BEFORE THE CANTERBURY REGIONAL COUNCIL

CRC 60938

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of application CRC 60938
BY	**SJB MUNRO**
	Applicant

BRIEF OF EVIDENCE OF ALEXANDER WILLIAM SMITH

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INTRODUCTION

1. My name is Alexander William Smith. I have the qualifications and experience contained in Appendix I. I have read the Environment Court Code of Conduct for Expert Witnesses and comply with it.

2. I have been asked by Struan Munro to give evidence about agricultural and horticultural suitability, crop capabilities, and irrigation requirements relevant to the application site.

3. I have been supplied with a copy of the application for this matter, CRC060938, including the map of the subdivision. I have consulted members of the expert team assembled to advise on this matter.

4. This is an application to take and use surface water from Lake Aviemore, on or about map reference NZMS 260 140: 983-147. A maximum rate of 3 litres per second is sought for up to 100m^3 per day, with the volume not exceeding 24,000m^3 per annum. The purpose of the application is to irrigate a new activity being a 6-hectare vineyard.

SUITABILITY OF THE SITE

5. The site has excellent combinations of attributes for producing fine wines.

Aspect

6. This site is a gentle slope facing north from State Highway 83 to the shore of Lake Aviemore. The land will be warmer with this aspect than flat land. There is a substantial moraine-formed area of raised land to the east of the block. I have closely examined the site by walking over it and putting down test bores on two occasions. Both times there were cold easterly winds blowing at the Aviemore Dam. In contrast this site was well sheltered. The Munro subdivision was significantly warmer than at the dam itself.

Warmth

7. Based upon these observations and my knowledge of the district in general, which goes back some 45 years, I am sure that this site will have higher than normal heat units for the area, whilst retaining the

nighttime cooling so essential for high quality wines. I expect the heat units to be at least the equal of those at Cromwell. I have discussed this site with colleagues one of whom has had data loggers upon the property. There is no argument with my favourable assessment.

Soil

8. The soil is moraine-based. The original glacial deposit has been pushed around somewhat by moving water from above and the Waitaki River itself. The result is a very deep soil featuring very large and smaller-sized, loosely assembled rocks with a relatively coarse sandy loam between them. Drainage is very free. Easy root penetration can be expected to considerable depths. The large rocks of the topsoil radiate heat improving crop day temperatures.

Soil attributes for grapes and other crops

9. Some years ago I selected a remarkably similar alluvial and colluvial (off the side of a hill or cliff) soil in the lower North Island (Otaki) for a client who planted and grew pinot noir, chardonnay, and sauvignon blanc. His ambition was to grow a gold medal vintage. The first commercial pick of the pinot noir was made into a wine, which earned a gold medal at the annual Romeo Bragato awards ceremony. Further awards continue to flow from that 5 ha vineyard.

10. One cannot guarantee results. The Munro site however has the physical attributes to optimise chances of producing very fine wines. This site is also conducive to producing a wide range of other premium products. For example apricots, cherries, nectarines, peaches, plums, herbs and paeonies.

IRRIGATION WATER REQUIREMENT

11. The climate of this site is considerably warmer and drier than many sites upon the Waitaki, which are closer to the coast. Gerlach J.C. *Climatographs of New Zealand* Ruakura Agricultural and Horticultural Research Centre. Hamilton. Research Bulletin 74-1.1974 describes the climate at a series of places of relevance. The most useful is on page 136 being that for Cromwell. This record, taken over a period of considerably more than 10 years is the source of the evapotranspiration figures, which I use to calculate the crop irrigation needs for grapes.

12. There is a greater nor-west wind run on this site than at Cromwell. Using this knowledge and local privately collected statistics I have assessed irrigation water usage at this Aviemore site at 5% higher than at Cromwell.

13. Table 1 shows the expected water usage in the absence of effective rain. These irrigation requirements are for moisture, which comes into contact with and is absorbed by the soil. An allowance for evaporation losses during application will need to be made. It is presumed that wastage to drainage is zero. This implies top management and use of modern assessment equipment such as AquaFlex. No use has been made of savings, which may be available from very modern techniques such as Regulated Deficit Irrigation (RDI) or Periodic Drying Irrigation (PDI).

TABLE 1 – S J MUNRO: Water usages on Aviemore site (All figures are millimetres)

Month	E Pan – Cromwell	E Pan – Application site	Dairy Pasture	Grapes
S	39	41.0	41.0	21.3
O	62	65.1	65.1	33.9
N	81	85.1	85.1	44.2
D	105	110.3	110.3	57.3
J	109	114.5	114.5	59.5
F	90	94.5	94.5	49.1
M	73	76.7	76.7	39.9
A	44	46.2	46.2	24.0
TOTAL:	**603**	**633.4**	**633.4**	**329.2**

14. From basic metrics it is calculated that 1mm of rainfall across a hectare is 10m^3. Therefore for grapes 329.2mm per annum. or 3292m^3 per hectare is needed per year. Therefore 19,752m^3 per annum is required for the vines on the application site.

15. The rainfall on the site is likely to be similar on average to that at Cromwell. However useful rain in this area of the Waitaki Valley can be extremely fickle. I calculate that the amount of useful rainfall will be

approximately 80mm per annum in a normal year. This is 4,800m³ per annum for the 6 hectares involved. Useless rainfall is precipitation, which fails to penetrate the soil far enough to be available to the vines. Rain events of less than 5mm each are commonly counted as not useful.

16. It follows therefore that the crop irrigation need is 14,952m³ per annum. This is nett irrigation absorbed into the soil. An allowance of 15% for application evaporation needs to be made. This is 2,242.8m³ per annum. A total allowance for plant growth needs of 17,194.8m³ per annum is made.

17. The balance of the water is available for irrigation of shelter planting plus the requirements for frost protection. Shelter planting will use some 1,000m³ per annum. Drip type application is allowed for here.

Frost protection

18. Frost protection by overhead sprinkling on the site will require 6mm of precipitation per hour. This sprinkling rate remains constant whether the temperature is -1° C. or -5°. The water need may occur from bud swell in September until November.

19. From above the gross amount of water required will be 360 m³ per hour. This is not a nett take. The nett take is 3.6 m³ per hour. This is 1.0 litre per second. On this site the vast majority of the frost protection water will, within a few hours, flow back into Lake Aviemore having achieved its purpose. Even the water, which is absorbed into the soil and drains through the profile will also return to the waters of Lake Aviemore. Any irrigation requirement is covered by the above irrigation section. Therefore the nett take of water will be that which evaporates during the actual act of application during frost projection. I calculate this to be 1% of the application in total. So the nett take is 3.6m³ per hour for the 6 ha.

20. The actual frost protection times required will vary from year to year. I have allowed for eight frost events per annum each of 10 hours duration. The actual nett water requirement will be 288m³ per annum in an average year.

21. So the nett take of water for irrigation of the grapes and shelter plus frost protection is:

Vines	17,194.8m³
Shelter Planting	1,000m³
Frost Protection	288m³
TOTAL	**18,482.8m³**

22. The above calculations are based upon averages. The 5,517.2m³ remaining is for use in above normal droughts and frost seasons. In 50% of all years some of this prudent allowance will be required.

ECONOMIC COMPARATIVE VALUE OF THE IRRIGATION WATER

23. Table 1 shows that the requested volume of 24,000m³ per year is insufficient for adequate sustained growth of good-quality pasture. Good-quality pasture would require a little over 36,000m³ per annum.

24. The economic comparison made here is to compare the increases in gross margin, which may reasonably be expected from crops, which can be feasibly grown with the requested irrigation take upon the site. I have compared this with the performance of grazing stock on the un-irrigated site.

25. In addition to the grapes, apricots, cherries, nectarines, peaches and plums can be expected to perform well on this site. The requested take will suffice for stone fruit. Additionally peonies, eremurus and several herbs will also thrive. The fruit crops would require the full 24,000m³. Herbaceous and shrub crops may not require the full 24,000m³ of water.

26. The economic response from irrigation water to these crops will vastly exceed the present sheep gross margin (which will be less than $1,000 per hectare). The comparative annual gross margins are, for grapes $16,000 per hectare, cherries $30,000 per hectare, and apricots $20,000 per hectare. Sources for these numbers are:

    (a) grapes - my records;

(b) cherries and apricots - Lincoln University Farm Manual 2008; and

(c) other crops - my records.

Peonies and eremurus can be expected to match or exceed these economic values.

27. The annual economic response to microjet irrigation over drip type irrigation is grapes $4,000, cherries $7,500, apricots $5,000. Each response is for the use of an extra 2,242.8m^3 of irrigation water. These are some of the highest economic returns for water in all agriculture anywhere.

VERSATILITY OF THE SITE

28. This site is versatile. All of the crops listed above would have excellent chances of being profitable on the site.

29. The requested water take is an integral part of the proposed development.

30. The profitability from grapes and other potential crops will provide an excellent return for the water used.

THE ECAN WATER REQUIREMENT CALCULATION

31. I have carefully looked at the Environment Canterbury annual water calculation (contained in Maria Bartlett's section 42A report) and compared it with my estimate. The most significant matter is the amount of rainfall, which Ms Bartlett allows as effective in her calculation.

32. Ms. Bartlett allows for 200mm of effective seasonal rainfall and I allowed for 80mm. I must point out that the site has a gentle and constant slope from the Kurow-Omarama highway.

33. There are therefore two types of rain, which is not effective on this site. There are light rainfall events of less than 5mm in total precipitation. These do not generally contribute to the water available to the plants. The second is rainfall, which falls at a rate of greater than 4mm/hour. Much of this rain will run directly off the land and into Lake Aviemore.

34. The difference is 120mm over six hectares = 7200m³ adding this to the Environment Canterbury allowance of 16,500m³ gives a total of 23,700m³ without frost protection.

35. I've allowed for 288m³ nett as a requirement for frost protection.

36. It is proposed to meter the frost protection water usage separately to the irrigation use.

RESTRICTING THE USE TO A SINGLE CROP – GRAPES

37. This suggestion is unsupportable. It fails to take into account the cyclical ups and downs of economic performance of all crops. I've been in advisory practice in New Zealand for 43 years. In the same period of time I am aware of some farms in our country where the crops over the same period include pasture, apples, grapes, stone fruit, and this year apples were replanted again. No change in water right was required.

38. Suggesting such a condition for water use is being overly prescriptive and extending into the field of farm management and crop selection. This is extremely dangerous ground especially given the way that the Resource Management Act is interpreted and has been interpreted over the years.

39. All sorts of resource allocation problems arise. Including unnecessary administration requirement.

40. Condition 2 in the section 42A report should be deleted.

SINGLE APPLICATION METHOD CONDITION

41. There is a proposal in the Officer's Report to impose a condition requiring the use of drip type irrigation water application. Once again Environment Canterbury is being excessively prescriptive.

42. Drip irrigation is not the most effective irrigation method for grapes at this site. Drip irrigation would significantly restrict grape productivity. Soils at the site are sufficiently coarse that lateral spread of water from drip irrigation is minimal. Trials from the 1970s showed that productivity dropped by approximately 25%. This is for drip irrigation compared with microjet type sprinklers. The tests were carried out in a dry climate on coarse soils such as are prevalent on the applicant's site. Similar

problems also occur with the orchard crops mentioned elsewhere in this report.

43. At the same time drip type irrigation is the preferred irrigation option for peony culture and many herbs. Prescribing a specific method will lead to further unnecessary administration if the crop type on the site were to be changed.

44. It is understandable that Environment Canterbury wish to make certain that irrigation water is applied efficiently. The applicant agrees with this wish. The water take application is certainly not enough to allow the consent holder to be grossly wasteful. It will be in the best interests of the consent holder to use the most effective application method available to maximise the benefit from the water resource.

45. I believe condition 2 should be deleted and suggest the following condition:

> *"The method of application shall be such that 80% or more of the gross irrigation water applied shall be absorbed into the soil."*

46. The suggested condition ensures a high level of efficiency is gained from the application method, which does not unnecessarily constrain the farm management options. It also allows technical change and improvements to be incorporated into the system by the farmer without the need to seek a variation from Environment Canterbury.

60M-SETBACK AROUND THE LAKESIDE

47. This suggestion if implemented would leave some 20% less than 6 ha gross upon which to grow crops.

48. At the same time grapes and other orchard type enterprises have a great deal of attraction in an environment such as that at Aviemore. The metric nature of such plantings provides a complementary contrast with the wild non-planted areas, which are often too steep or too rocky for such enterprises. A large number of people find the plantings of the Waitaki and Clutha Valleys attractive in their own right. These vineyards tend to emphasise nature's hand in the landscape.

49. Wind shelter plantings are not proposed along the shoreline. People would be welcome to picnic and walk along the shore. No fence is

proposed along the boundary between the Munro land and that of Meridian. Views from the lake would be of a pleasant vineyard set back from the boundary of the Meridian Title. This boundary is already some 50m from the usual shoreline, and 10 to 30m from the high water mark

50. The area planted in vines to within 8m of the boundary with no boundary barrier as proposed will allow open access to beach walkers, pedestrians, picnickers, anglers and all other recreationists. This is similar to many vineyards on the Awatere River in Marlborough. Many kilometres of roads to the seaward side of Sefton in Marlborough have no boundary fences in a similar fashion.

51. I too find grapes are quite attractive in the rugged environment such as here on the applicant's land. Other attractive vistas with grapes include both sides of the Clutha Valley from Cromwell to Wanaka, the Queenstown, Frankton, Arrowtown basin. Also the Kawarau Gorge, Wanaka, Bannockburn and Cromwell. Myriads of photographs of these vineyards in all seasons of the year feature in publications worldwide. Many tens of thousands of such photographs are taken annually. They emphasise the attraction of the area as a whole including the natural landscape and the man-made vineyard and orchards. When I am taking new clients and guests through these areas they inevitably want to stop for a closer, more intense look and take the inevitable pictures or photographs. They find the resulting landscape extremely attractive. There is no need to mitigate the view, which this vineyard area will create. It will be an attraction in its own right.

52. It would be a significant negative step to push these vineyard plantings away from the water by some 80m. Water users would not have the opportunity of a relatively close-up look at the vineyard from the lake. Photo opportunities would be greatly reduced.

53. There is no environmental or horticultural reason for the Munro development to be set back from the boundary.

54. It would be economically very wasteful to set back as there would be a 20% loss in total production of grapes, flowers and/or any other orchard crop, which could be grown most attractively on the site.

55. Condition 3 suggested in the section 42A report should be removed.

WATER QUALITY MATTERS

56. The applicant accepts the Officer's Report where it notes that effects upon water quality would not be more than minor.

57. However, it is important that the fertiliser and soil nutrient levels associated with the vineyards and other potential crops on the site be described and compared with other options. In the case of wine grape vineyards it is not normal to apply much fertiliser at all. The usual situation is to take a soil test and prescribe the application of trace elements and major nutrients, which will be needed to grow the crop in a balanced way. On the site, I expect from my experience, that applications of boron at 15kg per hectare of borax, molybdenum at 125g per hectare of sodium molybdate, and elemental sulphur at 50kg per hectare along with 100kg of reactive rock phosphate will get the soil balanced prior to planting. These will be worked in to prevent leaching.

58. From then on recycling of weeds, grasses and vegetation from the site itself may be carried out. These are spread back along the rows to provide all of the nutrients required. In this way the wine eventually produced is seen as a product of the site itself, the soils, and the environment.

Nutrient Comparison Analysis

59. Grape production will lose fewer nutrients to the lake than dry land farming of sheep and cattle farming . Use of nitrogenous fertilisers is not encouraged as it makes the wine taste watery. A comparative analysis of the situation has been carried out. I estimate that dryland pasture on this site will produce some 1500kg of grazable dry matter per hectare per annum. Typically this dry matter contains 3% nitrogen as element nitrogen, which is largely a result of atmospheric nitrogen fixation by pasture legumes. It follows that this fixation yields 45kg of nitrogen element per hectare. The phosphate in the pasture will be 0.4%. This is 6kg of phosphorus element per hectare. Lesser amounts of the other 12 elements will also be produced.

60. Typically these nutrients are eaten by the stock. Stock retain some 60% of the nutrients. The balance of the nutrients are excreted back onto the

land in a relatively soluble form. Urea for much of the nitrogen for example.

61. On this site I calculate that some 30kg per hectare per year of total nutrients element is washed into Aviemore per hectare per annum from dryland stock farming.

62. In the grape case the main product is removed from the land. This reduces nutrient levels. Replacement may be required. Fertilisers are not used which are readily water-soluble. Prunings, weeds etc are spread back across the land. These returns eventually break down in the soil and help maintain nutrient levels without the spike of soluble material generated by stock. In the case of phosphorous, any application made will be in slow release form such as reactive rock phosphate. This releases over two years or more. Optimal P levels in the soil are lower than for pasture in my experience. This is noted in Hill Laboratory Guidelines. The vines are deeper rooted than grasses and their ability to intercept the nutrient and phosphate ions is greater than in most pasture. Any nitrogen used will also be in slow release form to maximise plant uptake. Most years no nitrogen will be required.

63. After taking all matters into account, I consider that less than 10kg of element nutrient per hectare per year will wash into Lake Aviemore.

64. Grapes are clearly better than dryland stock farming from a lake eutrophication perspective.

65. Cherries and all of the other tree crops listed above have lower eutrophication potential when compared with dairy farming and dryland grazing on this site. Once again the use of compost and natural fertilisers is becoming increasingly prevalent. Soil test levels are often lower. Fruits with quality and top flavours are the product of balanced growth with fertility levels in precisely the right range and irrigation application such that leaching of nutrients into the lake system is eliminated.

Agrichemicals and Fertigation

66. Agrichemicals are today increasingly applied in accordance with GAP protocols. GAP means Good Agricultural Practice. These protocols restrict inputs to safe levels. The protocols are subject to whole farm

audits for compliance. Dangerous chemicals of the past are banned (DDT, DDD, Lindane, Benlate, Difolotan, Metasystox and a large number of other materials). Modern materials are subject to much deeper scrutiny than in the past. Application rates are set to minimise environmental impacts. The effects of such activities will not be more than minor.

67. The applicant will accept a condition preventing the use of fertigation techniques. Fertigation is the incorporation of fertiliser in irrigation water. Fertigation on this soil on this site is not Good Agricultural Practice.

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