IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF applications by Williamson Holdings Ltd, Southdown Holdings Ltd and Five Rivers Ltd for a resource consents to take and use water

Evidence of Neal Borrie

INTRODUCTION

1. My full name is David Neal Houston Borrie. I hold the qualifications of BE (Hons) (Agricultural Engineering) and a Post Graduate Diploma in Civil Engineering from Canterbury University. I am a member of the Institution of Professional Engineers of New Zealand, and also a member of Water New Zealand. I am currently employed as a Senior Environmental Engineer by Aqualinc Research Ltd in Christchurch, and have worked in the area of water and soil engineering for over 36 years. I have undertaken a wide range of work for central government agencies, regional and local authorities, and private industries and businesses.

2. I have had experience in the design and operation of schemes for the land treatment of wastewater for agricultural wastes (such as beef feedlots, piggeries and dairies), industries (such as meat processing plants, fellmongeries, vegetable processing plants and mushroom composting facilities), and municipal sewage treatment plants. This has included; the design and commissioning of land treatment systems and the preparation of assessment of environmental effects reports, resource consent applications and waste management plans for their operation, and the presentation of evidence at resource consent hearings.

3. I was a contributing author to the NZ Guidelines for Utilisation of Sewage Effluent onto Land, a joint publication by NZ Land Treatment Collective and Forest Research.

4. I have been engaged by Williamson Holdings Ltd, Southdown Holdings Ltd and Fiver Rivers Ltd to provide evidence on her behalf, in relation to collection, storage and spreading of dairy effluent from the proposed dairy sheds and cubical cow barns.

5. I have read the Code of Conduct for Expert Witnesses issued as part of the Environment Court Practice Notes and I agree to comply with this code.

SCOPE OF THIS EVIDENCE

6. My evidence will cover:
   a) The housing of the cows.
   b) The effluent collection system including solids separation.
   c) The effluent storage ponds.
   d) The application of the liquid and solid effluent to the land.

PROPOSED DAIRY FARMS AND HOUSING OF THE COWS

7. It is proposed to establish dairy farming on the following properties in the Mackenzie basin; the Williamson Holding Ltd (WHL) Killermont property, the Southdown Holdings Ltd (SHL) Glen Eyrie Downs' property and the Five Rivers Ltd (FRL) Ohau Downs' property. The proposed details of these dairy farms are as follows:

   - On the WHL Killermont property to establish three separate stand alone dairy farms comprising of a total of 3,850 cows.
   - On the Glen Eyrie Downs' property to establish six separate stand alone dairy farms comprising of a total of 7,000 cows.
   - On the Ohau Downs' property to establish seven separate stand alone dairy farms comprising a total of 7,000 cows.
   - The number of cows in each of the stand alone dairy farms will range from 1,000 on Ohau Downs to up to 1,300 cows on the WHL Killermont property.

8. On each of the properties it is proposed that the cows will be housed in cubic cow barns for 100% of the time during the months of March to October and for 50% of the time during the summer months of November to February. The pasture on the properties will primarily be harvested under a cut-and-carry operation for feeding to the cows housed in the cubicle barns, with only limited grazing by the cows during the summer months.

9. On each of the stand alone dairy farms the cows will be housed in two cubical cow barns each housing between 500 to 650 cows. The cubical cow barns comprise of enclosed barns built on a concrete floor. The approximate dimensions of each cubical barn are 150 metres by 33 metres. (Refer to photos 1, 2 and 3 in the Annexure.) These barns comprise of cubicles for the cows and a concrete channel along the back of each cubicle to collect the cows' excreta. The feed is transported into the barn for the cows and the cows' effluent is collected by a mechanical scraper system. (Refer to photos 4, 5, 6 and 7 in the Annexure.)

10. The cows on each of the dairy farms will be milked at the properties by conventional methods for factory supply for up to 300 days of the year. On each of the stand alone dairy farms there will be a dairy shed for milking the cows. The cows will be walked from the cubicle barn to the adjacent dairy shed for milking.

VOLUME OF EFFLUENT PRODUCED

11. On the basis that each cow produces approximately 54 ℓ of raw effluent per day the total volume of raw effluent collected during the period while the cows are housed for 100% of the time from a 1,000 cow herd will be approximately 54 cubic metres per day.

12. The system at the dairy sheds and the cubicle cow barns will be been designed to allow for minimal water use. It is estimated that with washed down water from the diary sheds and the cubicle cow barns, plus an allowance for dirty stormwater, that the average total diluted effluent per day would be approximately 125 ℓ/cow/day (i.e. 54 ℓ of raw effluent plus 70 ℓ of washdown water and drainage water). For a 1,000 cow dairy herd this would equate to 125 cubic metres per day of diluted effluent.

EFFLUENT COLLECTION SYSTEM

13. On each dairy farm the effluent produced from both the dairy shed and the cubicle cow barns will be scraped and discharged into a sump. From the sump the effluent will be pumped to a mechanical solids separator, such as an effluent press, to separate the solids. (Refer to photo 8 in the Annexure.)

14. The liquid effluent exiting from the solids separator will be discharged into a storage pond until the summer months (i.e. October to March) when it will be applied to the areas designated for effluent application. The separated solids will be stored on a concrete pad or in a concrete bunker and these solids will be spread over the property predominantly during the summer months.

15. Any leachate drainage from the area around the solids press and from the solids storage area will be collected and discharged into the effluent collection system.

16. On the basis that the solids content of the raw effluent is 10%, the volume of solids produced by a 1,000 cow dairy herd that is housed for seven months is approximately 1,150 cubic metres.

EFFLUENT STORAGE PONDS

17. The proposed holding capacity of the liquid storage pond on each of the dairy farms will range from 30,000 to 37,000 cubic metres which will be able to provide for up to seven months storage.

18. It is proposed that each storage pond will be of earth construction partly below ground level and partly above ground level such that approximately 50% of the storage volume would be below existing ground level. It is proposed that the storage ponds will be lined with an impermeable geotechnical fabric liner to achieve a seepage rate not exceeding 10-8 metres per second. (Refer to photo 9 in the Annexure.)

19. The indicative dimensions of the storage ponds are:

    - Maximum water depth 2.5 metres;
    - Maximum storage depth of 3 metres (allows for 0.5 metre freeboard);
    - Batter slopes 2 to 1; and
    - Approximate dimensions at top water level range from 115 metres by 115 metres to 130 metres by 130 metres.

EFFLUENT DISCHARGE SYSTEM

20. The liquid effluent will be pumped from the storage pond and applied to the land by the centre pivot irrigators that are used to apply the irrigation water to the properties. It is proposed to inject the liquid effluent into the irrigation water prior to it being irrigated onto the land. The liquid effluent will be injected into the irrigation water at a ratio of approximately 5-10%. For example an application depth of 1 mm of effluent would equate to a nitrogen application of approximately 20 kg N/ha.

21. The quantity of liquid effluent applied to the land per pass by the centre pivot irrigators will be determined according to the nitrogen requirement of the pastures. The total application depth per pass of the irrigator (i.e. irrigation water plus liquid effluent) will be less than half of the average water holding capacity of the soils.

22. The liquid effluent will only be discharged to land during the summer months of October to March each year.

23. The separated effluent solids will be spread onto the property, by a travelling mechanical solids spreader, over the total area of the property. The quantity of solids applied to the land will be determined according to the nitrogen requirement of the pastures.

Backup Systems

24. The size of the liquid effluent storage pond (providing for up to 7 months storage) and the separated solids storage pad will provide adequate backup in the event of pump or machinery breakdown and will also ensure that effluent is not discharged during undesirable weather conditions, such as during periods of heavy rain, frozen or snow covered ground.

CONCLUSION

25. The proposed approach to dairy effluent collection and discharge to land has some significant benefits to conventional methods whereby stock graze directly from the land and also excrete solid and liquid waste randomly onto the land. In the more conventional format of farming there is no control over the excreta, other than restricting the movement of stock within specific areas of the farm. However the use of cubicle barns allows for the collection of effluent from the cows and for the managed spreading of this effluent across the farm ensuring the discharge to land is spread evenly, is at the optimum time and place for soil fertility and hence pasture growth, and in a manner that will mitigate potential environmental effects on water quality.

Dated: 16 October 2009

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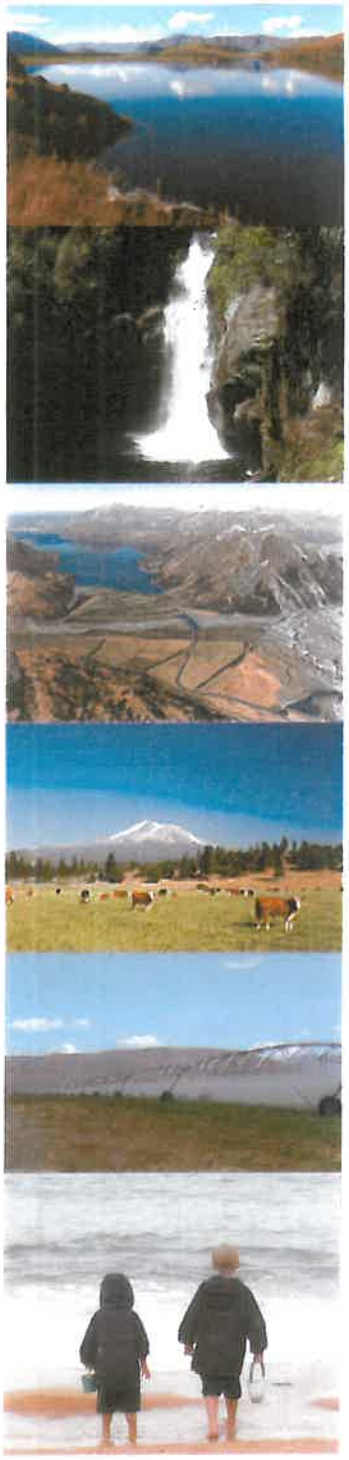

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Applications for Resource Consent by Williamson Holdings Ltd, Southdown Holdings Ltd & Five Rivers Ltd

Presentation to Hearing Panel

16 October 2009

Annexure Photograph Evidence of Neal Borrie

Photo 1: Outside view of a cubicle cow barn

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Photo 2: View inside a cubicle barn

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Photo 3: View of cows in a cubicle barn

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Photo 4: View of cows feeding in a cubicle barn

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Photo 5: Effluent scraper set in the concrete effluent collection channel AQUALINC

Photo 6: View of an effluent scraper working

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Photo 7: Effluent scraper discharging effluent into a drain at the end of the barn

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Photo 8: View of solids separator working

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Photo 9: Effluent storage pond lined with a geotechnical fabric liner

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