Before an Independent Commissioner
Appointed by the Selwyn District Council

Under	the Resource Management Act 1991
In the matter of	a hearing on Plan Change 79 to the Operative Selwyn District Plan
	Birchs Village Limited
	Proponent

Statement of Evidence of Mark Everest

17 April 2023

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Qualifications and Experience

1 My full name is Mark Rutherford Everest.

2 I hold a Bachelor of Agricultural Science (Hons) from Lincoln University and a certificate in Advanced Sustainable Nutrient Management.

3 I am a member of the New Zealand Institute of Primary Industry Management (NZIPIM), the regulating body for primary sector advisory professionals.

4 I have training in the use of Farmax, a farm modelling tool, and Overseer, a nutrient budgeting tool.

5 I have been working as a farm consultant at Macfarlane Rural Business (MRB) since January 2010. For the 13 years I've been with MRB, I have been operating as a farm management consultant working closely with farmers and industry to advise on best business strategy and management to run profitable businesses while balancing compliance requirements. As well as working with farmers I have also worked alongside industry and provided guidance on the Hinds limit setting process, nutrient management advice to Barrhill Chertsey Irrigation Ltd, Rangitata Diversion Race Management Ltd and Central Plains Water Ltd. I have also provided advice to District Councils on productivity and economic viability of land holdings with respect to subdivision plans.

6 I am familiar with Plan Change 79 (**PC79**).

Code of Conduct for Expert Witnesses

7 While this is not a hearing before the Environment Court, I confirm I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

8 My evidence covers the following:

(a) Availability constraints of nutrients and infrastructure required to enable the use of land for productive agricultural purposes.

(b) Regional impacts as a result of increased productive intensity of the 36.58 ha LUC 1 and LUC 2 land.

(c) The effective area of land currently available for land based primary production and loss of current effective area available for land based primary production.

(d) Potential constraints on rural productive uses from reverse sensitivity.

(e) The agronomic and economic viability of using the land classified as LUC 1 and LUC 2 land for land based primary production.

9 In preparing my evidence, I have reviewed in particular:

(a) Application documents relating to PC79;

(b) Submission PC79-0014 of Helen and Tom Fraser on PC79;

(c) Statement of Evidence of Mr Victor Mthamo dated 17 April 2023;

(d) Aqualinc's Memorandum for Birchs Village regarding irrigation water supply, dated 17 April 2023 (attached to this evidence as **Appendix 1**); and

(e) Clause 3.6 of the National Policy Statement for Highly Productive Land 2022.

Summary of Evidence

10 From a technical and economic perspective, the PC79 Site is constrained by water allocation limits, nutrient allocation limits and potential reverse sensitivity. Consequently, I am unable to conclude that the PC79 Site is capable of supporting highly productive land-based primary production even though the land to classed as highly productive.

11 I do not consider that there will be a reduction in the farmable pool of highly productive land in the Selwyn district as a result of PC79 as the land within PC79 is already subdivided to small land holdings (some as small as 5900m^2, 2ha and 2.6ha) demonstrating relatively low intensity uses. Productivity will likely continue to incur progressive reductions over time as a direct result of continued urbanisation of the Prebbleton area and the increased reverse sensitivity pressure of residents constraining odour and noise emissions from practices that enable the land to be managed in a highly productive manner.

12 Allocating the PC79 Site with the nutrient and water resources necessary for it to be run as a highly productive, land-based primary production unit could adversely impact catchment water quantity and quality objectives. Consequently, larger farming businesses in the catchment would need to compensate and make additional nutrient loss and productivity reductions to enable the catchment to meet its water quality objectives as set out in Plan Change 1 to the Canterbury Land and Water Regional Plan. A reduction in on farm profitability and productivity induces

reduced regional prosperity through reduced regional spending and lower levels of employment on farm.

13 Allowing the land to be re-zoned as Medium Density Residential and Business 1 would result in higher environmental and productive outcomes for the Selwyn-Te Waihora catchment, through reducing the risk of nutrient loss increase that would likely incur if irrigation was introduced to the PC79 land.

14 While the PC79 land can theoretically generate sufficient cash surpluses to provide the owners adequate remuneration for their efforts while run as commercial land-based primary production units, the return on capital of any assessed productive farm system option fails to meet the 4.0% ROC threshold. I therefore do not consider productive agriculture to be an economically viable use (having considered this over a 30-year timeframe) of the land.

15 The rezoning of proposed land from Rural Inner Plains to Medium Density Residential and Business 1 will have neutral rural economic and rural productivity impacts for the local community and catchment.

Availability Constraints of Nutrients and Irrigation Water

Resource Availability – Water

16 For land-based primary production to be highly productive from an agronomic perspective, the land manager or farmer must be able to ensure that pasture or crops do not incur undesirable soil moisture deficits. As discussed in paragraphs 43 to 59 of the Statement of Evidence of Mr. Mthamo, the Prebbleton location requires irrigation to ensure soil moisture deficits are not incurred.

17 The only irrigation water currently available to the group of properties is provided by a consent to take and use groundwater. The consent (CRC183694) held by 212 Birchs Road, permits the take of 4.9 litres per second.

(a) CRC183694 is limits the user to take only 657 cubic metres every eight days.

(b) The eight-day volume provides only enough water to irrigate 1.9 hectares of pastures, crops, vegetables or horticultural and viticultural uses.

(c) As the effective area within the Plan Change 79 site is nearly 27ha (as discussed further below), CRC183694 is insufficient to irrigate the land, with future productive capacity.

(d) From an agronomic perspective, if the land is to be able to be used for highly productive, land-based primary production, an additional source of reliable irrigation water is required.

18 Irrigation water is also not available from Central Plains Water Ltd (CPWL) as the Plan Change 79 site is outside the command area for irrigation detailed within the existing CPWL consents.

19 Additional groundwater for irrigation could be sourced and consented for the properties within Plan Change 79 if:

(a) annual volume was purchased from other consented water users in Selwyn-Waimakariri Groundwater allocation zone, and,

(b) the abstraction of the water did not result in any aquifer degradation or interfere with the reliability of any neighbouring bores, and,

(c) the abstraction and use meets the objectives of 1.3 (4) and 1.3 (5) of the National Policy Statement for Freshwater Management.

20 On the premise that water was available to cost effectively purchase as listed above at 20(a). I now step through the other factors that would need to be met.

(a) Initial hydraulic modelling undertaken by Aqualinc Research Ltd indicates that it would be difficult to obtain a consent to transfer groundwater for irrigation due to probable and significant negative impacts on neighbouring wells, and risks of water quality degradation in the catchment resulting from increased irrigation.

(b) Under section 1.3 (5) of the National Policy Statement for Freshwater Management, the Te Mana o te Wai hierarchy of obligations prioritises first, the health and wellbeing of water bodies and freshwater ecosystems before any use of water. From my perspective, it is difficult to see how additional water will be made available for the Site on the basis of the current environment and the application of this policy in future.

(c) The National Policy Statement for Freshwater Management also sets out National Bottom Line's for water quality with respect to nutrients for rivers and lakes as:

(i) Rivers: Annual median concentration of 2.4 mg Nitrate Nitrogen/litre (Table 6 – Nitrate (toxicity))

(ii) Lakes: Annual median concentration of 750mg Nitrogen per cubic metre (Table 3 – Total nitrogen (trophic state).

(d) The Water Services (Drinking Water Standards for New Zealand) Regulations 2022 establish the maximum acceptable value for Nitrate Nitrogen in drinking water at 11.3mg per litre.

(e) Land, Air, Water Aotearoa (LAWA) record a five-year median nitrate nitrogen concentration of 12.0mg/litre in well L36/0584 which is located within the Selwyn-Waimakariri groundwater allocation zone.

(f) Land, Air, Water Aotearoa (LAWA) record the five-year average state of water quality in Lake Ellesmere/Te Waihora at 2300mg Nitrogen per cubic metre. Far in excess of the National Policy Statement for Freshwater Management target of 750mg Nitrogen per cubic metre.

21 Given the LAWA water quality data suggests the water quality objectives of the of the National Policy Statement for Freshwater Management and the Water Services (Drinking Water Standards for New Zealand) Regulations 2022 are not currently being met in the Selwyn/Te Waihora zone, if the proposed use of irrigation water was likely to result in further degradation of ground or surface water quality, obtaining a consent would not be possible as:

(a) the first priority of Te Mana o te Wai would not be met,

(b) the activity would not be enabling water quality objectives of the of the National Policy Statement for Freshwater Management and the Water Services (Drinking Water Standards for New Zealand) Regulations 2022 to be met.

22 Assuming that it is possible to buy and transfer water to the PC79 site, I estimate that the cost of acquiring additional groundwater to sufficiently irrigate the Plan Change 79 area with groundwater would cost $295,908 as outlined in Table 1 below. My estimate of water acquisition is less than the cost estimate in paragraph 55 of Mr Mthamo's evidence as I have assumed only the current effective area of 26.92 hectares would be irrigated (

23 Table *2*) and only the transferred volume to be paid for as indicated in the Aqulainc Research Limited report. Mr Mthamo has provided a cost estimate for the whole 36.58 hectares and assumes paying for all water volume surrendered by the vendor. My cost estimate also includes a provision for consenting and establishment of a well and pump system referred to in paragraph 57 of Mr Mthamos' evidence.

Table 1: Costs of Irrigation Water Acquisition

Cost to Purchase Annual Volume	173,293m^3	$181,958
Consenting	PC sum	$50,000
Well and Pump establishment	1 unit	$63,950
Total Cost		$295,908

Table 2: PC79 Land Areas

	142 Birchs Rd	144 Birchs Rd	160 Birchs Rd	176 Birchs Rd	198 Birchs Rd	212 Birchs Rd	212A Birchs Rd	214B Birchs Rd	Group Total
Area (title)	0.59ha	7.23ha	2.58ha	2.07ha	4.05ha	4.05ha	12.01ha	4.01ha	36.58ha
Area (effective)	0.00ha	4.71ha	1.99ha	0.00ha	3.13ha	3.30ha	10.40ha	3.39ha	26.92ha

24 Effective area is the land which is available to land based primary production. It is land not occupied by infrastructure, access lanes, gardens or yards.

25 I consider that the purchase and transfer of water rights to the Plan Change 79 area would be the only technically feasible way to irrigate the site given the groundwater zone is over-allocated. The acquisition of groundwater would be subject to availability, commercial negotiations with vendors, approval of regional council and approval of potentially affected neighbours. It also doesn't take into account the current reality of fragmentation of ownership.

Resource Availability - Nutrients

26 The Selwyn-Te Waihora catchment, Rule 11.4.13 in the Canterbury Land and Water Regional Plan (CLWRP), requires that farms greater than 10 hectares must reduce their nitrogen loss to water from the baseline (defined as the nutrient loss averaged over the 48-month consecutive period within the period 1 January 2009 to 31 December 2013), in accordance with Sub-Regional Policy 11.4.16(1)(b).

27 While none of the of the properties in the PC79 Site are greater in size than the 10 hectare threshold required to consider the property a farm by the CLWRP, collectively, if the total 36.58 hectares is run as one management unit (farm), the activity of introducing irrigation typically contravenes Rule 11.4.13 as irrigated land based production systems result in increased nutrient losses to water and other farmers in the catchment would have to make further nutrient loss reductions in order for the catchment to meet its water quality targets as set out in the CLWRP for the Selwyn – Te Waihora catchment.

28 Satellite imagery of the PC79 land holdings and land use descriptions provided by submitter PC79-0014 (Helen and Tom Fraser) indicate that the site is currently used for horse training, hay or silage sales and lamb finishing. Without irrigation water, I consider these low intensity production systems.

29 OverseerFM modelling indicates that the farming system as described by Helen and Tom Fraser would result in nitrogen losses of approximately 7kgN/ha/year. As the properties are not located in the Phosphorus and Sediment Risk Zone, the CLWRP permits the properties to increase their nitrogen losses from farming activities to 15kgN/ha/year without seeking resource consent from Regional Council. Resource consents for increased nitrogen losses to water from land based production are required as the introduction of irrigation typically results in increased nutrient losses which can aggravate catchment water quality objectives.

30 Modelling of farm system options in OverseerFM indicated that while irrigated viticulture, pipfruit and lamb grazing based systems would not result in increased nutrient losses to the catchment, the introduction of an irrigated vegetable production and arable system would result in an increase in nutrient losses to the catchment.

31 The relatively low nitrogen loss baseline of 7kgN/ha/year limits productive activities that might be undertaken on the PC79 site to low intensity pastoral agriculture, or low impact horticultural or viticulture activities if irrigation water could be obtained.

32 The National Environment Standards for Freshwater 2020 (NES-F) applies further restrictions on land, precluding operators from undertaking intensification changes from the "reference period" defined as 1 July 2014 to 30 June 2019. These restrictions include:

(a) Clause 22: Changing land to land use to include dairy or dairy support requiring a land use consent.

(b) Clause 26(4)(a): A farm seeking to increase intensive winter grazing to an area greater than 10% or 50ha of the total area of the farm, whichever is the greater, and exceeding that which occurred in the reference period, also requires consent.

33 NES-F regulations would preclude the properties included in PC79 from increasing (introducing in this instance) intensive winter grazing of forage crops, introducing dairy heifers or converting to dairy farming without consent from Regional Council. This is particularly important for PC79 Site which does not have high baseline nutrient losses.

34 I have recently been involved in applications to increase intensive winter grazing area and introduce dairy heifers, and while it is possible to obtain resource consent to do so, successful applications have only been for properties which have a history of high nutrient losses:

(a) Consent CRC213226 to increase the area of dairy farm land was recently approved, as the application sought no increase in irrigation and no increase operational intensity as the farm started with a high nitrogen discharge baseline.

(b) Consent CRC145237 to increase irrigated area and increase winter forage crop intensity was recently declined, as the application sought an increase in operational intensity and additional water take despite the applicants modelling indicating no environmental degradation.

35 While productive farm systems could be implemented which are compliant with the nutrient loss constraints of the PC79 Site, the increasing effects of reverse sensitivity will likely result in a lower level of harvested produce relative to the level of nutrient input:

(a) If there is less yield (crop) removed from the land and the same level of nutrients are provided to the plants (nutrients applied as though the plants would not be limited by disease), there will be increased nutrient losses from the subject property and consequently in the catchment which is subject to drainage and leaching.

(b) Increased losses of nutrients from one farm in a catchment require other farms to make further loss reductions in order to meet the catchment targets.

(c) If the remaining properties in the catchment are not able to compensate for the aggregative increased nutrient losses of smaller land holders, water quality targets risk not being met which consequently risks the community not achieving the water amenity and food supporting cultural values sought.

(d) If the PC79 Site is retained for land-based primary production, there is significant risk of increased nutrient losses to the catchment. In order for the catchment to meet its water quality objectives as set out in Plan Change 1 to the Canterbury Land and Water Regional Plan, the remaining farmers in the catchment will need to make additional nutrient loss and productivity reductions to compensate for the PC79 Site increase in nutrient losses. A consequence of this reduction in on farm productivity and profitability has a direct negative impact on regional prosperity, through reduced employment and reduced input spending in the community.

36 Due to nutrient and irrigation water availability constraints, the properties within PC79 should therefore only consider farm systems which include trading livestock, horticulture, viticulture or grain, seed and vegetable crop production.

37 If the nutrient losses from the PC79 Site were able to be allocated to another un-constrained land holding through retirement of the subject land from land-based primary production, the Selwyn Te Waihora catchment would be environmentally advantaged, and, would sustain its economic prosperity.

Reverse Sensitivity Considerations

38 As urban land uses encroach on areas traditionally used for rural production, there is increased social pressure on farmers to comply with the convention of a residential setting, and associated expectations. Commonly these arise through burn-offs or spraying for example.

39 Objectionable odour can often be detected despite aerosol chemical residues being well below registered maximum residue limits. The thesis of JN Brown published in 1997 discussed how odour can be detected hundreds of metres from the site of application[1].

40 Canterbury Regional Council has developed rules to manage the effects of odour, they are:

(a) The Canterbury Regional Policy Statement, Rule 14.3.4 requires operators to avoid adverse effects of agrichemical sprays drifting beyond property boundaries or onto non-targeted properties.

(b) Canterbury Air Regional Plan Rule 7.77 requires that fertiliser spreading and agrichemical spraying does not cause an offensive or objectionable effect beyond the boundary of the property.

41 While the Canterbury Regional rules create provision for control of activities, the interpretation of the term objectionable can vary depending on the setting.

(a) A public example of this is the halting of spraying gorse in Wellingtons Belmont Regional Park farm in 2022. The spraying was halted due to a number of factors including objectionable odour. The Regional Park is both a farm and partially open to the public.

(b) In a traditional rural only setting, in my experience, the spraying of gorse and the emission of odour associated with the agrichemical products is considered acceptable as a result of being common practice.

(c) A further example of differing interpretation of objectionable is the introduction of Crop Residue Buffer Zones for Timaru and Ashburton in response to managing smoke and ash over densely populated areas. In traditional rural-only areas smoke and ash from stubble fires is considered acceptable or tolerable as a result of being common practice.

42 Rural production generally requires a different set of amenity values to be able to sustain itself, including:

(a) Residentially objectionable noise later than 7pm and before 7am on a regular basis as a consequence of land management and stock management activities.

[1] Brown, N.J., (1997), Agricultural Spray Drift and Odour, *Lincoln University*

(b) Residentially objectionable odour beyond the property boundary resulting from livestock or agricultural activities such as spraying.

(c) Residentially objectionable air pollution from time to time related to cropping activities such as burning residues as part of an integrated pest management strategy or dust originating from cultivation.

43 The listed activities above are considered standard practices in areas dominated by productive agriculture and/or horticultural farms. If the practices are not compatible with residential neighbours, then the productive capability of the land will be constrained. Practices relating to productive agriculture are often time critical, therefore altering timing to manage the above can negatively impact productivity.

44 PC79 Site is bounded with residential subdivision to the North and services, adjacent to a residential subdivision to the North East (PC72), and with Kakaha Park to the East, and shares a boundary with rural lifestyle with residential houses and sections to the West. Any farm operator of the PC79 Site would likely expect to have to operate a more conservative farm programme to comply with residential expectations. A more conservative farm programme, such as the dryland livestock system described below, results in poorer profitability and often makes properties economically unviable.

45 Kakaha Park is projected to have significant increases in patronage with the development of seven sports fields and accompanying human and dog exercise areas. While the sports facility will create a visual transition between rural and residential settings, due to the fact that the site will be frequently visited by large numbers of sports people and supporters the park is unlikely to create an amenity transition between residential and rural land uses. The park, while an open space, will likely be patroned by visitors predominantly from residential settings, and bringing with them the same expectations regarding amenity value. As such, the same pressures on rural production as discussed in paragraph 42 are likely to be applied to land surrounding Kakaha Park.

46 While properties neighbouring the PC79 Site have increased vegetable production in recent years, the properties in the Plan Change 79 are in much closer proximity to residential dwellings and would be significantly more impacted by reverse sensitivity effects.

Economic Viability

47 In this economic viability assessment of land-based primary production on the PC79 Site, I have assumed that the Site would be run as one contiguous management unit in the interest of providing a more optimistic rather than pessimistic economic assessment. For land holdings (sometimes less than 40

hectares) machinery ownership becomes uneconomic and obtaining contractors to undertake machinery work becomes difficult due to the small scale. There is no minimum size cut off where contractors will not complete work, rather contractors timing becomes very inconsistent or the establishment fees (cost of the contractor to turn up) make intensive land practices prohibitively expensive.

48 I define economic viability of a farming business as being able to satisfy two objectives:

(a) Objective One: Remunerate the owners of the land (if they are owner operators) equivalent to the weighted average salary of employees in the agricultural sector, scaled pro-rata based on the amount of time required to run the "farm". The average remuneration for agricultural employees in the 2022 Federated Farmers – Rabobank Farm Remuneration Report is $67,567; and

49 Objective Two: Generate a Return on Capital (RoC) acceptable for the class of country. On flat land in Canterbury, RoC[2] should be at least 4.0%.I have assessed the productive capability of the land, identifying nine possible land use options.

50 In my analysis I have only considered the economics of selling product wholesale to a further processor or retailer. Any further value added to product by a processor or retailer should be attributed to the investment in processing or retail facilities, not production.

51 Of the nine possible land use options, four would be practically viable based on the probability of compliance with planning frameworks. The practically viable land use options and excluded options are:

(a) Practically viable land uses:

(i) Dryland Livestock and Arable Production (part irrigated with existing consent);

(ii) Pipfruit/Apples (irrigated);

(iii) Viticulture/Grapes (irrigated);

(iv) Lamb grazing and strawberry production (irrigated);

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[2] Return on Capital is calculated as Earnings Before Interest, Tax, and Rent (EBITR) divided by Total Investment Cost (land, buildings, plant, machinery, livestock, supplier shares).

(b) Excluded options due to physical limitations:

(i) Vegetable production (irrigated). Discounted as the nutrient losses modelled in OverseerFM for vegetable production exceed the 15kg N/ha/year permitted loss rate. Due to probable exceedance of nutrient loss rate, irrigation water transfer is unlikely.

(ii) Diary heifer grazing (irrigated). Discounted as the nutrient losses modelled in OverseerFM for dairy heifer grazing exceed the 15kg N/ha/year permitted loss rate. Due to probable exceedance of nutrient loss rate, irrigation water transfer is unlikely.

(iii) Dairy milking (irrigated). Discounted as the nutrient losses modelled in OverseerFM for a full-scale dairy farm exceed the 15kg N/ha/year permitted loss rate. Due to probable exceedance of nutrient loss rate, irrigation water transfer is unlikely. Reverse sensitivity associated with effluent deemed as significantly greater than other propositions.

(iv) Cattle finishing (irrigated). Discounted as the nutrient losses modelled in OverseerFM exceed the 15kg N/ha/year permitted loss rate. Due to probable exceedance of nutrient loss rate, irrigation water transfer is unlikely.

(v) Livestock finishing, Vegetable and Arable production (irrigated). Discounted as the nutrient losses modelled in OverseerFM for vegetables production and arable crops exceed the 15kg N/ha/year permitted loss rate. Due to probable exceedance of nutrient loss rate, irrigation water transfer is unlikely.

52 I have prepared financial budgets for four practicably viable farm systems. One farm system is based on using existing limited irrigation water resources and three farm systems assume additional irrigation water can be acquired:

(a) Systems based on existing irrigation resources:

(i) Dryland livestock and arable production (as a representation of a more intensive production system given the existing irrigation resources),

(b) Systems based on acquisition of additional irrigation water:

(i) irrigated apples (as a proxy for pipfruit);

(ii) Irrigated grapes;

(iii) In-ground strawberry and cut and carry pasture operation (as a proxy for high value horticulture crops within a rotation).

53 While there are other high value land-based primary production land uses that the subject land could support, there are significant chemical applications required to produce an economically viable crop. The reverse sensitivity impacts of residential neighbours objecting to the use of aerial applied insecticides, herbicides and fungicides render these systems (primarily based on vegetable production) economically unviable, as a direct result of negative impact on crop yield.

54 Assuming irrigation water is acquired to enable the irrigated farm systems to be executed, the following economic likelihoods are probable. A summary of the capital and operational budgets for the four farm systems I have considered are outlined in Table 3 below.

Table 3: Financial Analysis of Farm System Options

	93% Dryland 7% Irrigated Livestock and Arable	Apples	Grapes	100% Irrigated Strawberries and Pasture/Lambs
Operating Budget				
Nett Farm Income	$1,780 /ha	$54,945 /ha	$22,246 /ha	$26,148 /ha
Total Expenses	$1,705 /ha	$42,814 /ha	$14,305 /ha	$22,155 /ha
Earnings Before Interest, Tax and Rent (EBITR)	$75 /ha	$12,131 /ha	$7,941 /ha	$3,993 /ha
EBITR/26.91ha	$2,017	$326,455	$213,696	$107,447
Pro-Rata Owner Remuneration (included in cash expenses)	$22,181	$0	$0	$17,702
Capital				
Land (Rating Valuation)	$732,104 /ha	$732,104 /ha	$732,104 /ha	$732,104 /ha
Irrigation Water (additional)	$0 /ha	$10,996 /ha	$10,996 /ha	$12,200 /ha
Land Improvements	$0 /ha	$141,852 /ha	$95,852 /ha	$2,185 /ha
Plant and Machinery	$557 /ha	$10,405 /ha	$557 /ha	$575 /ha
Total Capital	$732,661 /ha	$895,544 /ha	$839,696 /ha	$ 749,249 /ha
Return on Capital	0.0%	1.4%	0.9%	0.5%

55 From an economic perspective, all four assessed physically viable land based primary production systems show a positive EBITR[3].

56 Apples and Grapes are horticultural land use options considered in this analysis because they result in nitrogen leaching of between 4kgN/ha/year and 8kgN/ha/year. These nutrient losses align with the anticipated nutrient baseline for the site.

57 While I have considered Apples and Grapes as viable economic options, there is considerable agrichemical spraying (even for organic production) activities undertaken to enable healthy plants to generate a viable yield. Some crops can be sprayed up to 30 times per year. If spraying is deemed by neighbours as objectionable (reverse sensitivity effects constraining the farming operation), then

[3] EBITR is Earnings (Income less direct expenses) Before Interest, Tax and Rent

these crops would not be viable as the disease build up makes the end produce unsaleable.

58 For the strawberry option I have elected to grow these on a four-year rotation to ensure longer term sustainability, in alignment with the 30-year time horizon of the NPS-HPL. Strawberries are subject to yield decimating host specific diseases such as Phytophthora root rot or Verticillium Wilt, the ingress of which can be managed by rotating strawberries through the same land not more regularly than once every four years. As only 25% of the land holding is planted in strawberries at any one time the remaining area planted in pasture for three years and the grass being grazed by trading lambs or sold as silage. While the Earnings Before Interest and Tax per hectare (EBIT/ha) for the area sown in strawberries is significant at $12,105/ha, the much lower EBIT/ha obtained from the soil regenerating phase of the pasture results in a projected farm average EBIT/ha of only $3,993/ha

59 With residential and lifestyle properties and Kahaka Park present within 100 metres of the North, West and East boundaries of the PC79 Site; and a significant component of all irrigated systems requiring the use of agrichemical application, there is significant risk of reverse sensitivity could curtail necessary yield optimising practices for the assessed land-based primary production systems.

60 I note that all of the farm system options attained the targeted Pro-Rata Owner Remuneration Target for the 26.9 effective hectares. The systems which contain livestock require significant owner input, whereas the other options use a predominance of contract labour. As trading livestock and arable properties gain scale, the component of labour does not increase linearly. As an example, it takes approximately the same amount of time to shift one mob of 20 head of cattle as it does to shift one mob of 150 head of cattle.

61 While the Remuneration target of Objective One is met for all five of the farm system options evaluated, none of the options meet the 4.0% RoC threshold, primarily due to the underlying cost of land. As a result, no prudent operator would invest in the properties within the PC79 Site for the purposes of developing or expanding an economically viable land based primary production system.

62 With the most profitable land use option (Apples) not fulfilling the minimum RoC threshold of 4.0%, the land within CP79 should not be considered as land that would be economically viable for land-based primary production.

63 With no higher-value land use alternatives emerging, and a history of erosion of real profits, I do not consider the economic viability of the land within Plan Change 79 if used for land-based primary-production will change for at least 30 years:

(a) Real agricultural profits erode over time[4]. While advances in techniques, science and tools has enabled productivity gains, much of the productivity gain has been absorbed by increased costs. An example of this is summarised by the Beef and Lamb economic report for South Island breeding and finishing farms, which shows:

(i) In 2014, the farm group generated a $30.89/stock unit farm profit (1.78% Return on Capital)

(ii) In 2023, the farm group are forecasted to generate a $33.66/stock unit farm profit (1.14% return on capital)

(b) As agricultural profitability has reduced (relative to costs of living) over time, the scale of farms has needed to increase to remain economically viable. If there were marginally viable agricultural land options available currently, it is unlikely that they would remain viable in 30 years.

64 Despite the land being classed as productively capable by the Land Resource Inventory, due to both its small scale and the high capital cost, I cannot find an economically viable or securely productive land use.

65 My concern for productive and economic viability for the land within PC79 as either one contiguous unit or as eight individual units of land is amplified by the threat of residential neighbours objecting to necessary agricultural practices such as late-night noise and chemical spraying in future years.

National Policy Statement for Highly Productive Land

66 The rezoning of the PC79 Site from Inner Plains to Living Medium Density Prebbleton Zone and Business 1 Zone satisfies Clause 3.9 of the National Policy Statement for Highly Productive Land, as the rezoning satisfies sub clauses (2)(f) and (3).

(a) The rezoning of land would result in reduced nutrient losses and an aggregative but small increase in water quality, which progresses the catchment towards attaining the water quality targets of the Selwyn Te Waihora zone implementation plan and water quality targets set out in National Policy Statement for Freshwater Management, therefore satisfying Clause 3.9 (2) (f) of the National Policy Statement for Highly Productive Land.

[4] Erosion of real profits is a term which describes that while farms are continuing to remain as profitable over time, inflation devalues that profit over time.

(b) The subdivision of the PC79 Site will result in no change to the availability of Highly Productive land able to be used for highly productive land-based primary production. The land in the PC79 area is has already been fragmented into a total of 10 titles averaging 3.6 hectares in size. The small land holdings show no indication of historic intensive use, primarily due to the constrains of irrigation water availability. With all except three land titles possessing a residence, the significant risks of reverse sensitivity effects on highly productive, land-based primary production systems constrains the likelihood owners will invest in highly productive uses of the land. While the soils may be assessed as highly productive in the Land Use Classification system, the management constraints imposed by small lot subdivision results in no reduction in land available for highly productive uses, satisfying clause 3.9 (3) (a) of the of the National Policy Statement for Highly Productive Land.

(c) The land contained within the PC79 Site is enveloped by rural residential dwellings or residential facilities with residential amenity value on all boundaries except the south. The property to the southwest of the Plan Change 79 area is used predominantly for process vegetable production. There will be no likely increase in reverse sensitivity effects on the property to the southwest of the PC79 Site as the property to the southwest already shares a common boundary with residential dwellings, subjecting the property to the southwest to reverse sensitivity effects of residential amenity values. Consequently, there will be no likely increased reverse sensitivity effects on land-based primary production activities resulting from the subdivision of PC79 Site, satisfying Clause 3.9 (3) (b) of the National Policy Statement for Highly Productive Land.

67 Under clause 3.10 of the of the National Policy Statement for Highly Productive Land, land may be subdivided if there are permanent or long-term constraints.

(a) As assessed above, the most economically viable land-based primary production system probable on the PC79 Site would be Apple production. The Return on Capital resulting from Apple production is only projected to be 1.4%, which is insufficient to conclude economic viability, satisfying Clause 3.10 (1) (a).

(b) Due to the already fragmented land holding (10 titles), the land is unlikely to be used for highly productive, land-based primary production due to catchment constraints on nutrient and irrigation water allocation. Consequently, there is no loss of productive capacity of highly productive land in the district satisfying Clause 3.10 (1) (b) (i) of the National Policy Statement for Highly Productive Land.

(c) The PC79 Site is already highly fragmented into 10 titles averaging 3.6 hectares each. The probability of another land-based primary producer purchasing or leasing the effective area in the Plan Change 79 zone to run in conjunction with an existing operation is highly unlikely due to access constraints, irrigation water and nutrient allocation constraints and probable reverse sensitivity effects.

(d) As the PC79 Site already contains residential dwellings, there will be no further increase in reverse sensitivity effects on surrounding land-based primary production as a result of rezoning of the medium density PC79 Site.

68 The constraints on highly productive, land-based primary production being undertaken on the PC79 Site are not likely to change in the coming 30 years. In addition, Te Mana o te Wai provides that the first priority use for water is for the health and well-being of water bodies and freshwater ecosystems, constraining the increased use of available water resources for irrigation purposes.

69 I consider the fragmentation, irrigation water availability, catchment nutrient allocation constraints and potential reverse sensitivity impacts constraining the highly productive land contained within the PC79 Site to less than highly productive uses will consequently render the land uneconomically viable for land based primary production. I consider these constrains are unable to be mitigated against and will have a permanence for at least the next 30 years.

Conclusion

70 The National Policy Statement for Highly Productive Land, Section 3.6(1)(c) permits the re-zoning of highly productive land if, among other factors, the environmental, and economic benefits of rezoning outweigh the costs of losing highly productive land to land-based primary production.

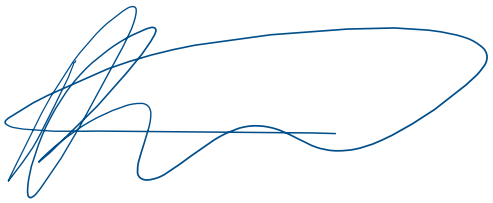
71 I consider that retaining the 36.58 hectares of land in PC79 as Inner Plains, will incur progressively reduced productivity over time due.

72 Retaining the 36.58 hectares of land for land-based primary production and providing the land with sufficient nutrient allocation and water resource (if available) to enable the land to operate productively, combined with aggregative increases in nutrient losses resulting from reduced productivity induced by reverse sensitivity effects could adversely impact catchment water quantity and quality objectives. Consequently, the remaining farmers in the catchment will need to make additional nutrient loss and productivity reductions to enable the catchment to meet its water quality objectives as set out in Plan Change 1 to the Canterbury Land and Water Regional Plan.

73 Allowing the land to be re-zoned as Living Medium Density Residential Prebbleton and Business 1 would result in higher environmental and productive outcomes for the Selwyn-Te Waihora catchment, through reducing the risk of an increase in nutrient loss that would likely incur through the introduction of irrigation to enable the PC79 Site to be operated productively.

74 While the PC79 Site can theoretically generate sufficient cash surpluses to provide the owners adequate remuneration for their efforts, the return on capital of any assessed productive farm system option fails to meet the 4.0% ROC threshold. I therefore do not consider productive agriculture or horticulture to be economically viable uses (having considered this over a 30-year timeframe) of the land.

75 The rezoning of proposed land to Living Medium Density Prebbleton and Business 1 will have neutral rural economic and rural productivity impacts for the local community and catchment.



Mark Everest

Dated this 17th day of April 2023

Memorandum

To:	Ryan Geddes	**Of:**	Birchs Village Limited
From:	Bayley Pearce	**Date:**	17/04/2023
Subject:	Birchs Village Limited – Irrigation Water Supply		

Introduction

This memorandum has been prepared for Ryan Geddes of Birchs Village Limited. The purpose of the memo is to outline the process for trying to secure a water supply for irrigation of 36.58 ha of land located south of Hamptons Road, west of Birchs Road and east of Springs Road, Prebbleton. The memo also outlines the main assessments that will be required to secure a water supply and comments on the whether these may cause a barrier to being able to secure such a supply.

Resource Consent CRC183694

Part of the subject property is served by resource consent CRC183694, which is for the take and use of groundwater from bore M36/1910 for the irrigation of land shown on plan CRC010648. The area shown is a 4 ha block (Lot 2 DP 27551). This consent authorises a take of up to 4.9 L/s, with a volume of 657 m^3 per 8 consecutive day period. This consent expires on the 31 January 2035. Bore M36/1910 is 17.5 m deep and screened from 13.9 m to 17.5 m. This is the only active groundwater resource consent located in the proposed housing development area.

This consent provides an average daily volume of 82 m^3/day. This equates to a flow rate of 0.95 L/s if the well was to be pumping consistently for 24 hours. This consent is limited to irrigate the 4 ha area. At the present time there is no mechanism to change this consent to enable the irrigation of any other land than the 4 ha currently identified on the consent. Although this consent does not currently have a seasonal volume, when one is imposed this will be calculated based on an area of 1.9 ha. This is because ECan require that the volume is based on an irrigated area based upon 0.5 l/s/ha.

Due to the limitations of consent CRC183694, other means of getting water to irrigate the property must be considered. A transfer of groundwater from another consent in the same groundwater allocation zone is the only option that is viable in this situation.

Groundwater Transfer

The transfer of groundwater from one site to another can only occur within the same groundwater allocation zone. This site is located within the Selwyn-Waimakariri combined groundwater and surface water allocation zone. A groundwater consent within this zone that is for sale will need to be found.

As this site is located within the Selwyn-Waimakariri combined groundwater and surface water allocation zone, ECan Land and Water Regional Plan (LWRP) Rule 11.5.38 applies, whereby 50% of the total volume transferred needs to be surrendered. However, you only pay for the water received, not the total amount of water purchased (i.e. you don't pay for the 50% that is surrendered).

There is a significant roadblock in this Groundwater Allocation Zone related to transfers. Rule 11.5.38 applies which has a condition which states that the bore interference effects, as set out in Schedule 12, need to be acceptable. If they are not acceptable, Rule 11.5.41 is applicable which makes the proposed transfer a prohibited activity. This status means that the regional council cannot accept an application for this activity.

What this means is that the well interference assessment will have to show that the effects upon all neighbouring bores are acceptable. The way ECan interpret this is that they will not accept the written approval from the owners of any potentially affected bores as mitigation. This is alarming as written approvals are often needed for this type of application and, as can be seen below, there could be many potentially affected bores in the area.

Consent Application Considerations

To enable the transferred water to be used, a consent application needs to be submitted to Environment Canterbury. As part of this consent application, the actual and potential effects on the environment must be assessed.

The main topics to be included within the accompanying assessment of environmental effects are:

a) Potential effects upon neighbouring bores

b) Potential effects upon surface water features

c) Potential effects upon water quality

There are numerous other topics that will need to be covered within the application, although these are the three that pose the greatest risk of frustrating the consent transfer.

a) Potential effects upon neighbouring bores

The effect on neighbouring bores is assessed by carrying out a well interference assessment, in accordance with Schedule 12 of the LWRP.

To assess the likely effects upon neighbouring bores, an understanding of the likely aquifer parameters is required. Aqualinc have obtained aquifer parameters in this locality from the ECan wells database. There is insufficient data available to enable a robust assessment of well interference to be carried out. In these circumstances we look to see what aquifer parameters may be available in the wider area. This can enable indicative assessments to be carried out, using a range of aquifer parameters in order to test sensitivity.

The assessments we have carried out assume that a new bore will be drilled in approximately the same location as existing bore M36/1910. This approach has been taken based on the assumption that power is available in this location. The assessments have used a 7-day and 150-day flow rate of 15.62 L/s. An assessment assuming that each section of the proposed sub-division drilled their own bore has not been carried out because the results of the environmental assessment will be similar to those outlined below.

Figure 1 shows all bores within a 2 km radius of bore M36/1910 that have the potential to be affected. There is a total of 209 bores in the 2 km radius of bore M36/1910 ranging in depth from 3.8 m to 138.9 m. The majority of these bores are relatively shallow, with 82% being 30 m deep or shallower.

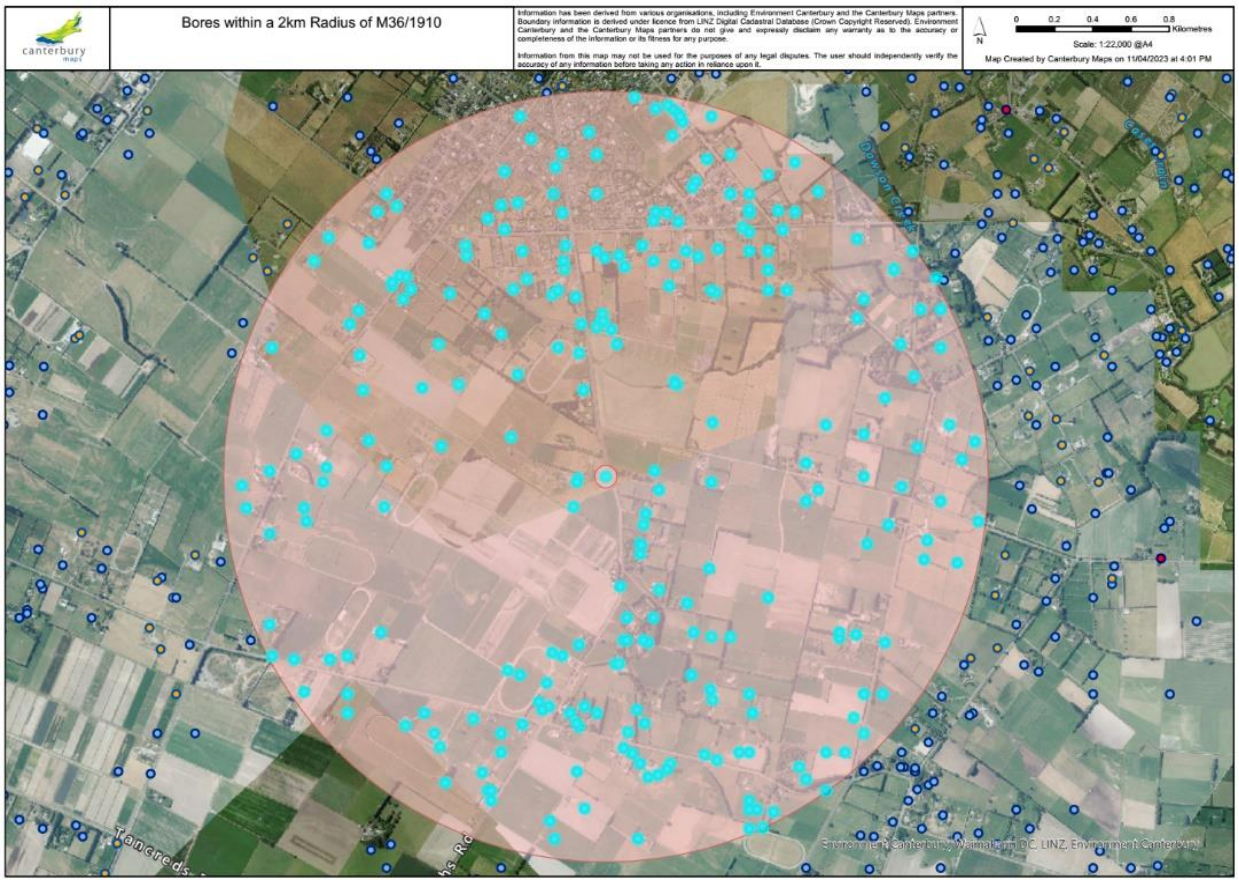


Figure 1: Map showing bores within a 2 km radius of M36/1910

There are 2 accepted methods for determination of aquifer parameters. The first of these is a step test, which only provides an indication of one of the aquifer parameters (transmissivity). This enables an initial conservative assessment to be carried out. We have assumed a number of different transmissivity values (T) and the results indicate that the effects upon neighbouring bores are very likely to be in excess of those allowed for by the LWRP.

Even with a proposed deeper bore, that is less likely to affect other bores in the area, at a T value of 1000 m^2/day 193 bores were affected within a 2 km radius of bore M36/1910. At a T value of 2000 m^2/day, 181 bores were affected. At a T value of 3000 m^2/day 165 bores were affected. At a T value of 4000 m^2/day 160 bores were affected and at a T value of 5000 m^2/day 151 bores were affected. This is outlined in table 1 below.

Table 1: Number of bores affected when running well interference using Theis method

Transmissivity Value (T) m^2/day	Number of Bores Affected
1000	193
2000	181
3000	165
4000	160
5000	151

Given the number of affected bores using the Theis method, further assessments were carried out with aquifer parameters from constant rate tests that have been performed in the general area. This provides us with some indication of likely parameters. There are 3 such tests, which range between 2.5 km and 3.5 km from bore M36/1910. We have used these parameters to run indicative well interference assessments.

Table 2: Number of bores affected when running well interference using Hunt-Scott method with some constant rate test parameters in the area.

Transmissivity (T) m^2/day	Storativity	Leakage (m)	Sigma	Cut off Depth (m)	Number of Bores Affected
3500	0.0005	6236	0.1	15	36
3500	0.0005	6236	0.1	30	0
3000	0.0009	500	0.1	15	1
3000	0.0009	500	0.1	30	0
1200	0.00025	775	0.1	15	23
1200	0.00025	775	0.1	30	0

At the existing bore depth of 17.5 m, it is calculated that a high number of neighbouring bores will be affected and getting a consent application to transfer water will likely not be accepted by the council. The assessments above were run with a proposed bore depth of 120 m. In these assessments cut-off depths were used. The results of this show that if pumping from the subject bore has a drawdown effect upon bores less than approximately 20 m deep, there is a high likelihood that the assessment will show some bores are potentially adversely affected.

Therefore, it will also need to be proved via testing that abstraction from that bore does not impact upon water levels in the upper water bearing zones of the groundwater system. If this testing is not favourable, the application will become a prohibited activity under rule 11.5.41 of the LWRP. This status means that the regional council cannot accept an application for this activity.

What this means is that there is no guarantee that drilling a deeper bore will result in no surrounding bores being affected, and there is a high degree of risk that testing will not prove that effects are acceptable, which is frequently the case for this type of application where there are numerous bores in close proximity.

b) Potential effects upon surface water features

There are some surface water features in this area, including springs and drains. Further work would be required to understand whether the existing bore on the property (screened from 13.9m bgl) may be hydraulically connected to these features.

It is likely that a deeper bore is required to ensure that surface water flows are not impacted by any proposed groundwater abstraction.

c) Potential effects upon water quality

Adding or increasing irrigation to a property is likely to increase the flushing of nutrients. This can be due to an intensification due to the introduction of the irrigation, although is also driven by the fact that more drainage occurs on irrigated properties. An application to transfer groundwater allocation would need to be accompanied by an assessment of the likely effects the introduction of irrigation may have upon water quality.

Until relatively recently such an assessment would tend to focus mainly on nitrogen losses to groundwater, although more recently the regional council requires an understanding of what may happen to overall water quality.

We are in an interesting situation with transfers in Canterbury at the moment. As part of the decision-making process ECan will need to consider the concept of Te mana o te wai. This means that in the consenting process the health and wellbeing of the water body needs to come first. If the allocation of groundwater being transferred to this property has not been used recently (which will typically be the case), then the transfer represents an increase in the total amount of water being taken from the groundwater resource. This may not be considered to be prioritising the health of the groundwater system. Given this situation, there is potential for transfers of currently unused groundwater allocation to become a thing of the past. If, (or when) this happens, it may become extremely difficult to successfully transfer water allocation to this property.

Key Messages and Conclusions

- A deeper bore will likely need to be drilled.
- A groundwater transfer will need to take place. Whilst it may be possible to find water allocation to purchase, it may not be possible to get a transfer application accepted and approved by ECan and local Iwi.
- If a deeper bore was drilled, a constant rate test will need to be performed on the new bore. However, it is possible that the aquifer parameters derived from the testing may not be favourable.
- The test will need to conclude that pumping from the subject bore will not have an effect upon bores shallower than approx. 20 m. If this is not proven, and the effects exceed those allowed for within the LWRP, the transfer will be a prohibited activity (and cannot be applied for). Written approvals from bore owners are not accepted in this Groundwater Allocation Zone.
- The effects of adding irrigation on water quality will need to be assessed and accepted by ECan and local Iwi. This could prove to be a difficult task.
- If all technical issues can be dealt with, and if the results show that everything complies with the requirements of the LWRP, there remains a risk that assessment of the proposal against the concept of Te mana o te wai would mean that it is not possible to transfer groundwater allocation.

The conclusion we draw from this is that it will be difficult to get an irrigation consent for this property due to the groundwater allocation zone it is in, the likely negative effects on neighbouring bores and the high risk of ECan and the local Iwi not accepting the application due to negative effects on water quality and Te mana o te wai.