

**Appendix 6. Affidavit of G D Davey**

**IN THE MATTER OF**

The Resource Management  
Act 1991

**AND**

**IN THE MATTER OF**

41 Applications to the  
Canterbury Regional Council  
to take and Use Water in the  
Selwyn-Waimakariri  
Groundwater Allocation Zone.

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**AFFIDAVIT OF GRANT RUSSELL DAVEY**

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I, **Grant Russell Davey**, Mineral Exploration Geologist, of Rangiora affirm,

1. I hold the qualifications of Bachelor of Science (Geology, 1977) and Post Graduate Diploma in Science (Environmental Science, 2002), both from the University of Canterbury.
2. I was employed by the Canterbury Regional Council from November 2002 to May 2006 and left with the position of Hydrogeologist.
3. I prepared this Affidavit in response to comments made by Commissioners about reports I prepared while I worked for the Canterbury Regional Council. The Commissioners had been appointed to hear and decide applications for groundwater in the Rakaia-Selwyn Groundwater Allocation Zone.
4. In April 2006 I completed two reports about the aquifers of the Canterbury Plains.
5. The first of these was referenced U06/08 and its purpose was to document some outcrops of aquifers on sea cliffs and in galleries, and to put forward some ideas on the character of the aquifers and aquitards.
6. In my opinion the report clearly shows that aquifers consist of interconnected lenses of highly permeable gravel within much less sandy gravel.
7. My view is that aquitards consist of relatively thin sandy gravel layers through which few or no highly permeable lenses penetrate.
8. I consider aquitards represent interglacial surfaces that are likely to be more permeable than the current land surface, given the absence of any evidence that soils or loess formed on present day surfaces are preserved at depth.

G.D.



9. Drill logs throughout the plains (excluding the confined aquifer system) are conspicuously lacking in any strata that could conventionally be described as aquitards.
10. I consider aquitards will readily allow vertical movement of water through them and are likely to be more permeable than current land surfaces.
11. Nevertheless they are less transmissive than aquifers, which explains different water levels in different aquifers. This can also explain lack of observed drawdown in one aquifer during a brief pumping test from a well in another aquifer.
12. In October 2007 I produced an Addendum to my reports, in response to concerns that my description of the formation and characteristics of aquifers and aquitards had been misunderstood and/or misinterpreted.
13. The Addendum expresses my disagreement with the view that aquifers are sediments that have been reworked during interglacial periods; and that inland aquitards are glacial deposits that have not been reworked.
14. I am unaware of any field evidence for the 'reworking' theory of aquifer formation in the Canterbury Plains. This theory seems to have developed within the Canterbury groundwater literature from mere speculation.
15. My interpretation of the aquifers is that they are located within, and are the result of primary permeability of those sediments. Reworking of gravels deposited during glacial times is not necessary to explain the channel deposits which form the permeable lenses.
16. My second report was referenced U06/10 and its purpose was to attempt to delineate the plains aquifers vertically and horizontally.
17. I did not consider that this report to have much relevance to groundwater allocation issues or for determination of cumulative effects of groundwater abstraction. Unfortunately it has been used for such issues in the Rakaia – Selwyn hearing decision.
18. In paragraph 296 of that decision the commissioners speculate that I did not consider inter-aquifer linkages to be significant.
19. This is quite incorrect, and can be best illustrated by some work I did on aquifer recharge from border dyke irrigation at the Valetta scheme. This work is briefly mentioned on page 10 of Report U06/10 and more fully covered in ECan Report U06/11 (referenced in U06/10).
20. Near the eastern edge of the Valetta Scheme I showed that there were at least two distinct aquifers but despite this there is also strong evidence of a delayed recharge of the second aquifer from border dyke irrigation.
21. After the end of the irrigation seasons, water levels in the heavily pumped second aquifer in this area (during the period of monitoring) recovered to significantly above what would have been predicted from the downward trend in levels before the irrigation seasons started.

G.D.

22. I understand from the MSc thesis of James Dommissie that a more rapid recharge of second aquifer wells was noted within the Mayfield – Hinds scheme area. I see no reason to believe that the properties of aquitards in the Rakaia – Waimakariri area should be significantly different from those in the area between the Ashburton and Rangitata Rivers where delayed but significant recharge of deeper aquifers from border dyke irrigation occurs.
23. Thus in my opinion there are very significant inter-aquifer linkages in the plains aquifer system.

AFFIRMED by G R Davey

at Christchurch this *27* day of July 2008

Before me:

  
A K MacDuff  
Solicitor  
Christchurch

A solicitor of the High Court of New Zealand.