

THE COMMISSIONER: I appreciate that, but it's the Authority that provided it.

DR MALLEN-COOPER: Yes. But no, the Authority. Yes, it is the Authority, yes.

THE COMMISSIONER: ..... credit where credit is due.

MR BEASLEY: It's a 2018 paper, so.

THE COMMISSIONER: That's what I mean.

DR MALLEN-COOPER: Yes.

MR BEASLEY: I wasn't going to ask any questions about the appendix 3 paper.

THE COMMISSIONER: No. It would be absurd to say it's self-explanatory, but combined with the statement, and what we have asked, I don't need to ask anything more. I don't mean that really, by the way, what I mean is, yes, I need help, but I think I've got it.

DR MALLEN-COOPER: Actually, I'm disappointed you found the only typo in that paper. I'm now looking for more.

MR BEASLEY: You see, it's not a typo, it's just a straight out error. Don't be easy on yourself.

DR MALLEN-COOPER: That's why it has got through.

MR BEASLEY: We lawyers we are really picky about things like that. It's terrible. We like to read the text of legislation and do all sorts of weird things.

DR MALLEN-COOPER: I think you need to proofread my manuscripts.

MR BEASLEY: I do have just one to ask you a few things about the paper, appendix 4 paper at tab 5. This is actually a report you prepared with Mr Zampatti, is it Dr Zampatti or Mr Zampatti?

DR MALLEN-COOPER: Mr Zampatti.

MR BEASLEY: Mr Zampatti. Sorry about that. So this was a project you did for the Basin Authority, February '15, 'Rethinking Natural Flow Paradigm in the Murray-Darling Basin.' This was again a paper where you're really identifying the impacts of hydrodynamics on particular fish species; correct?

DR MALLEN-COOPER: Correct.

MR BEASLEY: And the ultimate, or one of the – the main conclusion, am I right, in relation to this paper is that fish are adaptive to change in the location of their habitat, but not – but they are much more demanding with the hydraulics of the river: is that right?

DR MALLEN-COOPER: That's right.

MR BEASLEY: And that's really the message from the paper.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: So that you can shift them down the river but preferably to a place you will resemble hydraulically where they came from.

DR MALLEN-COOPER: They need – yes, hydraulic – with habitat.

MR BEASLEY: Like finding another Lake Cawndilla for the Golden Perch.

DR MALLEN-COOPER: I mention, you know, hydraulic diversity but with that comes habitat diversity. So it comes with snags or rocks, etcetera, so yes.

MR BEASLEY: And I don't think there's any need to go through it, but you outline in this - - -

THE COMMISSIONER: Sorry, that's page 26, 5.3.6 sub (2). That's what you are talking about there, is it?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: A management option to enable a targeted habitat rehabilitation so large woody debris and rocky substrates - - -

DR MALLEN-COOPER: That's right.

THE COMMISSIONER: - - - together, snags.

DR MALLEN-COOPER: Yes.

MR BEASLEY: And I think you pick up something about the – you discussed before about certain species being extinct – having become extinct, I'm sorry, in certain parts of the water. Page 17 of this report, you give the example of the trout cod, which has become extinct in the lower part of the Murray River because there's – amongst other things there has been, picking up the last couple of sentences, a complete loss of main channel flowing water habitat. And that's the habitat that that fish needs.

DR MALLEN-COOPER: Yes.

MR BEASLEY: That species of fish needs and hence it's disappeared from that part of the river.

DR MALLEN-COOPER: Correct.

MR BEASLEY: Yes. The paper at page 6, you are – sorry, not page 6, tab 6 which is entitled 'Managing the Chowilla Creek Environmental Regulator Fish Species at Risk,' you were one of the – the fact that your name comes first, do I read into that for this 2011 report that you were the main author? Or is that giving you too much credit?

DR MALLEN-COOPER: Yes. Actually, I would credit those other authors. In terms of - - -

MR BEASLEY: I'm not suggesting they don't get credit, but were you the main author of the report?

DR MALLEN-COOPER: I am the main author, but the intellectual property was certainly joint.

MR BEASLEY: Okay, sure. And this was a report commissioned by the South Australian Murray-Darling Basin Natural Resources Management Board. That's an organisation I haven't heard before ..... okay. But this is the – I was referring to this

earlier. This is the work you did, looking at the operation of the regulator and making predictions as to what the response might be for certain species of fish and I think picking up page (ii) in the executive summary the conclusion was that five native fish species would get – would likely get a benefit from the managed inundation. Two would be unaffected, and four native fish species including three threatened species, the Cod, the fresh water Catfish and the Silver Perch – that's – silver perch and Golden Perch, there could be a negative impact on them. And it also – this paper also predicts that use of the regulator might provide a fantastic habitat in the floodplains for Carp.

DR MALLEN-COOPER: That's right.

MR BEASLEY: Correct?

DR MALLEN-COOPER: Yes.

MR BEASLEY: And I think that is picked up in – let me just find it – I think at page 56 – sorry, commencing at page 54, you start the section Predicted Responses of Fish Species at Risk. Then you talk about what you think might be the likely outcome of use of the regulator for Murray Cod, the Perch, etcetera, and Carp is dealt with at page 61, with the comment that using the Chowilla river greater – with greater than 75 per cent. Is that greater than 75 per cent flowing habitats retained?

DR MALLEN-COOPER: Yes.

MR BEASLEY:

> *Inundating stream margins and low lying floodplains, increasing the extent of lentic habitats, will create excellent habitats for spawning and recruitment of carp.*

Just pausing there, that's not a good thing; right?

DR MALLEN-COOPER: That's not a good thing.

MR BEASLEY: In fact it's – not to be flippant about it, it's probably a very, very bad thing, isn't it?

DR MALLEN-COOPER: It's a bad thing and actually credit to this organisation for identifying the risks and wanting experts to quantify.

MR BEASLEY: And perhaps – I'm not sure anyone has told us yet. Why is it a bad thing to have a big spawning and recruitment of Carp in the river on the floodplain?

DR MALLEN-COOPER: Well, it's a non-native species?

MR BEASLEY: And what do they do that's - - -

DR MALLEN-COOPER: Well, they disrupt the wetlands and rivers, and I mean there's many, many papers written about the impacts of carp. So maybe I will find a few of those and send them to you.

MR BEASLEY: All right.

THE COMMISSIONER: But they have a physical effect because of their feeding habits?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: They also have a crowding or competition effect.

DR MALLEN-COOPER: It's very, very – it's probably both happening at a lower stage. At a lower stage, you know, there's competition but it's very obvious in wetlands for example, yes, they're extremely turbid due to their feeding habits, but I'm not an expert on Carp, but in fact some of those authors are that I can direct you.

THE COMMISSIONER: No, don't do that, because I've got to finish writing the report. I'm going to simply state that Carp are bad.

DR MALLEN-COOPER: Yes. Carp is bad.

MR BEASLEY: Surely there is a thousand page report on Carp somewhere that he could be given.

DR MALLEN-COOPER: There is a lot. A lot.

THE COMMISSIONER: I am interested, however; page 54, under the sub-heading 'Expected Ecological Changes', you make a reference to what I call source and effect of carbon input. Could you – the carbon in question will largely, if not entirely, be vegetable in origin?

DR MALLEN-COOPER: Okay. Yes. I think under natural floods, floodplains are inundated and they provide, like dry Eucalyptus leaves provide readily available carbon, and that creates very rapid productivity and creates plankton blooms, and they're food for fish larvae and other larvae as well. So carbon transport or carbon dynamics drives floodplain and river productivity. So the natural circumstances, floodplains inundated, carbon becomes available and then increases productivity and that productivity is now in the river and the floodplain. So it comes to the floodplain and at that point, of course, you have fish that migrate to that point as well. So carbon dynamics is the fundamental link between rivers and floodplains. And if you start to separate the floodplain, those carbon dynamics and carbon transport links are broken.

THE COMMISSIONER: So if parts of the floodplain, certainly the higher parts, are reached less often by water, then there will be what you've called poorer vegetation health?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: And poorer vegetation health will mean less ..... floodplain carbon inputs, meaning coming from outside their immediate locality.

DR MALLEN-COOPER: Outside the water.

THE COMMISSIONER: Yes.

DR MALLEN-COOPER: Yes, terrestrial.

THE COMMISSIONER: So that inundation of a certain extent and frequency is necessary for acceptable river health, I take it.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Because of the carbon cycle, which moves from the vegetable, the gum leaves - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - to - - -

DR MALLEN-COOPER: To the river.

THE COMMISSIONER: In familiar plankton.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Small life forms.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Now, then you say:

> *A caveat to this statement is that the extent that carbon inputs from floodplains are limiting productivity and natural floods in the River Murray is unknown.*

I'm sorry, I got lost at that point and I haven't even finished the sentence. What do you mean:

> *Carbon inputs from floodplains limiting productivity in natural floods?*

DR MALLEN-COOPER: I'm thinking beyond productivity. I'm thinking of recruitment of fish as well. So whether – whether for fish larvae, you know, the density of plankton or availability of plankton, if that is limiting, and in general it – there's a strong relationship between density of certain types of that drives the plankton components, whether that is limiting for fish larval survival, that those links are not clear.

THE COMMISSIONER: In theory it's plausible?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Thank you. I understand. Thank you.

MR BEASLEY: Now, so that was the projections. They seem to have been borne out. I just wanted to take you to the document at tab 9, which is a document headed Science to Inform Artificial Floodplain Inundation Movement and Habitat Use of the Murray Cod During Testing of the Regulator.

THE COMMISSIONER: Could I note that it is Dr Zampatti.

MR BEASLEY: Yes, it is.

DR MALLEN-COOPER: Yes.

MR BEASLEY: Thank you for that. I think the witness called him Mr.

THE COMMISSIONER: That may have occurred between the two publications.

MR BEASLEY: So this was a project where the Cod were monitored to see how they were responding to use of the regulator. And the concern, the first concern is mentioned at the second paragraph of the first page:

> *Operating in relation to the regulators, has the potential to alter the hydrodynamics of lotic habitat, interrupt longitudinal connectivity, and decouple riverine and floodplain hydrographs.*

So there was a one year investigation into the movement and habitat use of the Murray Cod in the Chowilla system using things such as tagging them with radio receivers, etcetera.

THE COMMISSIONER: Could I just intervene at that point?

MR BEASLEY: Yes.

THE COMMISSIONER: I realise this is in a sense, opportunist research, wasn't it? It was going to be operated for the first time and - - -

DR MALLEN-COOPER: Yes, but it was probably well-planned.

THE COMMISSIONER: I don't mean "opportunist" in a derogatory sense.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: I mean, it was going to happen and so there was this study done.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Among many others.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: And a good thing too. But it strikes me a one year investigation is pretty short for the phenomena that we are interested in.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Thanks.

DR MALLEN-COOPER: Yes, it's much too short.

MR BEASLEY: Well, in fact the regulator seem to be operating only from – I think there's a mention on the second page, 5 September to 5 December 2014.

THE COMMISSIONER: Yes.

MR BEASLEY: But nevertheless the observations made were a change in behaviour of the fish and also that the regulator substantially altered the hydraulic characteristics of the Cod reaches and the microhabitats used by the fish, particularly ..... the primary Murray Cod habitat ..... including the observation that during the peak regulator operation main water velocities in ..... were approximately 50 per cent of those measured when the regulator was not in place. And I take it a drop in velocity is something that is not beneficial to the Cod.

DR MALLEN-COOPER: That's a loss of flowing water habitat.

THE COMMISSIONER: There is, as it were, an attempt at empathy with a fish in that paragraph where it's speculated that this operation of the regulator initiated what's called exploratory behaviour in anticipation of a flood. And so six of them start to go upstream and then they think there's no flood, it's still the Lock's Six weir pools.

MR BEASLEY: It's cruel.

DR MALLEN-COOPER: Yes. Well, it's - - -

THE COMMISSIONER: Have I understood that correctly?

DR MALLEN-COOPER: Yes, you have understood it correctly.

THE COMMISSIONER: I'm not suggesting that disappointment of the Murray Cod is going to be a driving concept but I do – I just want to make sure I'm understanding what is being observed.

DR MALLEN-COOPER: Yes.

MR BEASLEY: And in short, based on those, I suppose they are limited observations but they may have a great deal of integrity, the comment is made in terms of adoption and impact that:

> *…engineered artificial floodplain inundation carries substantial ecological risk and to date untested benefits, yet the concept has been embraced enthusiastically by natural resource management agencies across the Murray-Darling Basin.*

Just say yes.

DR MALLEN-COOPER: Yes, I agree.

MR BEASLEY: And, well, we can speculate about why the enthusiasm exists but one is obviously that these are being used as a – these projects or measures, such as the construction of a regulator, is obviously being used as a way to reduce having – the amount of water that's said to be needed to be restored to the environment.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: Well, now, I don't want anything I say now – as I suspect I won't want anything in my report to be understood as deprecating experiments.

MR BEASLEY: Of course not.

THE COMMISSIONER: And so I don't read the reference to unparalleled experiment on the last page of this document as being an adverse comment.

MR BEASLEY: In terms of reduction of the amount of water for the environment, the concept of ESD it might be entirely different.

THE COMMISSIONER: You are anticipating me. So the first thing is that scientifically it is, with respect, very cogent – as I read it as a lawyer – that it is incumbent on those who conduct such experiments to ensure that there is appropriate

experimental method which includes the collection of data to permit their analysis not only by you but by others as well.

DR MALLEN-COOPER: I agree.

THE COMMISSIONER: And later on as well. That's the first thing. But, mercifully, this Royal Commission is not here to monitor scientific ethics. What my Terms of Reference to require me, however, to look at is achievement of the Basin Plan and Water Act objectives. And Mr Beasley has just noted that if you're engaged in an exercise of reducing the amount of water originally thought necessary to return to the environment in order to avoid compromise of key environmental objectives, then I'm presently finding it a little challenging to understand how unparalleled experiments which will require monitoring, data collection, analysis, etcetera, can produce an assessment of environmental equivalence or can produce satisfaction that it advances the protection and restoration of – I'm quite puzzled by this because I feel intuitively that the notion of preventing experiments because they are experiments, that is, you don't know what will happen, you may think you do, but if you persuade yourself too hard, you won't be much of a scientist.

But on the other hand, there is the precautionary principle which says you shouldn't postpone doing something that you think might help simply because you don't know everything. All of that adds up rather to having to build two experiments, if you think the experiment is likely to help. What this paper points out is maybe the experiment won't help. We just don't know.

DR MALLEN-COOPER: So, look, I think it raised a few – what I think are fundamental points, and I agree with you about unparalleled experiments. I don't think that's a negative thing.

THE COMMISSIONER: Right.

DR MALLEN-COOPER: I mean, much of this is unparalleled. No, that - - -

THE COMMISSIONER: It just means it's new.

DR MALLEN-COOPER: Yes. Yes, it's new. But when I re-read my submission on the way here, in terms of my way forward, I have nine points. I want to add one point.

THE COMMISSIONER: Please.

DR MALLEN-COOPER: And it's a big one. I think we talk a lot in the Basin Plan about gigalitres, and we think the risk is associated with whether that's high or low and whether the balance of social, economic, and environment is right with that number.

MR BEASLEY: Please don't use the term triple bottom line.

DR MALLEN-COOPER: I will not.

MR BEASLEY: We nearly got through a whole day without it. Go on. Sorry.

DR MALLEN-COOPER: But I actually think one of the greatest risks in terms of ecological outcomes is in adequate monitoring. We're spending over $10 billion on the Plan, and I would think it just prudent to spend one to five per cent of that on monitoring. My personal view - - -

MR BEASLEY: By monitoring, you're talking about Basin-wide monitoring, just not looking at an individual few sites; right? Yes.

DR MALLEN-COOPER: Basin-wide monitoring, and I think this is, by far, the greatest risk. We might find out in five years' time – as a matter of fact, if we continue presently with what we have, the data will be inadequate. We won't know whether to double that volume or to half that volume. I think it's - - -

MR BEASLEY: You're not suggesting that for things like the supply measures and a regulator that it might be a good idea to not reduce the amount of water for the environment until such time as you find out what good or bad the supply measures are doing. Is that - - -

DR MALLEN-COOPER: Look, there are several parts here, but I want to make the philosophical point right now - - -

MR BEASLEY: Yes.

DR MALLEN-COOPER: - - - it is grossly under-funded and under-resourced and will not detect change. And we have some amazing scientists in Australia, but they're competing for a small amount of funds, and I think of the – yes, over 10 billion on the Basin Plan – we want to know if that investment works, and we would like to fine-tune the Basin Plan, and to do that, we need more resources on the ground. And, sir, you already brought it up, you hinted that, what, one year of monitoring a radio-tagged Murray cod may not be enough. You're absolutely right. And this is a theme that has just started to come up, and that's my reading of it. I went through all the publicly available, you know, of initiatives and reports, and there are some excellent, you know – the Commonwealth Environmental Water Holder has the long-term intervention monitoring and the ..... and that ..... model as well. They are good, but they are under-resourced. We will have a lot of trouble being able to detect change in the Basin Plan and prove one way or another whether that number is correct.

THE COMMISSIONER: I think it's fair to say that you're pushing at not only an open door, but an absence of a wall, probably.

DR MALLEN-COOPER: Okay. Okay.

THE COMMISSIONER: And in a number of ways, I'm highly likely to include observations which will now almost certainly quote what you've just said. It seems to me inherent in the nature of science that you don't just do something that you observe and record. Unless you are very vain, you have to take into account that you might be hit by a bus tomorrow, and your work should be available for others.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: So, yes, observe and record so as to permit analysis, I agree, and re-analysis. The next thing, surely, has to do with the, what I'm going to call the precautionary principle that you see referred to as one of the principles of ecologically sustainable development in section 4, subsection (2) of the Act, which has some interesting expressions. If there are threats of serious or irreversible environmental damage, lack of what is called full scientific certainty – I just interpolate that, I'm not quite sure that that has any meaning or could ever have a meaning, but:

> *Lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

Now, it seems to me that in terms of science that is building in what I'm going to call a bias. That is a deliberate bias. Not as a bad thing, but just – as it says, you must not use this shibboleth of lack of full scientific certainty, whatever that could possibly mean, as a reason for postponing measures, and, now I interpolate, which the best available science suggests appropriate, and then I come back to the text:

> …*to prevent environmental degradation.*

Another colloquial way of putting that is we don't wait until it's too late. If I don't stop phenomenon X, I fear that may render a species extinct, but I'm not sure. And so you don't stop it, and it turns out you were right. The species is now extinct, at which point it's too late to do that which you thought, but you were not sure, might prevent it. But I think the Act is saying that bias has to be, to take those measures or at least not to postpone taking those measures, notwithstanding this lack of something that I fear – I think is a nonsense, this notion of full scientific certainty.

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: It does seem to me that for those reasons, all the science involved has to be proper science, which means observations, you set out your method, you set out your aim, you have your observations, you keep your records, and you leave them in such a state that somebody else can come in with friendly or unfriendly scholarly attempt to re-analyse. Have I got that right?

DR MALLEN-COOPER: You have got it right. I agree, and I also think, you know, this is a highly, as you're very aware, very polarised area, the Basin Plan. I think this is the path for partly depolarising a constructive transparent path. If we

have a – you know, if we really do the monitoring well so all stakeholders see what's happening along the way, I think that is a transparent path.

THE COMMISSIONER: When you say all stakeholders, why not everyone? Why not make this available to everyone?

DR MALLEN-COOPER: Everyone, they are all stakeholders.

THE COMMISSIONER: Well – and I don't just mean Australians. I would just mean nowadays – I mean, I don't understand why this kind of science can't be practiced, as it were, "Look, Mum, no hands" all in the open.

DR MALLEN-COOPER: I agree.

THE COMMISSIONER: Yes. Thanks. So I might need to say something about the considerable contribution that Australia's effort in relation to the Basin could make not only to us here and now, but to others in the future, which the Act actually talks about. Thanks.

MR BEASLEY: I suppose we do have to – clearly the document I just took you to, the project that Dr Zampatti was taking part in – he's identifying risks to fish ecology. Obviously, we don't have a report that says how much better the trees or the shrubs are doing as a result of the regulator. But in terms of a – some further work from that project, you've provided us with a document behind tab 11.

THE COMMISSIONER: Also, the one behind tab 10 says something about that, I think, doesn't it?

MR BEASLEY: It probably does.

THE COMMISSIONER: Yes. It has got something for the - - -

MR BEASLEY: Yes. Can you come back to that, and I will just deal with tab 11, which is - - -

THE COMMISSIONER: No, I don't need to come back to it, no.

MR BEASLEY: Yes. Okay. Right. Yes. You're right.

THE COMMISSIONER: But that's right, isn't it, Doctor, that - - -

DR MALLEN-COOPER: Yes. Thanks,

MR BEASLEY: Yes.

THE COMMISSIONER: So, sorry about that. I've interrupted the counsel assisting again. I'm so sorry. Tab 11.

MR BEASLEY: You know you don't need, Commissioner, to apologise. But tab 11, this is an extract, is it, from something called the Australian Society of Limnology conference 2016. I had no idea what limnology was until I started. That's inland aquatic ecosystems, is it?

DR MALLEN-COOPER: Which – which is why they've changed it to Australian Freshwater Sciences Society.

MR BEASLEY: That makes a lot – God, yes. Limnology is a really odd term. But the - - -

THE COMMISSIONER: I can't imagine why you would say that. Anyhow.

MR BEASLEY: I actually can't think of why I said that, too, but it just sounds like – it doesn't sound like it is the study of aquatic ecosystems to me. I don't know what it sounds like it is, but anyway.

THE COMMISSIONER: It's the only thing that I have ever understood it to mean.

MR BEASLEY: All right. Okay. Well, it's getting late in the day. I don't know why I'm distracting myself by referring to that, but anyway. The section entitled Can Further Regulation of the River Murray Be Used To Promote Ecosystem Health – a Fish Ecology Perspective – is this some further details that Dr Zampatti is recording from the project or is this – are these – I note that this is a conference in 2016. Is this as a result of further work and further observation?

DR MALLEN-COOPER: This is – yes, this is actual data - - -

MR BEASLEY: Right.

DR MALLEN-COOPER: - - - and – on the Chowilla floodplain. I don't know if the timing – yes, it's probably about the – the same.

THE COMMISSIONER: It is the same timing, is it?

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: This was also a movement of Murray cod using radio telemetry.

MR BEASLEY: Yes, because it – and it also says during spring 2014.

DR MALLEN-COOPER: Yes, so it's – it's the same sampling period and it – it - - -

MR BEASLEY: But it has a couple of extra details, and that is the fact that when the regulator was - - -

THE COMMISSIONER: Operated.

MR BEASLEY: - - - being used in the floodplain habitats, native fish were rare and young of the year carp comprising 90 per cent of the catch, whereas during a natural flooding, native fish were numerically abundant and Carp represented one per cent of the catch. Am I right that that's a – that seems like an incredible diversity or change - - -

DR MALLEN-COOPER: A change.

MR BEASLEY: - - - between use of the - - -

THE COMMISSIONER: Striking rather than incredible.

DR MALLEN-COOPER: Yes.

MR BEASLEY: Striking change between – for the carp response between use of the regulator and a natural flooding event.

DR MALLEN-COOPER: Yes.

MR BEASLEY: And that is clearly a real concern in relation to the use, continued use, of artificial flooding mechanisms such as a regulator.

DR MALLEN-COOPER: It is a huge concern. And, look, I didn't bring a book with me, I have a report from the Arthur Riley Institute on the population of carp. And, yes, if you construct more and more of these environment regulators, carp is a significant issue.

THE COMMISSIONER: Well, then, that rather means that we have something that, going back to something we were talking about earlier, produces this question: how can there be regarded environmental equivalence if you've - - -

DR MALLEN-COOPER: Yes.

THE COMMISSIONER: - - - favoured carp and disfavoured cod.

DR MALLEN-COOPER: Well, that's exactly right.

THE COMMISSIONER: Thank you. By which I mean – I gather you mean it's very difficult to see how you can seek – find environmental equivalence.

DR MALLEN-COOPER: That's right. If you consider all biota, or if you consider aquatic biota, no, there's not equivalence. In fact, there's a major risk there. So you need to consider, you know, regional plans for - - -

THE COMMISSIONER: I will trade you a fish for a tree.

DR MALLEN-COOPER: Yes, and look, I – I think there is a path forward.

MR BEASLEY: But that then becomes mad, to me. It's not going to – a madness.

DR MALLEN-COOPER: Yes. No - - -

THE COMMISSIONER: Well, I did intend by that, to be sarcastic. So if we're talking about offsets, I personally don't understand how you trade fishes for trees.

DR MALLEN-COOPER: Look, I think you do this adaptively.

THE COMMISSIONER: Apart from putting carp in commercial plantations as fertiliser.

DR MALLEN-COOPER: Yes. Actually, it's a good idea. But I think if you had a very, very well-designed monitoring program, as I say, that was monitoring seed bank on Chowilla, and the trees on Chowilla, and the Murray Cod and the Carp, and you were monitoring all these populations, and the tree health was going down but your Murray cod populations and other native fish were doing well, you would say, "Let's use the Chowilla regulator now". Yes, there is a path forward to balance this.

THE COMMISSIONER: But it needs science.

DR MALLEN-COOPER: It needs very good science. It needs well-resourced science.

THE COMMISSIONER: I keep hearing the word resource, meaning money from the government.

DR MALLEN-COOPER: Yes. Well, actually, I'm thinking money but also staff, and training of staff and - - -

THE COMMISSIONER: All of which needs money.

DR MALLEN-COOPER: - - - feet on the ground.

THE COMMISSIONER: All of which needs money.

DR MALLEN-COOPER: All of it needs money, yes.

MR BEASLEY: Well, there are options. I mean, you don't have to go ahead with a whole range of efficiency measures. Instead, put more water in and find out what's happening in the river, the Basin, in terms of the ecology. That would be one option. I'm not suggesting – I'm not making a submission. I'm floating a thought bubble.

THE COMMISSIONER: Thank you.

MR BEASLEY: It's probably dangerous at this time of day. Doctor, is there anything that you feel you would like to add to the Commissioner's knowledge or feel that we've missed in terms of covering the concerns you've raised in your submission?

DR MALLEN-COOPER: No. Look, we've – just that final point on monitoring, I think I really hadn't emphasised in my submission and I've done that now.

MR BEASLEY: Feel free to – I know this creates further work for you, but if you would like to put in a supplement to your current submission - - -

DR MALLEN-COOPER: Yes. I will.

MR BEASLEY: - - - dealing with the issue of monitoring, and why you say it's so important, then we would happily receive it from you.

DR MALLEN-COOPER: Okay. Sounds good.

THE COMMISSIONER: Can I otherwise say how grateful I am for your assistance, both written and spoken. It has really helped me, I hope. Anyhow, it made me feel better about things.

DR MALLEN-COOPER: Good. Well, look, I'm happy to answer any further questions, if you want to call me back. No, I have enjoyed being here.

THE COMMISSIONER: Good.

MR BEASLEY: Thank you.

THE COMMISSIONER: That's not our aim - - -

DR MALLEN-COOPER: I have enjoyed it.

THE COMMISSIONER: - - - but I'm glad it happened.

MR BEASLEY: All right.

THE COMMISSIONER: Thank you, we will adjourn until 10 o'clock here.

MR BEASLEY: Tomorrow.

THE COMMISSIONER: Thank you.

MR BEASLEY: Yes. Thank you. We're off.

THE COMMISSIONER: Tomorrow.

DR MALLEN-COOPER: Thank you very much.

THE COMMISSIONER: No, thank you.

<THE WITNESS WITHDREW [5.06 pm]

MATTER ADJOURNED at 5.06 pm UNTIL THURSDAY, 26 JULY 2018

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