BEFORE THE COMMISSIONER APPOINTED BY THE OTAGO REGIONAL COUNCIL

IN THE MATTER	of the Resource Management Act 1991 ("the Act")
BETWEEN	BSTGT Ltd and A P McQuilkin, N J McQuilkin, K L Skeggs, S A McQuilkin and G M Todd being Trustees of the A P McQuilkin Family Trust Consent Application RM19.151

BRIEF OF EVIDENCE OF MATT HICKEY EVIDENCE ON BEHALF OF BSTGT LTD AND A P MCQUILKIN, N J MCQUILKIN, K L SKEGGS, S A MCQUILKIN AND G M TODD BEING TRUSTEES OF THE A P MCQUILKIN FAMILY TRUST

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STATEMENT OF EVIDENCE OF MATT HICKEY

1. My name is Matthew Aaron Hickey.

2. I am an Environmental Scientist and sole Director of Water Resource Management Ltd

3. I hold a Bachelor of Science Double Major, Geography and Ecology (2000), a Post Graduate Diploma of Science in Ecology (2002) and a Master of Science (MSc) in Ecology (2005) all from the University of Otago. My MSc was focused on comparing two methods for obtaining fish population estimates - electric fishing compared to night spotlight counts.

4. Between 2003 and 2006, I was a Water Resource Scientist - Water Quantity within the Resource Science Team at Otago Regional Council (ORC). While at ORC, I authored reports on management flows for the Waianakarua River[1], Trotters Creek[2]2, Taieri River at Tiroiti[3], Waiwera River[4], Luggate Creek[5], Pomahaka River[6] and Manuherikia River[7]. These reports include hydrological analysis, a summary of aquatic ecosystem values, as well as consideration of the flow requirements of fish communities. In support of these documents I also carried out assessments of water surety for the respective plan change assessments.

5. In April 2006 I moved roles at ORC taking up the position of Manager of Resource Science. In this role I was responsible for managing the science program including the delivery of technical information for minimum flow setting across Otago. In this role I oversaw numerous

[1] ORC (2006). Management flows for aquatic ecosystems in the Waianakarua River. Otago Regional Council, Dunedin. 31 p.
[2] ORC (2006). Management flows for aquatic ecosystems in Trotters Creek. Otago Regional Council, Dunedin. 29 p.
[3] ORC, (2006). Management flows for the Taieri River at Tiroiti. Otago Regional Council, Dunedin. 30 p.
[4] ORC, (2006). Management flows for aquatic ecosystems in the Waiwera River. Otago Regional Council, Dunedin. 33 p.
[5] ORC, (2006). Management flows for aquatic ecosystems in Luggate Creek. Otago Regional Council, Dunedin. 31 p.
[6] ORC, (2006). Management flows for aquatic ecosystems in the Pomahaka River. Otago Regional Council, Dunedin. 38 p.
[7] ORC, (2006). Management flows for aquatic ecosystems in the Manuherikia River. Otago Regional Council, Dunedin. 37 p.

technical management flow reports. As Manager of Resource Science I also oversaw numerous hydrological investigations as well as reporting on water quantity issues at a regional level.

6. In 2015 I left ORC and started my own company (Water Resource Management Ltd) providing technical advice on ecological flow setting, hydrology, surety of supply and water sharing. I currently work for 20 water management groups or irrigation companies in both Otago and Canterbury helping them prepare for the transition from deemed permits to Resource Management Act (1991) (RMA) consents post 2021. I also currently work on behalf of several catchment groups either in or about to enter the minimum flow process, providing technical advice and liaising with the council and stakeholders.

7. Over the last 17 years I have made or reviewed over 100 technical recommendations for residual flow conditions to protect the ecological values at individual takes points across Otago; worked on setting environmental flows and allocation limits for a number of Otago's rivers; as well as water quantity policy development for the Regional Plan: Water for Otago (RPW), specifically around managing the transition from deemed permits to RMA consents.

8. As well as working at a regional level I've also worked on national level initiatives. In 2006 I started work on the Sustainable Water Program of Action, specifically the proposed National Environmental Standard on Ecological Flows and Water Levels[8]. As a member of the working group I applied my allocation knowledge to both policy and technical issues in a limit setting context. Further to this I was also a reviewer of the final science report[9] regarding ecological methods prepared by many of the lead scientists in the field in New Zealand.

[8] Ministry for the Environment, 2008. Proposed National Environmental Standard on Ecological Flows and Water Levels. https://www.mfe.govt.nz/publications/fresh-water/draft-guidelines-selection-methods-determine-ecological-flows-and-water-24

[9] Beca. 2008. Draft Guidelines for the Selection of Methods to Determine Ecological Flows and Water Levels. Report prepared by Beca Infrastructure Ltd for MfE. Wellington: Ministry for the Environment.

9. In 2014 I contributed to the freshwater accounting guidance being prepared by the Ministry for the Environment as part of the implementation of the National Policy Statement for Freshwater Management, specifically providing a case study on managing water allocation and reviewing the wider document.[10]

10. I have been given a copy of the Environment Courts code of conduct for expert witnesses. I have reviewed that document and confirm that this evidence has been prepared in accordance with it and that all opinions that I offer in this evidence are within my expertise. I have not omitted to refer to any relevant document or evidence except as expressly stated. I agree to comply with the code and in particular to assist the Commissions in resolving matters that are within my expertise.

Scope of Evidence

11. This brief of evidence addresses the following:

    1. The appropriateness of the Proposed NES interim limit for the Royal Burn[11].
    2. Hydrological regime of the Royal Burn.
    3. Ecological values of the Royal Burn.

Proposed NES interim limits

12. In 2008 the Ministry for the Environment (MfE) published two documents, the Proposed National Environmental Standard on Ecological Flows and Water Levels discussion document (Proposed NES) (MfE 2008) and the Draft Guidelines for the Selection of Methods

[10] Ministry for the Environment. 2015. A Guide to Freshwater Accounting under the National Policy Statement for Freshwater Management 2014. Wellington: Ministry for the Environment.
[11] Ministry for the Environment, 2008. Proposed National Environmental Standard on Ecological Flows and Water Levels. https://www.mfe.govt.nz/publications/fresh-water/draft-guidelines-selection-methods-determine-ecological-flows-and-water-24

to Determine Ecological Flows and Water Levels (Becca 2008). This guidance of which I was a contributor and technical reviewer was to provide a framework for setting ecological flow and water level limits in regional plans.

13. The intent of the proposed NES was to set interim default limits for rivers, lakes and aquifers while councils applied the technical guidance on methods for setting flow and level limits at a catchment or aquifer scale in regional plans.

14. The expectation was that eventually interim limits would be replaced by those set using the methods in the Becca (2008) report. The following is taken directly from page 25 of the proposed NES discussion document:

> *……..The proposed national environmental standard establishes interim limits on alterations to flows and water levels that will apply to water bodies for which there are no environmental flows or water levels specified in a proposed or operative water plan. The interim limits will apply until an alternative is established through the regional plan process.*

15. Unfortunately, some 12 years since the proposed NES was released it has not been implemented by central government. As a result, regional councils have not applied the default interim limits nor have councils had a program of works to systematically work through the default limits and replace them with site specific limits as intended.

16. The proposed NES interim limit specifically referenced by Aukaha in their submission of a minimum flow of 90% of the mean annual low flow (MALF) and an allocation limit of 30% of MALF has to be given some context.

17. This interim limit was to apply where there was no information available to make an informed decision, specifically the interim limit had to protect all ecological values in all streams until a specific environmental flow regime was adopted. As a result, there was consensus by experts

on the interim limit knowing full well there was to be an alternative process on a case by case basis.

18. Aukaha through their submission have asked that environmental flows (minimum flow and allocation limit) be set in accordance with the interim limits of the proposed NES with the following criteria:

- For rivers and streams with mean flows less than or equal to 5m³/s
- A minimum flow of 90% of the mean annual low flow (MALF) as calculated by the regional council and an allocation limit of, whichever is greater of:
  - (a) 30% of MALF as calculated by the Regional Council
  - (b) the total allocation from the catchment on the date that the national environmental standard comes into force less any resource consents surrendered, lapsed, cancelled or not replaced.

19. Firstly, the proposed NES default provisions for allocation would not apply in Otago because the Regional Plan: Water sets allocation limits through policy 6.4.2.

20. Secondly, as none of the proposed NES has been implemented at a national or regional level it would not be appropriate to implement part of it in my view for a tributary of the Arrow River without the wider approach having been implemented also – specifically setting an environmental flow and allocation regime for the Arrow catchment through the regional plan using the methods in the Draft Guidelines for the Selection of Methods to Determine Ecological Flows and Water Levels[12].

[12] Beca. 2008. Draft Guidelines for the Selection of Methods to Determine Ecological Flows and Water Levels. Report prepared by Beca Infrastructure Ltd for MfE. Wellington: Ministry for the Environment.

21. Thirdly, the preference of the draft NES is to set limits based on specific technical assessments or stream specific information rather than defaults.

22. The Aukaha submission advocates for using the proposed NES default approach in the case of the Royal Burn and New Chums Creek, while my preference would be to rely on a stream-specific technical assessment of hydrology and ecological values.

23. In my view the proposed NES supports my preference of relying on actual information rather than defaults. An assessment previously carried out by myself and Dr Olsen has identified the ecological values present[13] in both the Royal Burn and New Chums Creek, and subsequently an assessment of the specific hydrological situation of the Royal Burn has been done using NIWA naturalised flow model (Shiny), NIWA gaugings and numerous photo and video observations.

Hydrological analysis

24. There is no continuous flow site on the Royal Burn. Anecdotal observations from both the applicant and the downstream water users[14,15] indicate that the upper reaches of the North Branch is perennial, with a naturally intermittent reach and then a gaining/perennial reach downstream of the North and South Branch confluence (Figure 1).

[13] Macroinvertebrates and small brown trout.
[14] LOFTS Water Ltd application for certificate of compliance 27th Sept 2020.
[15] Section 7 of the submission lodged by J Desbecker/R M Bodle

Figure 1. Hydrological Reaches of the Royal Burn. Yellow = permanent flow, red = losing/drying reaches and green = gaining reach.

25. The observations of the local water users are the same as what myself and Dr Olsen observed and documented from our site visit in January 2019.

26. In late February 2021 NIWA was asked to carry out a set of concurrent gaugings along the Royal Burn to see if the measured flows demonstrated the observed flow patterns by water users. The results and locations of these flows are shown in Figure 2.

Figure 2. Gauged flows by NIWA on the 22nd of February 2021 throughout the Royal Burn catchment. Red dots are gauging locations and the respective flow at that point. Also shown are the two North Branch takes.

27. NIWA's shiny model predicts a natural 7-day MALF at the Lower North Branch intake of 10 l/s. The NIWA gaugings indicate that the reach between the Lower North Branch Take and Glencoe Road would naturally dry in most years. However, the gaugings also indicate that there is a significant gain in the Royal Burn even if the upstream section is dry. This is consistent with the observations of a number of

submitters[16] as well as the certificate of compliance application made by LOFTS in September 2020[17].

28. The lowest natural flows since 1976 in the Arrow catchment occurred in the 2015/16 and 2017/18 seasons meaning the two driest seasons in 45 years of flow record have occurred in recent history.

29. On the day of the NIWA gaugings in the Royal Burn, daily average flows in the Arrow at Cornwall Street were 1.527 m^3/s. Flows less than 1.527 m^3/s have been observed to occur ~16% of the time at the Cornwall Street Flow Site.

30. The lowest daily average flow for the Arrow at Cornwall Street that correspond with the photos and videos collected by Mr McQuilkin was 1.363m^3/s on the 24th of March 2021. Flows less than 1.363 m^3/s have been observed to occur only 11% of the time at the Cornwall Street Flow Site.

31. The flows gauged by NIWA and observed in the photos and videos collected by Mr McQuilkin are in agreement with the information contained in the LOFTS Water Ltd certificate of compliance application suggesting the Royal Burn flows in very dry seasons at the Crown Range Road Bridge even when the applicant is taking water from the North Branch further upstream.

Ecological Values of the Royal Burn and New Chums Creek

32. Schedule 1A of the Regional Plan: Water lists natural values of many Otago lakes and rivers but does not make any specific mention of the Royal Burn or New Chums Creek.

33. Following discussions with the Department of Conservation the applicant approached myself and Dr Dean Olsen to carry out freshwater fish surveys of New Chums Creek and the Royal Burn at a number of locations as it was considered there was potential for

[16] Reference the submissions
[17] Part D of the certificate of compliance application describing Royal Burn flows.

galaxias to be present as trout could not move upstream from the Arrow due to the drop over the Royal Terrace[18].

34. Our survey of New Chums Creek found no fish above a waterfall in the lower reaches which prevented trout moving upstream[18].

35. We found no fish above or below the applicant's top take from the North Branch of the Royal Burn. The macroinvertebrate community was dominated by EPT taxa indicating good water quality and no fish[18].

36. No fish were recorded both above or below the applicant's lower take from the North Branch of the Royal Burn. During the survey, despite a reasonable flow passing the intake the North Branch was dry above Glencoe Road[18].

37. Below Glencoe Road we followed the Royal Burn downstream until flows returned from a number of springs and seeps. At this point we captured brown trout, which unfortunately must have been liberated illegally to the stream as it would not be possible for trout to move upstream past the Crown Terrace from the Arrow River[18].

38. The size of the Royal Burn means that these trout will only ever be small and of no recreational value. The presence of trout however will have an impact on the indigenous invertebrate community that has developed without the predatory pressure of fish.

39. The significant gain downstream of Glencoe Road was evident on the day of our electric fishing surveys in January 2019 and the fact that we captured brown trout in the gaining reach indicates that the flows are most likely permanent.

National Policy Statement Freshwater Management 2020

[18] Memo From Matt Hickey to Hilary Lennox, 30th January 2019 RE: Fish Survey of the Royal Burn and New Chums Creek.

40. The applicant, on my advice, has proposed the following residual flow conditions for the Royal Burn:

    (a) Ensuring a surface flow for at least 50m past the North Branch intakes.

    (b) The 5 l/s cut-off flow at the downstream boundary of the BSTGT Limited property immediately above the LOFTS take.

41. I now evaluate those conditions against Objective 2.1 of the NPS FM 2020 and the implementing policies relevant to my expertise:

> ***2.1 Objective***
>
> *(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:*
>
> *(a) first, the health and well-being of water bodies and freshwater ecosystems*
>
> *(b) second, the health needs of people (such as drinking water)*
>
> *(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.*
>
> ***Policy 1:** Freshwater is managed in a way that gives effect to Te Mana o te Wai*
>
> ***Policy 7:** The loss of river extent and values is avoided to the extent practicable.*
>
> ***Policy 9:** The habitats of indigenous freshwater species are protected.*
>
> ***Policy 10:** The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.*

42. I acknowledge that the Royal Burn has not been subject to the NOF process required by the NPS FM 2020 and I do not propose to pre-empt whatever outcome might be arrived at for the FMU through that process. Nevertheless, I understand that the NPS FM 2020 applies to all decisions in relation to freshwater. For that reason, I address the

three-tier priority and associated policies for freshwater management to the extent that is within my expertise.

43. Tier 1 values are concerned with the health and wellbeing of the water body itself and the freshwater ecosystems it supports. I comment:

    (a) In terms of ecological outcomes, the Royal Burn below the lower take is naturally intermittent and this controls the life supporting capacity of the water body at that point. Provision for a visible surface water flow past the point of take will reduce the extent of drying that could occur and allow some water to pass the take that while going to ground likely re-emerges in the gaining reach downstream.

    (b) At the point above the LOFTS scheme take, 5l/s will provide adequate habitat for the freshwater ecological values present in that perennial gaining reach.

44. In terms of Tier 2, there is a take right for drinking water in relation to the LOFTS scheme, which is a Tier 2 value. The LOFTS scheme has a maximum lawful rate of take of 0.2684 l/s. The 5l/s residual flow at that point adequately protects the reliability of water available for the LOFTS scheme take, and any other Tier 2 take further below (because it is a gaining reach). I have my doubts about the Tier 2 values at that point of the catchment due to the presence of a septic tank discharge (not associated with the Applicant) immediately upstream of the LOFTS scheme intake.

45. In terms of Tier 3, the residual flows proposed will provide adequate reliability for the applicants and other water users in terms of the reliability of water required for economic wellbeing (irrigation). I am not aware of any other downstream take for economic purposes that would be affected by this application.

46. I am not aware of any mahinga kai values associated with the Royal Burn.

47. Policy 7 is relevant to the intermittent character of the reach below the upper and lower take points. Loss of the river extent and values at those points is unavoidable. The frequency and duration of the river loss will be influenced by the takes, however, this is likely to have a less than minor effect on instream ecological values.

48. Policies 9 and 10 are in tension in so far as the trout that have been liberated in the gaining reach predate on indigenous macroinvertebrate species. My expectation based on the NIWA gaugings is that low flows in the driest seasons, which occur infrequently, offer the greatest risk to ecological values and downstream water users. I would expect given the infrequent occurrence of low flows existing, habitat values for both macroinvertebrates and trout in the gaining reach would be protected by the 5l/s residual flow above the LOFTS intake.

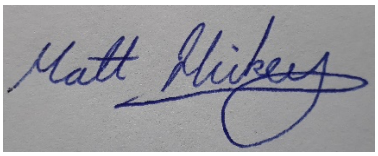
Summary

49. The North Branch of the Royal Burn naturally has both a perennial and a losing/drying reach, while the mainstem of the Royal Burn downstream of the North and South Branch confluence is a gaining reach.

50. Low flows in the mainstem of the Royal Burn at the Crown Range Road Bridge appear to be most influenced from groundwater gains downstream of the two North Branch abstractions rather than flows past the intakes.

51. The proposed residual flow condition ensuring a surface flow for at least 50m past the North Branch intakes will mimic the natural low flow conditions of the North Branch and ensure ecological effects are less than minor.

52. The 5 l/s cut-off flow immediately above the LOFTS take should ensure flows are sufficient at the LOFTS intake at all times to meet their required take of 0.2684 l/s.



Matt Hickey