

IN THE MATTER OF

the Resource Management Act
1991

AND

IN THE MATTER OF

applications by Central Plains Water
Trust to:

Canterbury Regional Council for
resource consents to take and use
water from the Waimakariri and
Rakaia Rivers and for all associated
consents required for the
construction and operation of the
Central Plains Water Enhancement
Scheme

Selwyn District Council for resource
consents to construct and operate
the Central Plains Water
Enhancement Scheme

AND

IN THE MATTER OF

a notice of requirement by Central
Plains Water Limited to:

Selwyn District Council for the
designation of land for works
associated with the construction and
operation of the Central Plains
Water Enhancement Scheme

BRIEF OF EVIDENCE OF TERENCE DAVID HEILER

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Qualifications and experience

1. My full name is Terence David Heiler. I am a Civil Engineer specializing in water resources engineering, with particular focus on large scale irrigation developments. My academic qualifications include: Associate of Sydney Technical College (Civil Engineering, Hons.) 1963; Bachelor of Civil Engineering (First Class Hons.), University of NSW, 1965; PhD in Agricultural Engineering, Water Resources, Lincoln College, University of Canterbury, 1982.
2. I am a Fellow of the Institution of Professional Engineers NZ. In 1981 I was awarded the Crawford Reid Memorial Award by the US Irrigation Association in recognition of significant achievements to irrigated agriculture outside of the USA.
3. I have worked as a professional engineer in the water resources sector for over 40 years. I was Director of the NZ Agricultural Engineering Institute at Lincoln College for 12 years until 1993, and led the soil and water research group at the Institute prior to that. This group was responsible for the design of the Glenmark Irrigation Scheme in the 1980's, the first based on water harvesting in NZ.
4. Since 1971 I have been involved in over 40 assignments in 20 overseas countries, directly engaged as a water resources expert by international financing and donor organizations, focusing on water resource development projects, many involving large scale irrigation.
5. In addition to my engineering career, I served as a director of Landcare Research Ltd for 6 years; Chairman of Linlinc Ltd. for 2 years, a technology transfer company specializing in water and environment services; and Chairman of Woolpro and Tectra Ltd, for 5 years, both agribusiness technology companies operating in the wool sector.
6. I am currently employed as Chief Executive of Irrigation NZ Inc (INZ)., which represents the interests of 3,500 irrigation farmers associated with over 300,000 ha of irrigated land. INZ deals with Central and Local Government on matters of mutual interest and in progressing technical and professional capabilities in the irrigation industry.

7. I was involved with the Central Plains Water Enhancement Scheme over the period 2000/2001 and carried out an independent peer review of earlier concept and pre-feasibility reports prepared by URS, and assisted with the public meetings associated with the initial share float for Central Plains Water Limited. I have had no formal involvement with the CPWE proposals since that time, but have kept up to date with developments.
8. I have read the code of conduct for expert witnesses set out in the Environment Court practice note and confirm that I have complied with the code in the preparation of my evidence.

Scope of evidence

9. I will briefly review irrigation development in New Zealand since settlement, in order to provide a background and context to the modern circumstances that relate to the CPWE proposals.
10. I have been asked to offer my professional view as to the merits and issues involved in the scheme proposal as it relates to the future economic, social and environmental development options for the Canterbury region. I will not address details of the Scheme as they will be covered by other witnesses.

Some Hydrological realities

11. The detailed hydrological information related to the proposals will be presented by Mr Tipler and others, but an overview of rainfall and runoff in New Zealand is relevant. It is generally true that the west coasts of both islands are very wet and flooding and land stability are the main water issues; the east coast rainfalls are much less and agricultural drought is common; and the North Island average annual rainfall is generally higher than in the east of the South Island., above 1,000 - 1,500 mm compared to 350 - 700 mm. There is also less spatial variability than in the South Island. The spatial variability in the South Island is extreme - a transect from the west to east coasts and through Canterbury will encounter average annual rainfalls that range from 7,000 mm in the west to 600 mm here. Canterbury rainfall is generally about the same in winter as in summer, on average, but seasonal evapotranspiration differences are great – 1-2 mm/day in winter and as high as 8-10 mm/day in summer in inland Canterbury. On the eastern seaboard of both islands, growing season rainfall totals are also variable over time - in the drier inland valleys of Central Otago, the rainfall between growing seasons can range from 100 mm to 600 mm. By and large, most runoff from

rainfall-fed rivers in Canterbury occurs in winter, and snow-fed alpine rivers in early spring (highest monthly average Waimakariri flows are September to December, and Rakaia are October to January). Irrigation demand peaks in December/January, when most of the surface runoff has passed to sea.

12. Mitigating the effects of agricultural drought therefore is a key driver in current water resources development proposals in Canterbury, especially as the effects of climate change are predicted to increase the frequency and severity of agricultural drought in Canterbury, reducing lowland stream flows and rainfall-induced groundwater recharge, whilst at the same time, increasing the mean annual flows in the alpine rivers
13. However, compared to Australia, New Zealand is water and runoff rich. The average annual runoff from the NZ land surface is about 300,000 million cubic metres (MCM) – the comparable figure for Australia is about 340,000 MCM, and the land area of New Zealand is only 3.5 percent of the land area of Australia. The average annual runoff from two South Island rivers – the Buller and the Clutha – is 30 percent greater than the average annual runoff from the entire Murray Darling Basin, which has a catchment area about 4 times the area of New Zealand as a whole (Burton, J.R. ,1985).
14. It is surprising to note that the irrigated area of New Zealand at about 750,000 ha and with 4 million people (0.19 ha/person), is more intensive on a per capita basis than many other jurisdictions. For example the comparable figures for Australia are 2.6 Mha and 25 million people (0.10 ha/person).
15. The relatively high per capita area irrigated figure for New Zealand surprises many professional observers from Australia, and it is a direct result of three factors: the relative abundance of groundwater accessible to individuals in Canterbury, meaning private developments have dominated irrigation growth since the 1980s – at least up to the present time; the more robust financial resources of New Zealand private farmers compared to their Australian counterparts, which has given them an ability to make substantial private investments in irrigation infrastructure; and the requirements in New Zealand of export market contracts to reduce production risks from soil moisture deficits that impact on timely delivery of quality agricultural products – which is a reflection on current and foreseeable market realities.

Market realities

16. Irrigated agriculture is now big business. In New Zealand the annual net farm gate contribution to the economy of some 500,000 ha of irrigated land in 2002/3 was \$920 million, representing 11% of all farm gate GDP. Based on analyses carried out by MAF Policy, likely new irrigation developments by 2013 under two scenarios – 210,000 and 470,000 ha -- would create additional annual net farm gate contributions of between \$330 million and \$660 million respectively, to the economy. This could be more than the Rugby World Cup is expected to bring into the economy in 2011 (\$500 million), and it is for every year. Off-farm benefits would double or treble these existing and possible developments. Irrigated agriculture is clearly a matter of significance at a national level.

THE ROAD MAP OF IRRIGATION DEVELOPMENT SINCE SETTLEMENT

Nation building phase

17. In order to understand the background to the current CPWE proposals, it is instructive to journey back in time to the first recorded example of irrigated agriculture. In 1865, the Wardens Court - charged with bringing order to the use of natural water for alluvial sluicing in the Central Otago goldfields - approved the application by a French national, a certain Mr Feraud, to irrigate a market garden near Clyde to provide vegetables for sale to the miners. This was the first formal irrigation water right in NZ (Hinchey, L.W. et al, 1981).
18. The subsequent development of more widespread irrigation starts in Central Otago around the mid 1880s. During the gold rush times, water rights for sluicing were issued initially by the Wardens Courts as property rights and then under the Mining Act of 1898. Water taken from small burns, creeks and water races diverted from larger streams – became the so-called “mining rights” of NZ folklore. When land use changed from mining to pastoral agriculture, these rights were utilized by private individuals to wild flood grasslands, as a form of drought mitigation in a semi-arid environment, and became an essential and fiercely protected property right.
19. Over time, the Crown purchased or appropriated many of these rights and developed larger irrigation schemes, often involving conservation storage. The current rights based on these entitlements do not expire until 2021, and in parts of Central Otago, when accumulated, they exceed available river

flow. Further north, irrigation trials were started in the mid-Canterbury region as early as 1880, but any real development of large scale irrigation was delayed until well into the 1930s.

20. During the period to the end of the 1920s, Government assisted local farmers to better utilize the water resources of Central Otago by constructing storage dams on-stream – as distinct from the Glenmark scheme and CPWE proposals involving water harvesting into storages located off-stream - and basic distribution infrastructure. The facilities were owned and operated by Government, with minimal financial contributions from water users for operation and maintenance. The policy position of Government in regard to irrigation at this time was not articulated until the Public Works Act of 1910 legitimized the role of Government in the construction of irrigation systems.
21. During this nation building period, and by about 1933, the total irrigated area was dominated by the Government schemes in Central Otago and probably totalled some 45,000 ha.

The Great Depression and unemployment

22. In the early 1930s through to the post-war period, irrigation development was justified under a policy that: a) considered irrigation development to be a legitimate and economic activity of Government; and b) aimed to find gainful work for unemployed persons through public good works programs. Works associated with several small schemes in Canterbury – Redcliffs (1936) and Levels (1937) and a start on the Rangitata Diversion Race (RDR) in 1935 – were primarily driven by this policy. These activities had increased the total irrigated area under Government schemes to about 80,000 ha by the mid 1950s.

Increasing total volume of export agricultural products

23. In the latter part of the post-war period up to about 1960, there was a clear policy position that irrigation for increasing production was a good thing and in the national interest, and should be supported by Government. This was very much in line with Government policy to increase production across the rural sector in a number of areas – economic development objectives were dominant at the expense of any conservation or environmental interest. In part, subsidized support of agriculture was seen as justified to balance the restrictive import policies of the day. By 1960, the irrigated area had increased under Government constructed schemes to about 95,000 ha.

Farmers in this period waxed and waned in regard to their enthusiasm for irrigation, depending on prevailing market conditions and seasonal droughts.

24. The period from 1960 through to the late 1970s saw rapid increases in Government supported irrigation development, the emergence of substantial private irrigation development and increasing concerns from the community about the primacy of development objectives at the expense of environmental values. Various subsidy modalities were applied during this period to encourage farming communities to agree to Government-sponsored irrigation schemes.
25. In 1967 the Government of the day passed the Water and Soil Conservation Act (WSCA), which for the first time recognized the emerging community concerns about land degradation – water and wind erosion – and the need to have minimum flow restrictions on certain rivers. For the first time, water takes had to be registered and fixed term permits issued. An amendment to the Act in 1981, promoted by environmental interests, provided for the needs of wild and scenic rivers and introduced the concept of National Water Conservation Orders (NWCOs) The irrigation communities of the time were unaware the implications of the new NWCO instrument to their future plans.
26. By 1970, the total area under Government irrigation schemes was still about 100,000 ha, but new schemes under process were about to come on line. Private developments had increased dramatically over the period mostly based on groundwater resource developments in Canterbury, but the total area involved in private development is not known precisely. The rapid increase in private irrigation investments reflected the increasing importance of irrigation as an essential input to modern farming systems and fundamental changes in the needs of a global market.

Environmental factors considered

27. The proposal to raise Lake Manapouri as part of a hydro-power project in 1968 galvanized and focused the emerging environmental lobby in NZ and led to massive debate over the Clyde Dam development later in 1977. These issues and in response to a clear signal from the electorate, the government of the day formalized its support of the environmental interest with the creation of the Department of Conservation in 1987.
28. The Government-supported process of developing community irrigation schemes disappeared with the demise of the Ministry of Works and

Development in 1988. This coincided with a dramatic reform of the public sector and was influenced by the prevailing economic rationalism of the time and the increasing power of the environmental lobby. This effectively left NZ without any formal agency responsibility for water resource development matters at Government level – a situation that continues to the present day. The Government at about the same time took a decision to dispose of the Government interests in all of the schemes that they had developed under earlier policies and these were eventually sold to irrigation interests over the period 1991-1995 (Farley, P.T. and B.M. Simon, 1996). Direct government support of agricultural production objectives and irrigation in particular, had dropped off the policy agenda.

29. When these changes had been made and by 1985, the total area surveyed under irrigation was about 260,000 ha, with private developments, which had continued apace over the period, representing some 50 % of the total.
30. The first real test of the altered attitude to irrigation development and the use of water resources was the granting of a NWCO on the Rakaia River in 1988, based on the Wild and Scenic Rivers Amendment to the WSCA of 1967.
31. The large number of statutes governing water allocation, management and use disappeared with the enactment of the Resource Management Act (RMA) in 1991 and its focus on sustainable management of resources such as water. This legislation has been subsequently interpreted by the courts to give primacy to environmental values.
32. The period from 1985 through to the present time has seen three community irrigation schemes developed by farmer interests – the Opuha Dam developments, Downlands and the Waimakariri Scheme. Private developments have continued apace, primarily from groundwater. The total area under irrigation in NZ has trebled in the period 1985-2007, almost entirely through private initiatives.
33. My outline of the historical development of irrigation and the associated policy and legislative environment provides a background to an appreciation of the current situation in NZ.

The present

34. The current situation (2007) is that the total area under irrigation has increased to about 750,000 ha¹, a trebling since 1985, and accounting for 77 percent of all water allocated in NZ. Canterbury alone has 400,000 ha of the total. The area under private developments is now substantially greater than the total area of the old government schemes and new community developments. We have seen a rapid increase in farmer initiatives to get new community schemes off the ground – these have been championed by farmers who do not have the opportunity to develop privately, and who depend on communal development of water sources to deliver a reliable supply of water to their property. It has been estimated that the area involved in early stage community proposals could exceed 400,000 ha. Whatever else is concluded, the strong interest of farming communities in additional irrigation development is indisputable.
35. In my opinion, much of what has happened with irrigation development since the 1880s until, say, the early 1980s, has been the result of the changing policy objectives of successive governments, influenced by the economic and social imperatives of the time. In terms of political influence, the political power of the irrigation farming lobby has not been a dominant feature in what happened – Government led the charge.
36. Since the mid 1980s, the irrigation development story has been very different. Farmers have led the charge, in an environment characterized by the increasing influence of non-development interests, environmental NGOs, community concerns about water quality, and under new legislation and policies related to resource development -- a complete reversal of the situation that existed up until 1970.
37. On the basis of my review of changing attitudes to water enhancement investments over time, my view, which is shared by Irrigation NZ Inc², is, that the current legislative and political environment contra-indicates any major initiatives being taken to address the future water problems and opportunities in Canterbury by Central or Local Government – solutions need to be found

¹ See Ministry of Environment : Snapshot of Water Allocation in NZ: <http://www.mfe.govt.nz/ser/snapshot-water-allocation-nov06/snapshpt-water-aallocation-nov06.pdf>. The total area consented is about 920,00 ha, but less is actually irrigated.

² Irrigation NZ Inc. is an association with 3,500 members, primarily irrigators, who have championed, so far unsuccessfully, for central government assistance in developing multiple purpose

within the communities affected. The CPWES proposal is an example of this happening.

The Central Plains Water Enhancement proposal

38. Given the history and context described above, I will now reflect on the reasons for the CPWE proposal. Essentially, we have reached the limit of exploitation of the groundwater resource in Canterbury. Availability from this resource will diminish with less rainfall recharge, affecting not only irrigators but communities dependent on groundwater for domestic water supplies.
39. Lowland streams are fully allocated with pressure to increase environmental flows. Access to alpine river surface flows is limited because of the Rakaia Conservation Order and existing allocations on the Waimakariri River. Demand for new irrigation to realise the huge land potential is high and unlikely to be realized under current conditions.
40. The key to the future clearly lies with sustainable exploitation of available water from the alpine river system in a multiple objective and benefit framework.
41. Two interventions are obviously needed from a hydrological viewpoint: a) large scale storage of water from alpine rivers when flows are in excess of other requirements³; and b) recharge of the unconfined aquifer system using alpine river sources in order to secure reliability for existing users, maintain flows in spring fed streams and allow additional development.
42. This assessment is also supported by the Canterbury Strategic Water Study (CSWS), commissioned by the Canterbury Mayoral Forum, and endorsed by ECan.
43. The CPWE proposal is one approach to addressing both of these needed interventions. Other options have been considered and will be discussed by Mr Tipler, who concludes that the CPWE proposal is the most technically and institutionally applicable, financially viable and most likely to be appropriate given current circumstances. I concur with this assessment.
44. Regardless of the outcome of the CPWE proposal, the interventions identified will be needed if we are to secure a satisfactory future for future generations of Cantabrians. A major issue for any development proposal will

be access to the financial resources needed to implement the large scale infrastructure that will be needed. A positive feature of the CPWE proposal is that the aquifer recharge requirement can be satisfied by alpine river sourced irrigation which, with storage, is sufficient to generate the financial resources needed to implement the scheme. It is difficult to see how these financial resources could be found without the associated economic benefits from increased irrigation.

Summary

45. In my opinion the CPWE proposal is an appropriate and technically feasible infrastructural response to a serious water shortage situation in Canterbury which affects all sections of the community.
46. If climate change predictions, come to fruition, the future will see increasing demand coming from existing irrigation water users, a greater need for additional irrigation to meet market conditions, and increases to alpine river flows.
47. The implementation of the proposal will materially assist with the continuing development of the agricultural and urban economy.
48. The proposals provide a sound financial basis to implement the interventions needed.
49. The benefits extend strongly into the community by augmenting and thus securing access to the groundwater resource into the future.
50. The proposal has the potential to restore the environmental values associated with lowland streams with minimal negative impacts.

Terry Heiler

³ Given current community attitudes, providing such storage on major rivers through dams is unlikely to be acceptable.

References

Burton, J.R. (1985): Water Resources Development – For what? For where? For why? NZ Agricultural Science, November 1985, Vol.10, No.4, NZ Institute of Agricultural Science.

Hinchey, L.W. et al (1981): Report of Working Party on Central Otago Irrigation to Minister of Works and Development, Alexandra, July 1981.

Farley, P.T. and B.M. Simon (1996): Privatizing Government Irrigation Projects in NZ. Water Resources Bulletin, American Water Resources Association, Vol.32, No. 3, June 1996.