BEFORE THE MINISTER FOR THE ENVIRONMENT

SPECIAL TRIBUNAL

IN THE MATTER of an Application by New Zealand and North Canterbury Fish & Game Councils for Hurunui River Water Conservation Order

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STATEMENT OF EVIDENCE BY RUTH GOLDSMITH ON BEHALF OF TRUSTPOWER LIMITED

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1. INTRODUCTION

1.1 My full name is Ruth Johanna Goldsmith. I am an environmental scientist and hold a BSc. (Zoology, 1998), a Postgraduate Diploma (Wildlife Management, 2000), and a PhD (Zoology, 2004) from the University of Otago. I am a member of the New Zealand Freshwater Sciences Society.

1.2 I have been an employee of Ryder Consulting Limited, an environmental consulting business based in Dunedin for approximately five years.

1.3 During this time I have undertaken studies throughout New Zealand examining the effects of human activities on freshwater ecosystems, including municipal sewage discharges, industrial discharges, gravel extractions, water abstraction, and water augmentation.

1.4 I have considerable experience with hydroelectric power schemes and have undertaken ecological assessments on a number of existing and proposed power schemes including the Arnold, Branch, Cobb, Dillmans, Hawea, Matahina, Mokau, Monowai, Wahapo and Waipori schemes.

1.5 I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note (2006).

1.6 My evidence today addresses:

(a) The effectiveness of fish passes in providing upstream passage for salmonids; and

(b) The evidence of Dr Roger Young.

2. THE EFFECTIVENESS OF FISH PASSES IN PROVIDING UPSTREAM PASSAGE FOR SALMONIDS

2.1 The requirement to provide salmonid passage was formally recognised in New Zealand in 1947 by the adoption of regulations that gave fisheries authorities the right to request that a fish pass be constructed at any weir or dam built on a river where trout or salmon did or could exist. Much of the information for the design of fish passes in New Zealand has come from North American experience, where the importance of native salmonid runs and the high number of hydroelectric dams has led to extensive research and the development of techniques to allow upstream salmonid migration (e.g. Wunderlich *et al.* 1994,

Clay 1995, Nemeth and Kiefer 1999, Dauble and Mueller 2000). The earliest fish passes varied in their effectiveness; being limited somewhat by a lack of understanding of fish swimming performance and behaviour and sometimes the constraints of retrofitting the pass to an existing structure. However, technological advancements and increased understanding of fish biology, mean that fish pass designs are now considered mostly well developed and understood for certain species, including salmonids (United States OTA 1995).

2.2 Despite the formal recognition given to the importance of salmonid passage in 1947 there have been few salmonid passes constructed in New Zealand. Jowett (1987) noted in the early 1980s that there had only been about eight salmonid passes constructed at the around 33 major dams throughout New Zealand. As in North America the design of these early passes (e.g. Waitaki, 1934; Monowai, 1926) were limited by a lack of understanding of design requirements and knowledge of fish biology. Recent designs have benefited from an increased understanding of physical and hydrological conditions and fish behaviour and consequently are generally more effective at providing passage.

2.3 For example, the vertical-slot fish pass at the Mararoa Weir (Lake Manapouri Control Structure), installed in 1998, allows brown and rainbow trout to move upstream, with 1645 trout recorded through the pass from April 1999 to June 2000 (M. Rodway, Southland Fish and Game, Presentation at New Zealand Limnological Society Conference, Christchurch, 2000). The vertical-slot fish pass replaced the original pass (Borda orifice, 1976), which was repeatedly blocked by gravel deposition (Boubée 2001). Another example of an effective salmonid pass is the pool and weir pass constructed in 1967-68 to provide access to the artificial Aveimore Spawning Channel on the Waitaki River. The pass is used by hundreds of brown and rainbow trout each season to access the spawning channel. Both of these examples are of relatively low height fish passes, with 4.7m at the Mararoa Weir and 3m at the Aveimore Spawning Channel (Boubée 2001). Jowett (1987) considered that the maximum height for a pool and weir fish pass is about 30-35m. Providing fish passage over higher dams therefore requires a different design of pass.

2.4 Glova (2000) undertook a literature review and assessment of fish passage at high dams for the Central South Island Fish and Game Council. Glova's (2000) review concluded that the technology is available to allow adult trout and

salmon to pass over high dams (30-60m high). There are no examples of high dam fish passes currently operating in New Zealand, however fish locks and fish elevators are two designs that are used extensively overseas for high dams (Clay 1995).

2.5 Past experience has led to considerable advancements in fish pass design and it is clear that effective fish pass design needs to be site specific (United States OTA 1995). The reasons for pass failure is therefore also site specific and tends to result from poor information at the design stage and also inadequate operation and maintenance (United States OTA 1995). There is uncertainty in the construction of fish passes but with a thorough understanding of site characteristics and adequate attention to design, operation, and maintenance effective upstream passage of salmonids can therefore be achieved (United States OTA 1995).

3. RESPONSE TO EVIDENCE OF DR YOUNG

3.1 Dr Young states in his evidence that "*Fish ladders designed to allow trout and salmon movement past dams in New Zealand have often been failures. Even in the few situations that are considered a success, it is not known what proportion of the potential migrating population is successfully negotiating the fish passes. Therefore, there is substantial risk involved in relying on a fish pass to maintain fish passage.*"

3.2 While the first part of Dr Young's statement relating to the frequent failure of salmonid fish passes in New Zealand is true in part, it is a simplistic view in that it does not acknowledge that the reasons for past failures were often due to poor design due to a lack of knowledge and that there has been significant design advances since, resulting in more recent designs having greater effectiveness. As demonstrated overseas and discussed in section 2.4, a review prepared for the Central South Island Fish and Game Council in 2000 concluded that the technology is available to allow adult trout and salmon to pass over even high dams (30-60m high) (Glova 2000).

3.3 In his evidence Dr Young discusses the success or otherwise of the Branch River weir fish pass (weir and orifice, 1983), which is part of the Branch River Hydroelectric Power Scheme owned and operated by TrustPower. Dr Young notes that there is anecdotal evidence that the Branch River fish pass allows some trout passage (Jowett 1987, Young 2000), then goes on to explain that

more recent data however, has failed to confirm successful passage (citing Lawson Davey, Nelson/Marlborough Fish & Game, pers. comm.). Dr Young does not define what he considers to be successful passage, however video monitoring of the Branch River fish pass by the National Institute of Water and Atmosphere (NIWA) during trout migration periods in 2002, 2003 and 2005 identified that an average of 54 large trout used the fish pass to move upstream each year (Jellyman 2007). As Dr Young notes in his evidence it is not known for this or other passes what proportion of the potential migrating population is successfully negotiating the fish pass, however I do not agree that a lack of monitoring data in these examples are grounds to make a general conclusion, as Dr Young has done, that "... *there is substantial risk involved in relying on a fish pass to maintain fish passage." (my emphasis).*

3.4 Dr Young's colleagues at the Cawthron Institute are currently involved in a resource consent application to construct a 77m high dam on the Mokihinui River (Hayes *et al.* 2007). Although Hayes *et al.* (2007) acknowledge the proposed dam will disrupt upstream trout passage they do not consider that it is practicable (the height of the dam exceeds 60m) or cost effective (given the value of the Mokihinui trout fishery) to install a fish pass at the dam. However, if subsequent monitoring indicates that there is a significant decline in the trout population following construction of the dam Hayes *et al.* (2007) have recommended that trap and transfer of upstream migrant adult trout over the dam may be undertaken (trout stocking is also proposed as an option). The Mokihinui River is identified as supporting one of the best headwater trout fisheries in the upper South Island and initial monitoring of trout movement indicates that fish move throughout the catchment, including to and from the sea (although further monitoring is proposed to clarify this) (Hayes 2008).

3.5 Given that Hayes (2008) consider that trap and upstream trout transfer is a feasible option to mitigate any effects of a 77m high dam on trout movement within the Mokihinui River, a similar approach may also be appropriate to mitigate the construction of any dams on the Hurunui River.

Dr Ruth Goldsmith.

Dated 23 March 2009.

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