Otago Regional Council

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Minute 2 response

To: Independent Hearing Commissioner Rob van Voorthuysen for RM20.039

From: Alexandra King, Team Leader Consents

Date: 10 September 2021

Re: Minute 2 response

Question for Alexandra King

A number of the applicants (including the holders of Takes 3, 5, 6 and 7) utilise water from sources other than the Pig Burn, including the Maniototo East Side Irrigation Scheme and the Sowburn Water Co Ltd. It is therefore important to ensure that there is no 'double counting' of irrigation allocations insofar as the volumes of water granted to those applicants from the Pig Burn should not be sufficient to meet the full annual demand for their respective irrigable areas. In the absence of a detailed assessment of the proportion of annual demand that is met from each water source (which does not appear to have occurred or may not even be possible) this can possibly be achieved by ensuring that no such applicant receives any more than their maximum historical Pig Burn annual volume on the assumption that in the past the volume taken from the Pig Burn would have reflected the volume of water available from the other sources. From Table 6 of the Section 42A Report this appears to be the case for your recommended allocations for Takes 3, 5 and 6 where the recommended annual volume is less than that used historically (Takes 3 and 5) or is based on historical use (Take 7).

- Can you please confirm that this is also the case for Take 6?
- Is there anything else you wish to say about the above issue?

Response from Alexandra King

It is difficult to undertake an assessment of proportion of annual demand that is met by other water sources, this is specifically applicable to the additional water from the Maniototo East Side Irrigation Scheme. Therefore, I have used the historic water use from the Pig Burn takes as a guide to what water is available from other sources.

I note in Take 6 I have made an error for the Mullholland annual volume, this should be 764,070 m^3/year to align with historic volumes rather than 768,615 m^3/year which is what the Applicant has applied for. I note another error in Take 6 for Hamiltons Dairy Limited/Greenbank Pastoral Limited their historic use should be the same as Take 5 not Take 3 meaning their historic use is 91.1 L/s, 177,017 m^3/month, 620,275 m^3/year rather than 42 L/s, 111,820 m^3/month, 571,695 m^3/year. I have attached the updated Table 6 (with deletions ~~struck through~~ and additions <u>underlined</u>) as Appendix 1 to this minute.

Question for Dr Allibone

At your paragraph 37 of your evidence (Appendix 2 to the Section 42A report) you recommend time steps and residual flow increases that you say would reflect the duration of the consent granted.

- Can you please explain the scientific basis for the time steps and the residual flows?
- Can you please explain the scientific rationale for linking residual flows to consent duration when those flows are designed to protect the health and well-being of the Pig Burn and its freshwater ecosystem, both of which are independent of consent duration?
- Can you please explain how, if residual flows are eventually required to be set at 30 L/s, not imposing those residual flows immediately would be giving effect to Objective 2.1 of the NPSFM 2020?

Response from Dr Allibone

Q1. Can you please explain the scientific basis for the time steps and the residual flows?

The time steps for the implementation of residual flows is not based on ecological grounds, rather my experience with other replacement consent processes in Otago have shown that time is required for existing abstractors to develop irrigation systems or conduct other on farm adjustments to achieve higher residual flows that they have applied for.

The scientific basis for the residual flows has three parts.

Firstly, the habitat modelling, while not ideal due to difficulties dealing with the gaining and loosing reaches, shows a very clear rapid increase in habitat for juvenile trout and eels from 0 L/s upwards (Figure 1). This is a habitat flow relationship that is common and while the model has some error the trend it shows is one I that have seen in the many models, and this is what I would expect to occur as flow increases. I use this habitat model as a guide to the trend in habitat increase but not a key residual flow setting criteria by itself

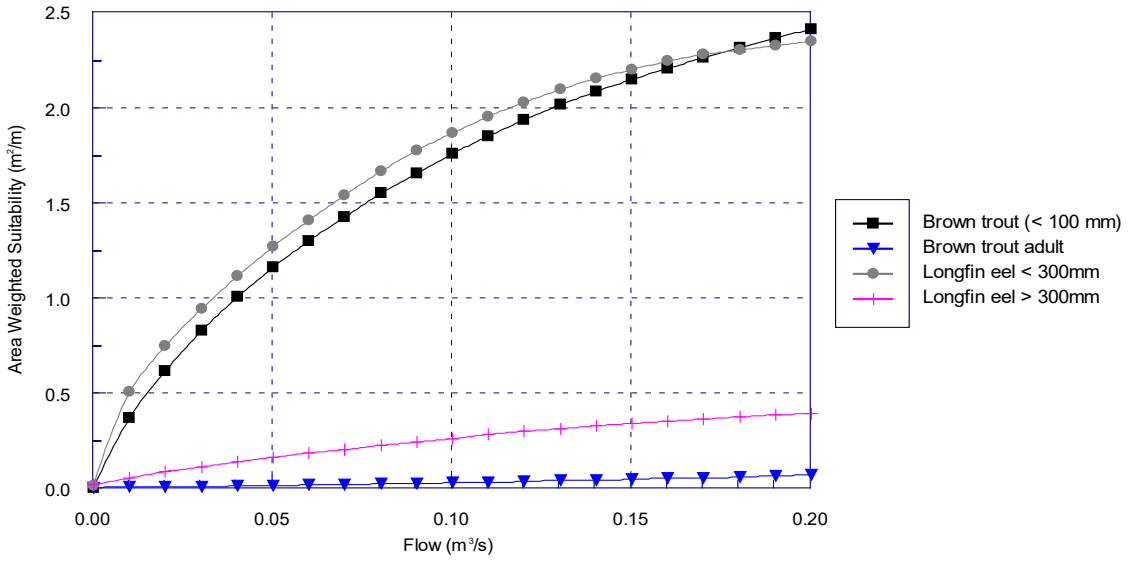

Figure 1: The SEFA habitat model outputs for longfin eel and brown trout for Pig Burn downstream of Hamilton Road.

The second aspect of the scientific rational is the flow loss in the lower loosing reach. Hickey (2020) identified the lower loosing reach to lose approximately 30 L/s to groundwater. Given he indicated there was some uncertainty with respect to the flow loss I considered setting a residual of 30 L/s will maintain groundwater levels and potentially provide for periods of connected flow through the drying reach. Alternatively, it will allow for connecting flows to be established through the drying reach when rainfall events occur as there will be little is any groundwater deficit to fill. I now note that in Mr Hickey's evidence in chief he now estimates this lower loosing reach to have losses to groundwater in the order of 40 L/s – 60 L/s and the ORC proposed residual flow of 30 L/s is unlikely to maintain the ground water levels and a higher residual flow of at least 40 L/s would be required.

A third part of the residual rational is the gorge flow record. Hickey (2020) reports the lowest flow recorded is 31 L/s. He also expects that flows in the neutral reaches below gaining areas to equal the gorge flow. This flow is subject to the upstream Bradfield take and the Shared take, the latter of which may not be taking if the take point is dry. However, the 31 L/s flow is the lowest flow recorded and this sets a 'bottom line flow' below which the lower Pig Burn never naturally falls below, except in the drying reaches. Therefore, I would expect that to protect ecological health in the Pig Burn maintaining a flow at least as high as the lowest recorded flow is the minimum required. Providing a 10 L/s residual flow at the Combined and Concept North takes is providing a flow that is 30 % or less of the observed lowest flow. The applicant has not provided any flow duration estimate for the 10 L/s residual flow, but I expect it will exceed a single day and possibly be weeks or longer. Therefore, maintaining this 10 L/s flow for an extended duration through the summer will be well outside the natural low flow condition and will not meet the requirements of NPS-FM (2020) for providing for the ecological health of the Pig Burn. I consider providing the 30 L/s residual flow at these lower takes the minimum required to achieve

Given Mr Hickey's revision of the flow loss in the lower drying reach and the need to consider the Bradfield take influence on the Gorge flow recorder there is grounds to consider a residual flow of at least 40 L/s to maintain ecosystem values in the lower Pig Burn. However, I would recommend the water meter record for the Bradfield take is examined to determine the water takes influence on the Gorge flow recorder record around the period the 31 L/s flow was recorded before considering this.

Q2. Can you please explain the scientific rationale for linking residual flows to consent duration when those flows are designed to protect the health and well-being of the Pig Burn and its freshwater ecosystem, both of which are independent of consent duration?

There is no direct scientific rationale for the linkage aside from the time taken to achieve the development of methods to achieve the residual flow.

Q3. Can you please explain how, if residual flows are eventually required to be set at 30 L/s, not imposing those residual flows immediately would be giving effect to Objective 2.1 of the NPSFM 2020?

In part I believe this is a planning related issue. However, from my thirty years experience with water management in Otago I have found implementing change such as is required by the NPSFM requires time and a staged approach is required to achieve the desired outcomes and the NPSFM.

Alexandra Kin

Team Leader Consents

Richard Allibone

Table 6: The efficient use calculations, historic use records, amount applied for and recommended rates and volumes for each Applicant.

Take	Consent holder(s)	Efficient volumes	Historic water use	Rates and volumes applied for	Recommended rates and volumes
Take 1: Pig Burn shared take	**Duncan Cleugh** Farming Trust (Names of trustees updated 1 October 2018) (1/3 share)	**Irrigation** Monthly: 60,242 m^3 Annual: 292,103 m^3 **Stock** Monthly: 569 m^3 Annual: 6,831 m^3	86 L/s 223,200 m^3/month 2,548,709 m3/year	The rate of abstraction must not exceed: a) 56 Litres per second (L/s) b) 500,000 m^3 during period 1 July to 30 June in the following year	Applied for is less than historic 56 L/s No monthly as 223,200 (historic) is more than 56 L/s over month 500,000 m^3/year
Take 1: Pig Burn shared take	- **Pig Burn Gorge** Limited (1/3 share)	**Irrigation** Monthly: 104,178 m^3 Annual: 494,487 m^3 **Stock** Monthly: 35 m^3 Annual: 420 m^3			
Take 1: Pig Burn shared take	- Janine Ruth **Smith** (1/3 share)	**Irrigation** Monthly: 85,800 m^3 Annual: 386,400 m^3 **Stock** Monthly: 112 m^3 Annual: 1,350 m^3			
Take 2: Bradfields/En Hakkore	**En Hakkore** Limited	**Irrigation** Monthly: 42,900 m^3 Annual: 193,200 m^3 **Stock** Monthly: 35 m^3 Annual: 424 m^3	7 L/s 18,600 m^3/month 155,511 m^3/year	The rate of abstraction must not exceed: a) 7 Litres per second (L/s) b) 70,000 m^3 during period 1 July to 30	Applied for is less than efficient and historic 7 L/s 18,600 m^3/month 70,000 m^3/year

				June in the following year	
Take 4: Weir	**Hamilton Runs** Limited	**Irrigation** Monthly: 545,080 m^3 Annual: 2,808,800 m^3 **Stock** Monthly: 2,370 m^3 Annual: 28,440 m^3 **Domestic** Monthly: 120 m^3 Annual: 1,440 m^3	55.6 L/s 77,844 m^3/month 465,044 m^3/year	The rate of abstraction must not exceed: a) 55.6 Litres per second (L/s) b) 895,000 m^3 during the period from 1 July to 30 June in the following year.	Applied for is considered efficient but volumes are more than historically used. 55.6 L/s 77,844 m^3/month 465,044 m^3/year

Take 3: Herlihy Gorge take	**Hamiltons Dairy** Limited and **Greenbank Pastoral** Limited	**Irrigation** Monthly: 1,069,550 m^3 Annual: 5,541,650 m^3 **Stock** Monthly: 5,066 m^3 Annual: 60,796 m^3 **Dairy shed:** Monthly: 2,460 m^3 Annual: 29,520 m^3	42 L/s 111,820 m^3/month 571,695 m^3/year	The rate of abstraction must not exceed: a) 42 Litres per second (L/s) b) 454,120 m^3 during the period from 1 July to 30 June in the following year.	Applied for is less than historic 42 L/s 111,820 m^3/month 454,120 m^3 /year
Take 5: Herlihy Ford	**Hamiltons Dairy** Limited and **Greenbank Pastoral** Limited	Same as take 3	91.1 L/s 177,017 m^3/month 620,275 m^3/year	The rate of abstraction must not exceed: a) 70 Litres per second (L/s) b) 459,875 m^3 during period 1 July to 30 June in the following year as a combined total with the annual volume authorised under Take 6	Applied for is less than historic 70 L/s 177,017 m^3/month 459,875 m^3/year
Take 6: Combined take	- **Concept** Farms Ltd (South take)	Concept **Irrigation**	55.5 L/s		Applied for is considered efficient,

		Monthly: 1,093,780 m^3 Annual: 5,422,260 m^3 **Stock** Monthly: 5208 m^3 Annual: 62,496 m^3 **Dairy Shed:** Monthly: 3,720 m^3 Annual: 44,640 m^3	148,800 m^3/month 816,519 m^3/year	The rate of abstraction must not exceed: a) a) 60 Litres per second (L/s) as a combined total between the consent holders taking water pursuant to this consent. b)100 litres per second as a combined total between the Mulhollands and Concept/Sophic when flow immediately below the point of take is equal to or greater than 200 litres per second c) 920,655 m^3 during the period from 1 July to 30 June in the following year by **Concept** Farms Ltd d) 768,615m^3 during the period from 1 July to 30 June in the following year by **Mulholland** e) 459,875m^3 during the period from 1 July	Concept has applied for more than used historically for annual volume. 60 L/s 110 L/s (with 200 L/s residual) a. 148,800 m3/month 816,519 m^3/on their year by **Concept** Farms Ltd b. 114,000 m^3/month 7,64,070 ~~768,615~~ m^3/on their year by **Mulholland** c. 117,017 m^3/month 459,875m^3 /on their year **Hamiltons** Dairy Limited as a combined total with the annual volume authorised to be taken by Consent XXX
Take 6: Combined take	- Christopher Patrick **Mulholland** and Dale Evelyn Mulholland	**Irrigation** Monthly: 453,702 m^3 Annual: 2,238,174 m^3 **Stock** Monthly: 510 m^3 Annual: 6,120 m^3	55.6 L/s 114,000 m^3/month 764,070 m^3/year		
Take 6: Combined take	**Hamiltons Dairy** Limited and **Greenbank Pastoral** Limited	Same as Take 3	~~Same as Take 3~~ Same as Take 5		

				to 30 June in the following year by **Hamiltons Dairy** Limited as a combined total with the annual volume authorised to be taken by Consent XXX [insert consent number for **Hamiltons Dairy** Limited consent i.e Herlihy Ford Take]	
Take 7: Concept North	Concept Farms Ltd (North take)	**Irrigation** Monthly: 1,093,780 m^3 Annual: 5,422,260 m^3 **Stock** Monthly: 5,208 m^3 Annual: 62,496 m^3 **Dairy Shed:** Monthly: 3,720 m^3 Annual: 44,640 m^3	42 L/s 112,344 m^3/month 1,028,478 m^3/year	The rate of abstraction must not exceed: a) 42 Litres per second (L/s) b) 1,697,665 m^3 during the period from 1 July to 30 June in the following year.	Applied for is considered efficient but more than used at this site annually. 42 L/s 112,344 m^3/month 1,028,478 m^3/year

Reference

Hickey M. (2020). Assessment of Effects on Instream Ecology due to Water Takes from the Pig Burn. Report prepared for the Pig Burn Water Users Group.