BEFORE THE CANTERBURY REGIONAL COUNCIL

UNDER	the Resource Management Act 1991
AND	
IN THE MATTER	of the Proposed Hurunui and Waiau River Regional Plan before Environment Canterbury

STATEMENT OF EVIDENCE OF DR BRIAN COFFEY ON BEHALF OF AMURI IRRIGATION COMPANY

Dated October 2012

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Statement of Evidence of Dr Brian Coffey on behalf of Amuri Irrigation Company

1 Introduction

Qualifications and general experience

1.1 My name is Brian Thomas Coffey. I am the Director of Brian T. Coffey and Associates Limited, and its chief scientist. I hold the degrees of Bachelor of Science, Master of Science with honours and Doctor of Philosophy in Botany from the University of Auckland.

1.2 I have had 15 years experience as a Government research scientist in New Zealand with national management and advisory responsibilities in the field of aquatic biology.

1.3 Since 1988, I have had 24 years applied experience as an independent consultant:

- documenting resource inventories,
- assessing and monitoring the environmental effects of developments and
- preparing management plans

for freshwater, estuarine and marine sites in New Zealand.

1.4 I am a member of the New Zealand Water and Wastewater Association and I am a past president of the New Zealand Limnological (freshwater sciences) Society.

Involvement in Project

1.5 I was approached by Kelvin Reid on behalf of the Amuri Irrigation Company to provide an opinion on the scientific defensibility of potential changes that may occur to their existing conditions of consent as a result of the Proposed Hurunui and Waiau River Regional Plan.

The information I have reviewed to arrive at my conclusions is that contained in the Section 42A Staff Reports by:

- Andrew Parrish, Principal Planner, Canterbury Regional Council,
- Elizabeth White, Senior Planner, Canterbury Regional Council,
- Christina Robb, Programme Director – Water and Land, Canterbury Regional Council,
- Jeff Smith, Water Resource Scientist, Canterbury Regional Council,
- Antonius Snelder, Principal Scientist in Freshwater Ecology at NIWA,
- Maurice Duncan, Hydrologist, NIWA,
- Donald Jellyman, Fisheries Biologist, NIWA,
- Edward Norton, Water Resource Management Consultant, NIWA,
- Ian Brown, Principal Strategy Advisor to Canterbury Regional Council,
- and the references cited.

1.6 I visited the Waiau and Hurunui catchments during October 2012 to re-familiarise myself with the river systems and the current state of irrigation development in the area.

Compliance with Expert Code of Conduct

1.7 Whilst this is a Regional Council hearing, I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court when presenting my evidence. Except where I state that I am relying upon the specified evidence of another person, my evidence in this statement is within my area of expertise. I have

endeavoured to be accurate and to cover all relevant matters relating to the topic on which I am giving evidence. I am not aware of any matters that might adversely affect my conclusions that I have not included. The assumptions on which my evidence is based are not, in my view, unlikely or unreasonable assumptions and, therefore, my evidence complies with Section 5.3 of the Environment Court's Code of Conduct for Expert Witnesses.

2 Background

2.1 Amuri Irrigation Co Limited is an existing abstractor of water from the Hurunui and Waiau Rivers in North Canterbury. The Company has interests in:

- the Balmoral Irrigation Scheme, which is located on the North Bank of the Hurunui River and that irrigates approximately 5,000 hectares of land.
- the Waiau Irrigation Scheme, which is located on the South Bank of the Waiau River and that irrigates approximately 14,500 hectares of land.
- the Waiareka Downs Irrigation Scheme, which is located on the left bank of the Waiau River between the Waiau Township and the Stanton River and that irrigates approximately 450 hectares of land.

2.2 All three schemes have consented takes that were granted in 1998 for terms of 35 years. However, conditions of consent on the relevant permits to abstract water from the Hurunui and Waiau Rivers include review provisions to:

(a) deal with any adverse effect on the environment which may arise from the exercise of these consents, or

(b) require the adoption of the best practicable option to remove or reduce any adverse effect on the environment; or

(c) comply with the requirements of a relevant rule in an operative regional plan.

2.3 Canterbury Regional Council is currently promoting a regional plan change to alter the minimum flows and allocation blocks for the Waiau and Hurunui Rivers (proposed Hurunui and Waiau River Regional Plan [Environment Canterbury, October 2011]). Clearly, this has implications for the existing conditions of consent for water permits being exercised by the Amuri Irrigation Company.

2.4 The purpose of the proposed Hurunui and Waiau River Regional Plan is to promote the sustainable management of rivers and streams and groundwater in the Hurunui, Waiau and Jed river catchments.

2.5 The Waiau-Hurunui Zone Committee (established under the Canterbury Water Management Strategy) has produced a non-statutory Zone Implementation Programme that recommends how water management issues in the Waiau-Hurunui Zone should be addressed.

2.6 A key finding of the Waiau-Hurunui Zone Committee is that water storage will be required to effectively irrigate additional land in the Waiau Hurunui Zone. Isolated Hill was considered one of the few viable options for off-river major water storage in the Waiau River catchment. The Waitohi sub-catchment is the preferred location for major water storage in the Hurunui River catchment.

2.7 In terms of the Company's Hurunui abstractions, the existing low flow restrictions imposed on Water Permit CRC951326.1 (to divert water from the Hurunui River to a settling pond at or about map reference NZMS 260 M33:742-234) are as follow.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Min. Flow (m^3/s^{-1})	12	12	12	12	12	12	12	13	15	19	18	13.5

2.8 If the recommendations in the proposed Hurunui and Waiau River Regional Plan were to be adopted (i.e. the Environmental Flow and Allocation Regime proposed in Table 1), these existing minimum flow requirements in the Hurunui River would change to the following (i.e. the January minimum flow would increase from 12 to 15 cumecs and the December minimum flow would increase from 13.5 to 15 cumecs) both until and after water storage with a capacity greater than 20,000,000 m^3 is developed in the catchment.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Min. Flow (m^3/s^{-1})	12 to15	12	12	12	12	12	12	13	15	19 to 15	18 to 15	13.5 to 15

2.9 Conversely, the minimum river flows for October and November would decrease from 19 and 18 cumecs respectively to 15 cumecs.

2.10 Submission 1 by the Amuri Irrigation Company seeks to retain the minimum flow of 12 m^3/s for the month of January in the Hurunui River until storage with a capacity greater than 20,000,000 m^3 is developed.

2.11 In terms of Amuri Irrigation Company Limited's abstraction from the Waiau River, the existing low flow restrictions imposed on Water Permits CRC951296, CRC951304 and CRC951339 are as follow.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Min. Flow (m^3/s^{-1})	20	15	15	20	25	25	25	25	25	25	25	25

2.12 If the recommendations in the proposed Hurunui and Waiau River Regional Plan are adopted (i.e. the Environmental Flow and Allocation Regime proposed in Table 1), these existing minimum flow requirements in the Waiau River would change to the following (i.e. 20 m^3/s for all months of the year) following the commissioning of water storage with a capacity greater than 20,000,000 m^3 in the Waiau River catchment.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Min. Flow (m^3/s^{-1})	20	15 to 20	15 to 20	20	20	25 to 20	25 to 20	25 to 20	25 to 20	25 to 20	25 to 20	25 to 20

2.13 Submission 4 by the Amuri Irrigation Company seeks to retain the existing minimum flow regime for the Waiau River following the commissioning of any water storage facility, which takes and stores more than 20,000,000 m^3 of water. In particular, Amuri Irrigation Company wish to retain the 15 m^3/s minimum flow in the Waiau River during February and March.

2.14 The purpose of my evidence is to consider the scientific basis for adopting a higher minimum river flow in the Hurunui and Waiau River during the summer period.

3 Recommended Minimum River Flow in the Hurunui and Waiau Rivers

3.1 Background

3.1.1 In terms of recommended minimum river flows, the staff reports of Mr. Parrish, Dr. Smith, Dr. Snelder, Mr. Duncan, Dr. Hughey, Dr. Hicks, Dr. Jellyman and Mr. Norton

rely on the use of 2D hydrodynamic modelling of braided reaches of the Hurunui River and Waiau River by Mosely (2002 and 2004) and NIWA (2004, 2007 and 2009) that mapped the weighted useable area for taxa and recreational pursuits in relation to non-channel forming river flows.

3.1.2 However, minimum flows in terms of weighted useable area (a measure of potential physical habitat) versus flow plots for species / life stages and recreational pursuits is only one aspect of designing a managed flow regime. Other considerations include water temperature maintenance, water quality maintenance, periphyton flushing flows and flood flows to effect sediment transport and to keep the riverbed clear of terrestrial vegetation.

3.1.3 These other matters are accounted for in generic terms under Policy 6.2 and rely on the maintenance of mid to high flushing flows in the river systems, not only minimum flows.

3.1.4 In my opinion, it is not sufficient to produce a graph showing the weighted useable area for a particular taxa / life stage may be reduced under a proposed minimum flow regime to justify a higher minimum flow regime, unless it can be scientifically established that it is indeed available useable area rather than other factors such as predation or water temperature or nitrate toxicity for example that are the ecological bottlenecks for those particular taxa.

3.1.5 In terms of nuisance periphyton management (and potential nitrate toxicity), a nutrient loading cap has been proposed for the Hurunui River but not for the Waiau River at this stage. Schedule 1 to the proposed Hurunui and Waiau River Regional Plan recommends maintaining dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP) loads in the Hurunui River at 2005-2010 levels (40 tonnes DIN per year at the Mandamus flow recorder and 693 tonnes DIN per year at the SH1 flow recorder; 3.6 tonnes DRP per year at the Mandamus flow recorder and 10.2 tonnes DRP per year at the SH1 flow recorder) in the long term, while in the future progressively also setting nutrient limits in the tributaries of the Hurunui River.

3.1.6 In my view, it is unfortunate the proposed Hurunui and Waiau River Regional Plan has been produced before information required to define and allocate site specific "Nutrient Discharge Allowances" for individual sub-catchments / farms have been generated for these two river catchments.

3.1.7 Moreover, the proposed trigger mechanism (Rule 10.2) for the Hurunui catchment load limit may fail to prevent over-allocation of nutrient assimilative capacity because of the time lag for nitrogen loads lost from land in some parts of the catchment to travel through soil into groundwater and on to the monitoring point in the Hurunui River at State Highway 1. These issues have been defensively canvassed in the staff reports of Ned Norton and Liz White.

3.1.8 In essence, the proposed Hurunui and Waiau River Regional Plan will rely on "Audited Self Management" land use practices (staff reports of Liz White and Ned Norton), and other potential offset / mitigation measures such as catchment-based wetland development (staff report of Dr. Chris Tanner), to counter the eutrophication effects of land use intensification resulting from additional irrigation in these catchments. Existing irrigators will need to reduce their nutrient discharges to create headroom for competing irrigators to join in the scheme.

3.1.9 The other issue that has not received sufficient consideration in the staff reports is the predicted quality of storage water that it is proposed to use for flow augmentation in the Hurunui and Waiau Rivers. The maintenance of water quality in reservoirs that store more than 20,000,000 m^3 of water will be a particular challenge.

3.2 **Hurunui River**

3.2.1 The staff reports generally attest to the upper mainstem of the Hurunui River being in reasonable ecological health but with a decline of instream values downstream from the Mandamus site to State Highway 1.

3.2.2 Concerns were raised about the quality of water in the lower Hurunui River In the late 1990s because the lower reaches of the river frequently had high nutrient and indicator bacteria concentrations which compromised its suitability for contact recreation, such as swimming, in the summer months (Andrew Parrish).

3.2.3 Sporadic occurrances of nuisance periphyton growths have occurred in the river (e.g. in 2000, during January to March, after a long period of stable flows in the Hurunui River, periphyton blooms occurred that resulted in concern being expressed about nutrients in the Hurunui River – Andrew Parrish).

3.2.4 2D Hydrodynamic modelling of minimum flow requirements in the Hurunui River have been reported in the staff report by Maurace Duncan for a braided section of the gravel bed river one km downstream of the State Highway 7 Bridge.

3.2.5 In terms of fish passage, adult salmon are generally the indicator taxa used because water depths that are suitable for salmon passage are also suitable for other fish taxa. At 15 $m^3.s^{-1}$ modelling shows there should be sufficient depth (more than 0.24 m) for unimpeded fish passage in December and January (Maurice Duncan). In February to April, modelling reported by Maurice Duncan also shows 12 $m^3.s^{-1}$, prior to storage being developed provided sufficient depth for fish passage.

3.2.6 I acknowledge Maurice Duncan and other experts such as Dr. Jellyman would prefer a more precautionary approach of raising the minimum environmental flow from 12 to 15 $m^3.s^{-1}$ in the Hurunui River.

3.2.7 However on balance, I consider the supporting evidence for 15 $m^3.s^{-1}$ as opposed to 12 $m^3.s^{-1}$ as a recommended minimum flow in the Hurunui River during January, is based on precautionary expert opion rather than compelling scientific evidence. I note this opinion is also shared by Dr. Vaughan Keesing in his evidence on the minimum flow issue in the Huranui River on behalf of the Hurunui Water Project Limited.

3.3 **Waiau River**

3.3.1 Mosley (2002) conducted a review of the instream values and flow regime of the Waiau River, and made recommendations on a minimum flow regime for the river. NIWA (2009) repeated this assessment based on an instream habitat assessment using two-dimensional (2-D) hydrodynamic modelling for prediction of depths and velocities for flows from 10 - 100 $m^3.s^{-1}$ in a 3 km reach of the Waiau River, one km downstream of Mouse Point on the northern edge of the Amuri Plain.

3.3.2 The NIWA (2009) study recommended higher minimum flows than Mosley (2002) in spring and early summer to protect riverbed nesting birds from predators, and lower minimum flows than Mosley (2002) in autumn in winter.

3.3.3 In this regard, I do not consider mitigation measures such as predator control programmes that have been proposed elsewhere to protect river bed nesting birds from predators have received sufficient consideration in the staff report by Professor Hughey.

3.3.4 Maurice Duncan reports adult salmon could probably traverse the study reach when the flow was 15 $m^3.s^{-1}$ but water depths in some riffles would be less than ideal and a minimum flow of 20 $m^3.s^{-1}$ was considered preferable for adult salmon. Similarly, both kayaks and jet boats should be able to traverse the study reach when it is flowing at 15 $m^3.s^{-1}$ but kayakers with average ability would probably prefer flows of 25 $m^3.s^{-1}$ or more.

3.3.5 Maurice Duncan also reported river conditions were too harsh for filamentous algae and they have good quality habitat on major channel edges and in minor braids at all modelled flows except for short filamentous algae at the lowest modelled flows. Conditions are good for diatoms except for the high velocity parts of the main stems at higher (>60 $m^3.s^{-1}$) modelled flows.

3.3.6 My understanding is that the Zone Implementation Programme for the Waiau River considers minimum flows are able to remain unchanged, provided current water use remained unchanged and in-river values do not deteriorate. As recorded in the Zone Implementation Programme (p. 22), the Zone Committee was not presented with any

evidence that in-river values have been compromised in the last decade under the existing minimum flow and current water use from the river.

3.3.7 However, nutrient caps and / or "Nutrient Discharge Allowances" have yet to be proposed and / or assessed for individual sub-catchments / farms in the Waiau River catchment.

3.3.7 On balance therefore, I do not consider a compelling case has been presented in the staff reports to justify the current 15 $m^3.s^{-1}$ minimum flow in the Waiau River during February and March being increased to a minimum river flow of 20 $m^3.s^{-1}$ following the commissioning of water storage with a capacity greater than 20,000,000 m^3 in the Waiau River catchment.

3.4 **General Matters**

3.4.1 Policies 5.3 of the proposed Hurunui and Waiau River Regional Plan currently prescribes annual nutrient loads for the Hurunui River at the State Highway 1 flow recorder as a mechanism to protect existing values, uses and the mauri of the Hurunui River and its tributaries while also providing for future development in the catchment.

3.4.2 Policy 5.4 proposes to progressively set nutrient limits in tributaries of the Hurunui River and at the river mouth and in the Waiau River Catchment to ensure that Objective 5.1 and 5.2 are met.

3.4.3 In my opinion, these policies would best be replaced by a combination of imposing national periphyton guidelines (Biggs, 2000) and monitoring potential nitrogen toxicity in the downstream reaches of the Hurunui and Waiau Rivers.

3.4.4 The best mechanism for achieving compliance with instream periphyton guidelines and avoiding nitrogen toxicity issues in the Hurunui and Waiau Rivers is the development and enforcement of site specific "Nutrient Discharge Allowances" for individual sub-catchments / farms in these two river catchments.

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