Before the 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 Victor Mthamo

17 April 2023

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Qualifications and Experience

1 My full name is Victor Mkurutsi Mthamo and I am a Principal Consultant for the environmental science, engineering and project management consultancy Reeftide Environmental and Projects Limited. I have been in this role for almost 9 years. Prior to this I was a Senior Associate with the surveying, environmental science and engineering, and resource management consulting firm CPG New Zealand Limited (now rebranded to Calibre Consulting Limited), where I was also the South Island Environmental Sciences Manager. I have worked in the area of environmental science and engineering for over 27 years.

2 I have the following qualifications:

(a) Bachelor of Agricultural Engineering (Honours) with a major in Soil Science and Water Resources (University of Zimbabwe);

(b) Master of Engineering Science in Water Resources (University of Melbourne in Victoria, Australia); and

(c) Master of Business Administration (University of Zimbabwe).

3 I also hold an Advanced Certificate in Overseer Nutrient Management modelling qualification.

4 I am a member of Engineering New Zealand (MEngNZ) and am a Chartered Professional Engineer (CPEng) and an International Professional Engineer (IntPE). I am a past National Technical Committee Member of Water New Zealand and New Zealand Land Treatment Collective (NZLTC).

5 My experience and expertise includes:

(a) Stormwater planning, catchment hydraulic and hydrological modelling and design.

(b) Presenting evidence at a regional council hearing on catchment wide modelling that I carried out to assess the effects of flooding in the lower reaches of the Waitaki catchment in South Canterbury.

(c) Regular engagement by Christchurch City Council (**CCC**) as a Three Waters Planning Engineer. In this role as a stormwater planning engineer I review stormwater designs and modelling by various engineers from consulting firms and I peer review their reports (concepts, calculations and detailed designs) and provide them with the required guidance for solutions that are acceptable to the CCC. As a result, I am conversant with various hydrological modelling tools, flooding assessments and flood mitigation.

(d) Designing and implementing of numerous on-farm irrigation schemes, soil investigations and land use assessments. Examples of projects include Hunter Downs Irrigation Scheme, North Bank Hydro Project, Mararoa-Waiau Rivers Irrigation Feasibility Study and the North Canterbury Lower Waiau Irrigation Feasibility Assessment.

(e) Assessing large subdivisions in relation to stormwater management, earthworks and the associated actual and potential impacts on soils, groundwater and surface waterways and how to effectively use erosion and management control plans to mitigate the potential impacts that may occur during the construction works.

(f) Assessing effects on soils and groundwater associated with onsite and community wastewater discharge systems such as the Wainui Community wastewater discharge consent.

(g) Assessing actual and potential effects on groundwater and surface water associated with groundwater and surface water takes.

(h) Providing quarry soils and rehabilitation expert evidence for the extension of the Road Metals Quarry on West Coast Road in Templeton in 2018. My evidence at the hearing covered the effect on soils and groundwater resulting from the changes to site levels post rehabilitation. I assessed the effectiveness of adopting a 300 mm topsoil layer and whether or not this was sufficient for plant growth and providing contaminant attenuation, treatment and removal to protect the underlying groundwater.

(i) Acting as a soils and rehabilitation expert witness for the proposed Roydon Quarry in Templeton in 2019 and 2020. Fulton Hogan's proposal was for the establishment of a quarry and extraction aggregate. I provided an assessment of the soils' versatility and the effect of the requested changes to the land use on the land's productivity potential.

(j) Acting as an expert witness at the proposed Fulton Hogan Miners Quarry extension in 2020 and 2021. I provided an assessment of the soils, their versatility and productivity potential with and without mitigation post quarrying.

(k) More recently, I have been involved with a number of Plan Changes. These include:

    (i) Plan Change 66 (PC66) in Rolleston.

    (ii) Plan Change 67 (PC67) in West Melton.

    (iii) Plan Change 68 (PC68) in Prebbleton.

(iv) Plan Change 71 (PC71) in Rolleston.

(v) Plan Change 75 (PC75) in Rolleston.

(vi) Plan Change 69 (PC69) in Lincoln.

(vii) Plan Changes 80-.82 (PC80-PC82) in Rolleston.

(viii) Plan Change 73 (PC73) in Rolleston.

6 This evidence is provided in support of Birchs Village Ltd (**BVL**) private plan change request to rezone approximately 37 ha of land from Rural Inner Plains to Living Medium Density Prebbleton and Business 1 in an area south of Hamptons Road, west of Birchs Road and east of Springs Road, Prebbleton (**Site**). My role has been to provide advice in relation to the versatile soils and potential loss of productive land as a result of the rezoning.

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 is presented on behalf of BVL. It addresses matters relevant to the capacity of the Site for primary production, and in particular, criteria relevant to rezoning of the Site under the National Policy Statement for Highly Productive Land 2022 (**NPS-HPL**).

9 In preparing this evidence, I have reviewed:

(a) PC79, and its supporting technical assessments;

(b) My evidence for the submission seeking rezoning of the Site on the Proposed Selwyn District Plan;

(c) The evidence of Mr Mark Everest and Mr Fraser Colegrave;

(d) The NPS-HPL;

(e) The Council Officer's section 42A report on PC79;

(f) Relevant submissions on PC79.

Executive Summary

10 I understand that rezoning can only occur under NPS-HPL[1] where it is necessary to meet the development capacity requirements of the National Policy Statement on Urban Development 2020 (**NPS-UD**), and where:

(a) There are no other reasonably practicable and feasible options for providing that capacity within the same locality and market while achieving a well-functioning urban environment; and

(b) The benefits of rezoning outweigh the long-term costs associated with the loss of HPL for land-based primary production, taking into account both tangible and intangible values.

11 The Site's productive capacity is constrained by the following factors:

(a) Soils. While the soils are predominantly classified as Land Use Capability (**LUC**) 1 – 2, wetness is a factor that constrains the productive use of parts of the Site.

(b) Moisture deficits and irrigation availability. The Site has a single consent. The available irrigation water is not sufficient to meet the water demand of arable agriculture. It is currently not possible to apply for new resource consents for that purpose, so irrigation of the Site could only occur if existing consents were transferred from other sites.

(c) Nutrient limits. The Site is in a red nutrient zone. Strict nutrient limits are currently in place through the Canterbury Land and Water Regional Plan (**CLWRP**) which would significantly constrain the use of nutrients at the Site. In my opinion, those limits are unlikely to ease in the short or medium term.

(d) Reverse sensitivity. The Site is next to a newly established sports field, Kakaha Park. In my opinion, establishing and maintaining any primary production activities will result in adverse effects on mainly young people who will use the park. This can be managed through the use of a dense landscaped buffer. However, such a buffer will reduce the availability of land for the actual production activities, in turn further limiting its productive capacity.

(e) Fragmentation. The Site and the land around it are in fragmented ownership. Consolidating ownership to create a large contiguous block that can be farmed intensely will be difficult, if not impossible. Fragmented ownership is well documented as a hindrance for intensive land use productivity. On this

[1] Clause 3.6 of the NPS-HPL 2022.

basis, it is unlikely that the productive potential of the LUC Class 1 and 2 soils will ever be realised for the Site even assuming other constraints such as lack of irrigation water are addressed.

12 Alongside these factors, the 'costs' of losing the Site for land-based primary production must also, in my opinion, be considered in the context of land which would remain available for those activities within the Selwyn district and the Canterbury region. In particular, of all the "HPL" in those geographical areas, the Site represents a reduction of only 0.0044% and 0.026% respectively.

13 Put simply, BVL's Proposal would result in the loss of negligible amount of land which, while it may be "highly productive" in terms of the NPS-HPL definition, is subject to a number of constraints which significantly limit its productive capacity over the long term.

14 In that context, I support PC79 in terms of clause 3.6 of the NPS-HPL and the wider objectives of that document.

Description of the Site, Current and Proposed Plan Change Proposal

15 BVL seeks to rezone approximately 37 ha of land from Inner Plains to Living Medium Density Prebbleton (**LMDP**) and Business 1 (**B1**) in an area south of Hamptons Road, west of Birchs Road and east of Springs Road, Prebbleton under the Operative Selwyn District Plan (**OSDP**). The location of the Site is shown in **Attachment 1**.

16 The Site consists of nine rural residential lots and has a total area of approximately 36.58 ha. Table 1 below provides details of the individual lots.

Address	**Legal Description**	**Area (ha)**
57 Hamptons Road	Lot 2 DP 29035 & Lot 2 DP 43993	7.2300
142 Birchs Road	Lot 1 DP 43993	0.5904
160 Birchs Road	Lot 3 DP 29035	2.5798
176 Birchs Road	Lot 1 DP 21433	2.0651
198 Birchs Road	Lot 1 DP 27551	4.0468
212 Birchs Road	Lot 2 DP 27551	4.0468
212A Birchs Road[2]	Lot 1 DP 407808	4.0
		4.0
		4.0
214B Birchs Road	Lot 2 DP 344727	4.0108
Total		**36.5791**

Table 1 – Details of the Individual Land Parcels

[2] 212A Birchs Road holds a subdivision consent for 3 x 4 ha lots.

Description of the Site Soils

Soil Properties

17 S-Maps Online[3] and Canterbury Maps[4] provide details of the soils under the Site. The soils are primarily Eyre, Templeton and Wakanui soils. **Attachment 2** shows the location of the soil types, areas of each soil sub class and the properties of the soils.

Land Use Capability

18 The Land Use Capability (**LUC**) is described by Lynn et al. (2009)[5]. It is a general purpose, qualitative evaluation system which has been widely applied in New Zealand for land use planning, especially for management and conservation. The land use capability:

(a) Is the broadest grouping in the capability classification;

(b) Classifies land according to properties that determine its capacity for sustainable production for cropping, pastoral farming, forestry and soil/water conservation;

(c) Reflects general versatility of the land and gives the general degree of limitation to use, taking into account the physical limitations to sustained production; and

(d) LUC classification system defines eight LUC classes. Classes 1–4 are classified as arable land, while LUC Classes 5–8 are non-arable. Versatile soils are defined as Class 1, 2, or 3 soils as delineated by the New Zealand Land Resource Inventory (New Zealand Soil Bureau amended 1986).

19 **Attachment 3** shows the potential land uses and the relationship between the versatility and LUC classes.

20 S-Maps Online, Canterbury Maps and the New Zealand Land Resource Inventory (NZLRI) Portal provide details of the default LUC Classes within the Site.

21 I have attached (**Attachment 4**) an image showing the LUC Classes under the Site. In Table 2 below I provide details of the areas under each LUC Class.

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[3] https://smap.landcareresearch.co.nz/

[4] https://canterburymaps.govt.nz/

[5] Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF 2009. Land Use Capability survey handbook: a New Zealand handbook for the classification of land, 3 rd ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science. 163 p.

LU Class	Area (ha)	Percentage
1w	4.97	13.59%
2w	31.61	86.41%
Total Area	**36.58**	**100%**

Table 2 – LUC Classes within the Site

22 The "w" in Table 2 indicates *"soil wetness resulting from poor drainage or a high-water table"* (Refer to **Attachment 2**) as the dominant limitation on the Site's productive capacity.

The National Policy Statement for Highly Productive Soils

Highly Productive Land

23 The NPS-HPL was gazetted on Monday 19 September 2022 and is in effect from Monday 17 October 2022. It aims to protect Highly Productive Land (**HPL**) for use in land-based primary production, both now and for future generations.

24 The NPS-HPL:

(a) "…provides direction to improve the way highly productive land is managed under the Resource Management Act 1991 (RMA). This is achieved through clear and consistent guidance to councils on how to map and zone highly productive land, and manage the subdivision, use and development of this non-renewable resource".

25 The NPS-HPL defines highly productive land as:

(a) "…land that has been mapped in accordance with clause 3.4 and is included in an operative regional policy statement as required by clause 3.5 (but see clause 3.5(7) for what is treated as highly productive land before the maps are included in an operative regional policy statement and clause 3.5(6) for when land is rezoned and therefore ceases to be highly productive land)".

(b) Clause 3.5(7) states that "Until a regional policy statement containing maps of highly productive land in the region is operative, each relevant territorial authority and consent authority must apply this National Policy Statement as if references to highly productive land were references to land that, at the commencement date:

(i) is

(A) zoned general rural or rural production; and

(B) LUC 1, 2, or 3 land; but

(C) is not:

(1) identified for future urban development; or

(2) subject to a Council initiated, or an adopted, notified plan change to rezone it from general rural or rural production to urban or rural lifestyle".

26 As discussed in Paragraphs 18-22, the NZLRI mapping confirm that 100% of the site is LUC 1 and LUC 2.

27 Until that regional identification (through mapping) occurs, the NPS-HPL (including its various constraining provisions) will only apply to land that, at the commencement date of the NPS-HPL, meets the transitional definition of HPL[6] as long as the land is:

(a) zoned general rural or rural production; and

(b) LUC 1, 2 and 3 land.

28 "LUC 1, 2 and 3 land" is defined in the NPS-HPL as land identified a Land Use Capability Class 1, 2 or 3, as mapped by the NZLRI or by any more detailed mapping that uses the Land Use Capability classification.

Criteria for Rezoning - Clause 3.6 of the NPS-HPL

29 PC79 seeks to rezone the Site for urban purposes, under Clause 3.6 of the NPS-HPL urban rezoning is only authorised where:

(a) the rezoning is required to meet the development capacity obligations of the NPS-UD; and

(b) there are no other reasonably practicable and feasible options for meeting those obligations within the same locality and market while achieving a well-functioning urban environment; and

(c) the benefits of the urban rezoning outweigh the longer-term environmental, social, cultural and economic costs associated with the loss of HPL for land-based primary production, taking into account both tangible and intangible values.[7]

[6] National Policy Statement for Highly Productive Land 2022, Clause 3.5(7).
[7] NPS-HPL, clause 3.6(1).

30 Clause 3.6(2) requires that in assessing (b) above, consideration must be given to a range of options including rezoning of land that is not highly productive as urban, and rezoning different HPL that has a relatively lower productive capacity.

31 In his evidence Mr Colegrave addresses the NPS-UD requirements. The focus of my assessment is therefore on supporting the alternative options assessment required under (b). The cost-benefit analysis associated with the loss of the site for land-based primary production under (c) is discussed in more detail in the evidence of Messrs Colegrave and Everest.

32 As I outlined in Paragraph **Error! Reference source not found.** above, my evidence discusses the productive capacity of the proposed plan change Site.

(a) This is critical to the assessments required in Paragraphs 29-31 above.

(b) Identification of preferable alternative locations for primary production will depend (in part) on the capacity of those locations to accommodate primary production compared to the plan change Site.

(c) Any costs associated with the loss of HPL also directly correlate to its relative capacity to support primary production over the long term. If the land is a low productive value, then any costs associated with the loss of that land will be low/negligible.

Productive Capacity of the Site

Productive Capacity

33 "Productive capacity" is defined in the NPS-HPL as "*the ability of the land to support land-based primary production over the long term, based on an assessment of:*

(a) *Physical characteristics (such as soil type, properties, and versatility); and*

(b) *Legal constraints (such as consent notices, local authority covenants, and easements); and*

(c) *The size and shape of existing and proposed land parcels.*

34 Based on my desktop analysis and observations at the Site, there are a number of factors, in my opinion, that would significantly constrain the ability to undertake land-based primary production at the Site. I discuss these factors below and where applicable, I have discussed the extent to which those limitations could be feasibly managed (or not).

Soil Properties

35 I demonstrated in Paragraphs 21-22 above that the soils within the plan change Site are LUC 1 and 2 soils. This theoretically indicates their suitability for arable cropping as I discuss in Paragraph 18.

36 While the soils may be in LUC 1 and 2 or versatile, the soils have a significant physical constraint which is wetness.

37 I have presented the soil drainage properties in **Attachment 2**. While only 11% of the soils are imperfectly drained the rest of the soils while well drained do have wetness as a potential constraint as well.

38 Poor management and excessive wetness or poorly drained soils affect production as some crops/plants do not do well in these soils. Reid and Morton (2019)[8] carried out surveys of commercial crops in Hawke's Bay and Gisborne in 1998–99 and 1999–2000 and concluded that "…*70% lost yield because of insufficient or poorly timed irrigation, and 84% lost yield because of inadequate nutrition. The nutrients most usually in short supply were nitrogen (N) and phosphorus (P). However, extra fertiliser will not compensate for poor crop establishment, water stress, or waterlogging due to heavy rain, excessive irrigation or poor drainage*".

39 Regardless of the management strategies some plants/arable crops do not tolerate waterlogged soils. A few examples of these are:

(a) Swedes;

(b) Barley;

(c) Chicory;

(d) Lucerne is highly susceptible to waterlogging due to lack of oxygen reaching the deep tap root;

(e) Pipfruit, stonefruit, berryfruit and avocadoes which experience stunted growth particularly in late winter-spring when soils are waterlogged and bordering on anaerobic;

(f) Carrots; and

(g) Onions where *Pythium spp.* can cause root decay of established onion plants under conditions of poor soil drainage.

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[8] http://www.processvegetables.co.nz/assets/Uploads/Nutrient-Management-for-Vegetable-Crops-in-NZ-Manual-Feb-2019.pdf

40 The list above is only a small sample of crops affected by poor drainage and this demonstrates that while the soils are labelled versatile soils, they do have inherent limitations that reduces the range of crops that can be grown. This results in a lack of crop diversity which in turn leads to recurring soil and plant diseases.

41 In summary, poorly drained areas will generally not be able to achieve the productive potential assumed by just looking at their LUC classes.

Soil Moisture

42 I analysed the soil moisture deficits for the Site using the climatic data from the Selwyn District Council Burnham Wastewater Treatment Plant (Agent No 4880). This station has data from 1953 to 2020.

43 The analysis showed that:

(a) There was an average of 109 and a maximum of 167 days per year when soil moisture deficits were experienced. Most of these deficits were from later in spring and throughout the summer months.

(b) The mean monthly moisture deficits in the summer months range from 55-146 mm.

(c) The maximum moisture deficits in the summer months range from 86-149 mm.

(d) For example, the average deficit of 122 mm in January would need at least an equivalent amount of irrigation water to ensure that the soil moisture stayed between field capacity and the allowable depletion point.

44 These soil moisture deficits demonstrate the critical need for irrigation water if agricultural productivity on the Site is to be maximised, as these soil moisture deficits stunt crop growth regardless of the soil's natural capital.

45 Below, I discuss the availability of water to meet the assessed soil moisture deficits.

Water Availability/Irrigation

46 I assessed the irrigation water requirements for the Site using a software programme called IrriCal[9]. This tool is approved by Environment Canterbury and uses one of the methodologies recommended in the Canterbury Land and Water Regional Plan (**CLWRP**) i.e., it estimates the irrigation requirements in 9 out of 10 years for pasture assuming an irrigation system with an 80% efficiency.

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[9] http://mycatchment.info/.

47 The annual irrigation volume I estimated using IrriCal is presented in Table 3 below.

Irrigated Catchment	Irrigated Area (ha)	Annual Volume (m^3)
PC79 Site Area	36.58	276,545

Table 3 – Annual Volumes Required Over the Site

48 There is one irrigation consent within the area and this is located at 212 Birchs Road. The consent CRC183694 is associated with Well M36/1910.

49 Consent CRC183694 permits:

(a) The taking and using water at a rate of 4.9 L/s.

(b) The taking of a volume not exceeding 657 m^3 in any period of eight consecutive days.

50 There is no annual volume on the consent CRC183694. However, using Schedule 13 of the Canterbury Regional Land and Water Plan (**CLWRP**) states that "*where the water permit is to take water for irrigation use, either the annual volume calculated using Schedule 10, or the annual volume calculated using the average daily rate of take derived from the water permit x 212 (days), whichever is the lesser*". The annual volume is 82.125 m3/day x 212 days = 17,410 m^3.

51 There is, therefore, a shortfall of 259,135 m^3 (the volume in Table 38 less the existing consented annual volume of 17.410 m^3). This will need to be provided if the land is to realise it's full productive potential based on the LUC classes.

Practicality and Cost of Getting the Water

52 The site is within the Selwyn-Waimakariri Groundwater Allocation Zone. This zone is over-allocated and applications for new consents to take groundwater for irrigation are prohibited under the CWLRP.

53 The only other possible option to acquire water for irrigation would be to buy and transfer an existing consent to the site. With regards to the transfer of consents:

(a) I have looked at the trading history at Hydrotrader[10] – while there was water available for purchase within the zone at the time of writing this evidence this does not mean that there will be available in future.

(b) The CLWRP (Rule 11.5.38(4)) requires 50% of any volume transferred be surrendered. That is, a consent or consents with a combined annual volume

[10] http://hydrotrader.co.nz/trade-history

of 518,269 m^3/year would have to be purchased to provide the annual volume of 259,134 m^3/year.

54 The average price of water on Hydrotrader is \$1.05/m^3 which means the required 518,269 m^3 would cost almost \$544k. This is a prohibitive cost. For low margin crops it will take several years to recoup this cost this is even before the opportunity cost is taken into account.

55 The almost \$544k cost of water is a huge initial cost. Once the required volume has been sourced a consent has to be sought to transfer the volume to the site.

56 A requirement of the transfer is for an applicant to demonstrate that they can actually take the flow and volume at the site. This process is done by carrying of a well interference assessment. In this assessment the applicant has to demonstrate that in taking that water they will not cause well drawdown effects on neighbouring wells. To this end I note that:

(a) The BVL's Site is comprised of several small blocks. This means the drawdown effects (usually assessed on bores within 2 km of a bore on each separate lot within the site will extend well beyond the site given the likely groundwater parameters (e.g. transmissivity and storativity).

(b) All the properties that are non-urban rely on groundwater wells as their source of potable, stock and irrigation water. There is a total of 44 wells in use. The potential drawdown effects on these wells cannot be understated and this will limit the consentability of new wells within the lots that make up the Site.

(c) Therefore, even if the required annual volume was to be found this may not be able to be abstracted for irrigation use due to the impact on neighbouring wells.

(d) In addition to the cost of water (Paragraph 54) the following costs would also be incurred per each of the lots that make up the Site:

(i) Drilling and equipping the well which would cost \$100,000-\$200,000.

(ii) Irrigation equipment would cost \$20,000-\$50,000/ha depending on the irrigation system type.

(iii) These costs further reduce the economic viability of any land based enterprise as they are such a large upfront cost.

57 For completeness, I also not that it is also unlikely that water from Central Plains would be available for the Site given the number of properties upstream of the Site for which it would be more economic to irrigate with Central Plains water.

58 The unavailability of irrigation water and/or the high cost to access water makes the economics of irrigated production a significant hindrance to intensive production.

Nutrients

59 Strict nutrient limits currently apply to primary production activities. The CLWRP includes numerous provisions that regulate land use and farming activities. These provisions make it difficult to intensify land use and agricultural production and thus constrains the productive potential of the land/soils irrespective of the LUC Class. Examples of policies in the CLWRP that relate to farming intensity are:

(a) Policies 4.34-4.36 relate to management of nutrient loss from farming among other activities.

(b) Policies 4.37 to 4.38H which apply to individual farming activities, nutrient user groups and farming enterprises.

(c) Policy 4.38 which restricts increases in nitrogen loss from farming activities to no more than a total of 5kg/ha/yr above the Baseline GMP Loss Rate.

(d) Policies 4.41A-D require that applications for resource consents for farming activities be accompanied by a Farm Environment Plan that has been prepared in accordance with Schedule 7.

(e) Policy 4.74 require resource consents for the use of land for farming activities and the associated discharge of nutrients in catchments that are zoned Red. The rezoning request area is a Red Nutrient Allocation Zone.

60 The CLWRP Plan Change 7 will also limit some farming activities (e.g., commercial vegetable growing operations) due to the proposed nutrient limits.

61 These limits seek to address excessive groundwater nutrient concentrations in catchment over which the Site lies. The effects of these limits have been identified in various literature. For example:

(a) A Landcare Research study called "*Modelling Economic Impacts of Nutrient Allocation Policies in Canterbury: Hinds Catchment*" in 2013 prepared for the Ministry for the Environment[11] concluded that loss in productivity could result in revenue reductions of up to 41% with an average of 14% across the farming systems studied.

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[11] Landcare Research (2013). Modelling Economic Impacts of Nutrient Allocation Policies in Canterbury: Hinds Catchment. Prepared for the Ministry for the Environment. https://environment.govt.nz/assets/Publications/Files/modelling-economic-impacts-of-nutrient-allocation-policies-canterbury.pdf

(b) Reports prepared by the Agribusiness Group (2014)[12,13] on behalf of Ministry for Primary Industry found significant reductions in yield and profitability resulting from nutrient reductions.

(c) The Agribusiness Group reports also include budgets showing losses for some crops with the conclusion that "At the 10% reduction in the amount of nitrogen applied the Gross Margin result is reduced to approximately one third to a half of that under the Status Quo situation and from there it dips towards a close to breakeven scenario which means that it would not be economic to grow the crop. This reflects the relatively tight margins which these crops are grown under".

(d) Samarasinghe et al (2011)[14] carried out research in the Hurunui District and concluded that reduction in nutrients below the baseline levels resulted in >5% loss in revenue. For some enterprises, this would be a net economic and financial loss.

62 The limits in the CLWRP are examples of initiatives being taken to mitigate these adverse effects resulting from excessive groundwater nutrient concentrations in the catchment (in which the site is located). These concentrations primarily result from primary production activities (e.g. dairying and arable agriculture) of the 70s, 80s, 90s and early 2000s. The effects of the more recent (1980s to the present day) intensification in dairying and other agricultural activities will manifest over the next 20, 30, and 40 years, and in my opinion, are likely to be considerably worse than what the catchment is experiencing now because of this intensification.

63 For that reason, these mitigation initiatives – while important - are, in my opinion, highly unlikely to restore the nutrient levels to the pre-intensification levels. If that is to occur, greater limitations on the application of nutrients and nutrient rates should be expected. These constraints would further limit the capacity of the Site to establish and maintain land-based primary production.

Adverse Effects – Reverse Sensitivity

64 Normal farming activities involve regular cultivation, planting, irrigating, fertilisation, spraying, and harvesting of crops. Dust, spray drift, droplets, vapour, solid particles are all associated with these activities, as is odour, and noise resulting from the use of machinery and vehicle movements. Where those effects are encountered

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12 The Agribusiness Group (2014). Nutrient Performance and Financial Analysis of Lower Waikato Horticulture Growers. Prepared for MPI. https://www.horizons.govt.nz/HRC/media/Media/One%20Plan%20Documents/Nutrient-Performance-and-Financial-Analysis-of-Horticultural-Systems-in-Horizons-Region-2014.pdf?ext=.pdf.

13 The Agribusiness Group (June 2014). Nutrient Performance and Financial Analysis of Horticultural Systems in the Horizons Region. Prepared for MPI.

14 Samarasinghe , O. Daigneault A, Greenhalgh, S, Sinclair , R (2011) Modelling Economic Impacts of Nutrient Reduction Policies in the Hurunui Catchment, Canterbury. https://www.nzae.org.nz/wp-content/uploads/2011/Session4/42_Samarasinghe.pdf

(particularly by sensitive land uses, such as residential), attempts to address those effects (for example, through the establishment of a buffer) can constrain the use of the subject land for primary production.

65 The proposed rezoning Site is next to the new SDC sports facility, Kahaka Park. The facilities will be used by young people.

66 In my opinion, it is highly likely that the establishment and operation of any primary production would have adverse effects. It would however be difficult to manage those adverse effects without compromising the productive capacity of the Site.

67 The other major reverse sensitivity issue will arise from complaints by people using the park. I expect use of the park to increase when its fully developed. With hundreds or thousands of people coming to the park it is possible that some will start to complain about the farming activities (e.g. noise. dust, spray drift) on land adjacent to park if this stays rural. Such complaints will necessitate a scaling back of the farming activities or changes to the farming practices both of which could have adverse effects on the land's productive capacity regardless of its LUC classes.

68 Examples of mitigation include:

(a) Creating strips (5-10 m wide) of land between the farm and the sensitive receptors to create buffers. This further reduces the area of land available for productive use.

(b) Limiting the times when certain farming activities are undertaken. For example:

(i) Use of farm machinery is limited to the hours of the day when the sports grounds are not in use.

(ii) Limiting the cultivation of land to when wind speeds are below a specific threshold to avoid dust being blown to residential areas.

(iii) Prohibiting the use of odorous sprays i.e. application of effluent.

Adverse Effects – Land Fragmentation

69 Land fragmentation is defined as "*division of a land resource that changes the current or future range of possible activities and thereby alters the actual or potential uses of that land resource across a number of scales*"[15].

[15] Hart, G., Rutledge, D., Price, R. (2013) Guidelines for monitoring land fragmentation: review of knowledge, issues, policies and monitoring. Landcare Research, New Zealand.

70 The Site is comprised of small lifestyle blocks (1-7 ha). The small lots are currently owned by different individuals and entities. Consolidating ownership to create a large contiguous block that can be farmed intensely will be difficult.

71 I also understand that 212A Birchs Road has a subdivision consent for 3 x 4 ha blocks (Table 1). This subdivision is being given effect to thus adding to the fragmentation of the land.

72 The fragmentation of current ownership and size of the land parcels around the Site means that it will be nearly impossible for large contiguous blocks (>50-100 ha which are more efficient to farm irrigated arable crops) to be available for crop and/or pastoral agriculture.

73 Fragmented ownership is well documented as a hindrance for intensive land use productivity.

74 On this basis, it my opinion that it is unlikely that the productive potential of the LUC Class 1 and 2 soils will ever be realised assuming other constraints such as lack of irrigation water are addressed.

75 Therefore, because of this land fragmentation, the Site's productive capacity may be lower that assumed by just considering the default LUC classes imply.

Alternative Options Assessment

76 The NPS-HPS rezoning criteria requires consideration of whether there are any sites within the same locality and market which could feasibly and practicably accommodate the proposed development capacity while achieving a well-functioning urban environment.

77 The area around Prebbleton, illustrated in **Attachment 4**, has been identified as the "same locality and market" for the purposes of (b) on the basis that it is:

(a) In or close to Prebbleton as a location where demand for additional capacity has been identified;

(b) Is for a market for the types of housing in demand i.e. Medium Residential Zoning.

78 I undertook a desktop review of the LUC Classes of the land in this area.

(a) The nearest land that is >LUC Class 3 is northwest of the PC79 site and this extends northwest along Hamptons Road and eastwards to Tosswill Road as shown in **Attachment 4**.

(b) Most of this land that is >LUC Class 3 is over the already approved Plan Changes 68 and 72 land.

(c) The remaining area that is not within the already developed area bound by Hamptons Road, Birchs Road and Trices Road.

(d) Therefore, most of the land around the fringe of Prebbleton that is >LUC Class 3 is either already zoned or has been developed.

79 Beyond the site and Prebbleton fringe, the next nearest >LUC3 land is west of Rolleston township.

80 With regards to the LUC Classes 1-3 soils in and around the site and in Prebbleton, it is my opinion, that land is likely to be subject to less constraints on productive capacity compared to the site based on the following reasons:

(a) There are some sites within that area that have consented irrigation takes and this have sufficient available water for irrigation.

(b) Unlike the Site (which adjoins the new sports facility, Kahaka Park and some residential neighbourhoods), there is greater separation between that land and urban areas, which makes those other sites less subject to potential reverse sensitivity effects.

(c) Many sites other than the PC79 Site are less fragmented and comprise much larger blocks that can be used for primary production without the constraints associated with fragmentation.

81 Based on that review, I conclude that there is no land within that subject area that has overall lower productive capacity than the Site. Given the multitude of constraints I have discussed for this Site, I consider this land to meet the test provided in Clauses 3.6(2)(b) and (c) NPS–HPL relative to other land within the Prebbleton fringe.

82 Therefore, it is my opinion that if residential supply is needed, the Site is the appropriate location for that from a productive capacity perspective.

Cost Benefit Analysis

83 In the discussion above, I have identified a number of factors which compromise the productive capacity of the Site. While techniques and options may be available to manage/address some of those factors, use of those techniques over the long-term would each incur costs which will impact the economic viability/benefits of using the site for primary production activities. These are discussed in more detail in the evidence of Messrs Colegrave and Everest.

84 For the reasons set out above, I consider that there are other sites within the Selwyn district which have better capacity for primary production activities and can better support the economic and social wellbeing and resilience of communities through those activities. Comparatively, use of the Site for residential development as sought by BVL will support those outcomes by:

(a) Providing new lots for housing development that will support everyday activities of people and communities.

(b) Integrating that development with an existing residential area, making efficient use of infrastructure (e.g. water supply, wastewater, power etc) compared to what would be the case if subdivision was relegated to the areas that are >LUC Class 3 (**Attachment 4**).

Cumulative Loss

85 In my opinion, any costs associated with the loss of the Site for primary production activities must be viewed in the wider context of available HPL. In Table 4 below, I give a sense of the proportional loss of LUC 1, 2 and 3 land within the district and the region as a result of the rezoning request for the Site.

LU Class	Canterbury (ha)	Selwyn (ha)	Site (ha)	Percentage of HPL Loss	
				Canterbury	Selwyn
LUC 1	**23,200**	**6,522**	**4.97**	**0.0044%**	**0.026%**
LUC 2	**270,500**	**46,111**	**31.61**		
LUC 3	543,000	87,927	0		
Total Area	**836,700**	**140,560**	**36.58**		

Table 4 – NPS-HPL - Potential Loss in HPL (LUC 1, 2 and 3) as a Result of the Proposed Plan Change

86 Table 4 above shows that the reductions in HPL as a result of the rezoning request in the region and district would be insignificant.

Response to the Section 42a Report

87 I have read through the s42A Report. It discusses the NPS-HPL from Paragraph 192 onwards.

88 In Paragraph 202 the report states that "…*land ownership within the PC79 area is somewhat fragmented, the land itself does not constitute a small, isolated pocket of LUC 1-3, but is instead part of a much wider area of HPL".* I agree that the land is fragmented as I point out in my brief of evidence above. However, I do not share the officer's implication in the second part of the paragraph. Land in fragmented ownership is just as inaccessible as small, isolated pockets of LUC 1-3. Different owners will have different priorities for their land making it almost impossible for all

the lots to be applied to primary production to achieve any meaningful productivity. As I discussed in Paragraphs 69-75 fragmentation impacts the land's productive potential.

89 The reports states in Paragraph 204 that "*Constraints or limitations on the productive use of that land such as fragmented ownership, limits on water supply, or economic viability are merit-based considerations that can feed into the regional council mapping process. They are not however matters that are in play now during this transitional mapping period, and for which the criteria for identifying (and excluding) HPL are limited to those set out in Clause 3.5(7)*". While I appreciate the context in which the comment was made, I do not agree with the Officer's comment that factors such as fragmentation, water supply constraints etc are not relevant to the assessment. As I discussed in Paragraph 32 these factors are critical to the determination of the site's productive capacity making them necessary for the assessments required in Paragraphs 29-31 above. I have provided a definition of the productive capacity in Paragraph 33. An understanding of the site's productive potential enables some of the tests in Clause 3.6 to be assessed as has been done by Messrs Colegrave and Everest.

90 The rest of Paragraphs 208-219 of the report discuss supply and demand supply and economic considerations. Mr Colegrave and Mr Everest's evidence will discuss responses to these in more detail.

Response to the Issues Raised by Submitters

91 I have reviewed all the submissions relating to the soils and concerns regarding loss of HPL. Below, I offer comments on these submissions.

92 The main concern by submitters was in regard to the loss of productive land and the need to protect it for food production.

93 In my evidence I have directly or indirectly addressed the concerns raised by the submitters when I discussed various aspects of the soils, the land use, the production potential and their relevance to PC79. Below I summarise how my evidence addresses the issues raised by the submitters:

(a) In Paragraphs 35-41, I discussed the soil properties in the area. I discussed the potential effect of the poor drainages on parts of the Site.

(b) In Paragraphs 42-57 I assessed the effects of the moisture deficits, availability of irrigation, and their adverse impact of the soils' production potential.

(c) In Paragraphs 59-63 I outlined the constraints of land use intensification as a result of the statutory provisions in the regional plan.

(d) Paragraphs **Error! Reference source not found.**-**Error! Reference source not found.** of my evidence discuss how future productivity potential will be affected by reverse sensitivity issues.

(e) As I noted in Paragraphs 85-0 the scale of the developable area in the context of the total LUC 1 and LUC 2 soils in the district and the regional is very small (0.026% and 0.0044% respectively). This is able to be compensated for by utilising the available irrigation resources on the remaining consented irrigation area and the continuous improvements in agricultural technology.

94 As set out in my summary, I conclude that the proposed loss of the soils is not considered to have a significant adverse effect on the district or region's versatile soil resource and will not create a shortage of land or soil resource for other activities in the future.

Conclusion

95 In summary, I support BVL's request to rezone the site for urban purposes through PC79 in terms of the directions of the NPS-HPL on the basis that:

(a) There are multiple long-term constraints on the capacity of that site to support primary production activities.

(b) In light of these constraints, the overall benefits of retaining this land for primary production are, in my opinion, negligible. That is especially given:

(i) There are very few other rural sites within the Prebbleton area that have lower productive capability or less constraints than the submitter's site.

(ii) The proportional reductions in HPL in the district and the region as a result of the rezoning of the site are insignificant.

Victor Mthamo

Dated this 17th day of April 2023

Attachment 1 – Location of the Site and the Individual Lots

Attachment 2 – Soil Properties and Distribution

Soil Types

Sibling	Area (ha)	Proportion
Temp_2a.2	17	48.10%
Temp_1a.1	5	14.60%
Eyre_2a.1	4	12.00%
Temp_4a.1	3	8.70%
Waka_8a.1	2	6.30%
Temp_3a.1	2	5.80%
Waka_3a.1	2	4.20%
Eyre_4a.1	< 1 ha	0.20%
Eyre_23a.1	< 1 ha	0.10%
Total	**36.58**	**100**

Drainage Properties

Class	Description	Area (ha)	Proportion
	Imperfectly drained	4	10.9
	Moderately well drained	28	76.5
	Well drained	<5	12.6
	Unclassified Land	0	0.0
Total		**36.58**	**100**

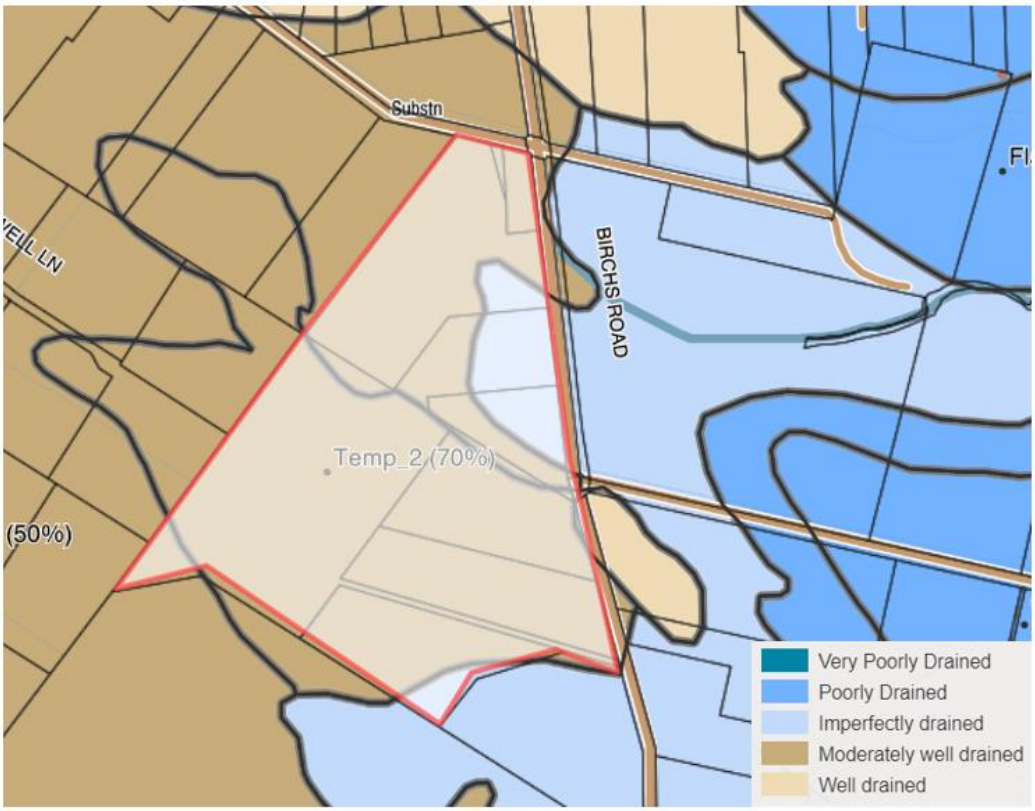
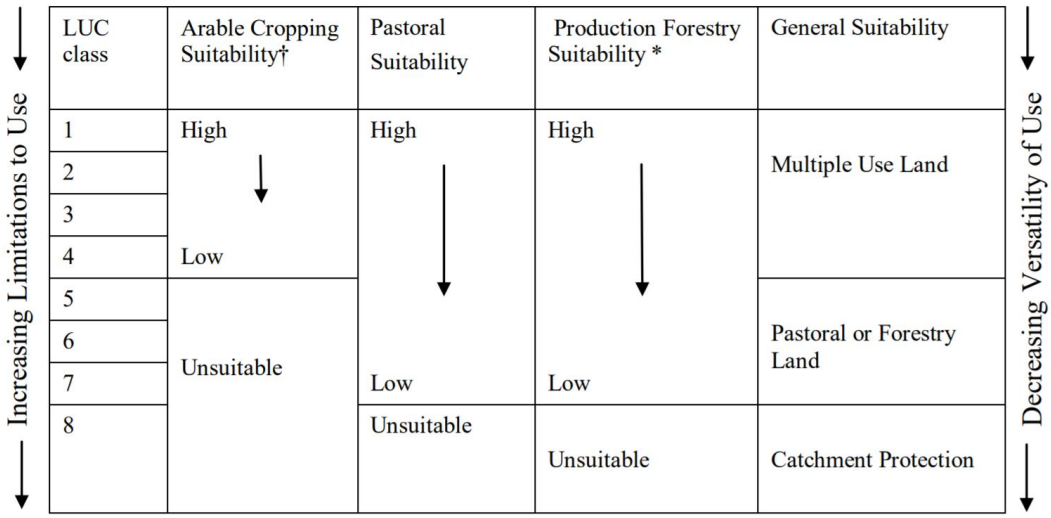


Figure 2.1 – Drainage Properties of the Soils in the Area

Attachment 3 – The New Zealand Land Resource Inventory (NZLRI)

The figure below shows the potential land uses and the relationship between the versatility and LUC classes. High Class/versatile soils are defined as Class 1, 2, or 3 soils as delineated by the New Zealand Land Resource Inventory (New Zealand Soil Bureau amended 1986).



Relationship between the Versatility and LUC Classes (Lynn et al, 2009)

LUC Class Definitions

LUC Class code	***Description***
1	Class 1 land is the most versatile multi-use land with minimal physical limitations to arable use. It is nearly level, has deep easily worked soils and there is practically no risk of erosion. The soils are well drained and not seriously affected by drought. They are usually well supplied with plant nutrients and responsive to applied fertilisers. The climate is favourable for the growth of a wide range of cultivated crops, vineyards and berry fields, pasture, tree crops or production forestry.
2	This is good land with slight limitations to arable use which makes it more difficult to manage than Class 1. Management practices to overcome these limitations are easy to apply. Depending on the limitation, the land can be suitable for many cultivated crops, vineyards and berry fields, pasture, tree crops or production forestry. Limitations may be – a) slight to moderate susceptibility to erosion; b) gentle slopes; c) soils of only moderate depth; d) wetness existing permanently as a slight limitation after drainage; e) occasional damaging flooding; f) unfavourable structure and difficulty in working.
3	This class of land has moderate physical limitations to arable use. These limitations restrict the choice of crops and the intensity of cultivation, and/or make special conservation practices necessary. Depending on the limitation, Class 3 land can be suitable for cultivated crops, vineyards and berry fields, pasture, tree crops or production forestry. Limitations may be – a) moderate susceptibility to erosion under cultivation; b) rolling slopes; c) shallow or stony soils; d) wetness or water-logging after drainage; e) frequent damaging overflow; f) low moisture holding capacity; g) low natural fertility not easily corrected.
4	This land has severe physical limitations to arable use. These limitations substantially reduce the range of crops which can be grown, and/or make intensive soil conservation and careful management necessary. Because of these difficulties, Class 4 land is suitable only for occasional cropping but is suitable for pasture, tree crops or production forestry. Limitations may be – a) moderate to high susceptibility to erosion under cultivation; b) strongly rolling slopes; c) very shallow soils; d) excessive wetness with continued hazard of water-logging after drainage; e) frequent flooding; f) very low moisture holding capacity; g) low fertility very difficult to correct.
5	High producing land unsuitable for arable use, but only slight limitations for pastoral or forestry use

LUC Class code	*Description*
6	Non-arable land with moderate limitations for use under perennial vegetation such as pasture or forest
7	Non-arable land with severe limitations to use under perennial vegetation such as pasture or forest
8	Land with very severe to extreme limitations or hazards that make it unsuitable for cropping, pasture or forestry

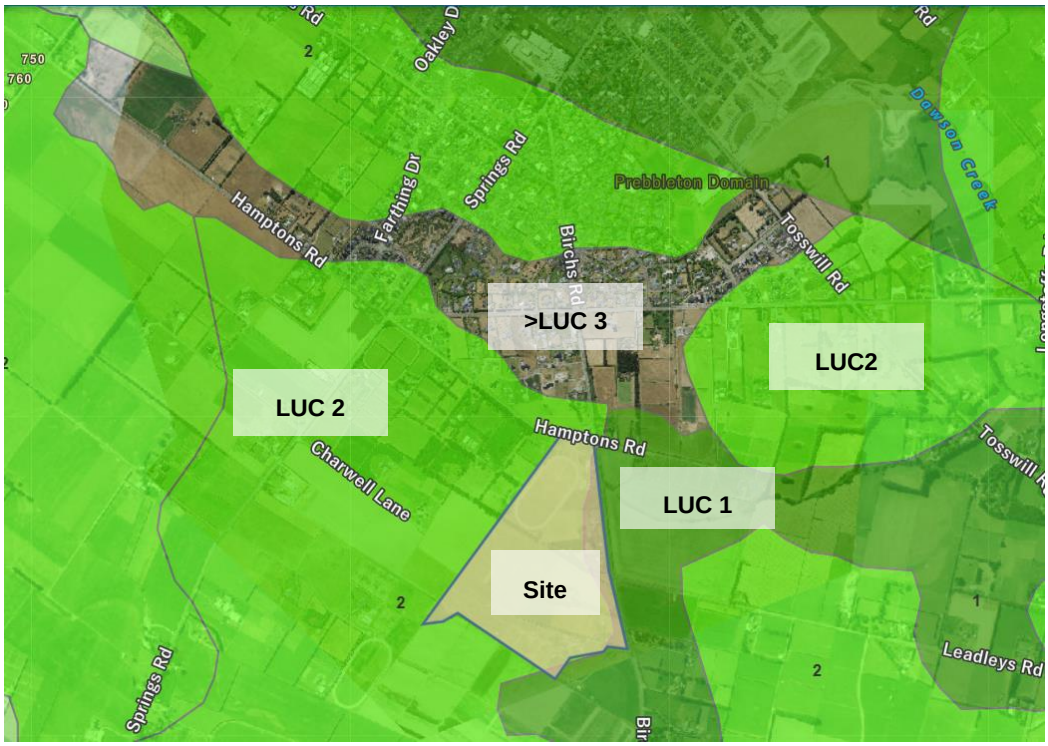
LUC Subclasses

LUC subclass modifier	*Description*
e	erosion susceptibility, deposition or the effects of past erosion damage first limits production
w	soil wetness resulting from poor drainage or a high-water table, or from frequent overflow from streams or coastal waters first limits production
s	soil physical or chemical properties in the rooting zone such as shallowness, stoniness, low moisture holding capacity, low fertility (which is difficult to correct), salinity, or toxicity first limits production
c	climatic limitations such as coldness, frost frequency, and salt-laden onshore winds first limits production

LUC Units

LUC unit identifier	*Description*
1 2 :	A number that makes the combined LUC expression unique. It associates and orders polygons below the level of LUC subclass, on the basis of common landform, productive potential, physical limitation and management behaviour

Attachment 4 – Area of Versatile Soils Associated with Various Plan Changes




>LUC 3
>LUC 3
Rolleston
Prebbleton
OAKLANDS
HALSWELL
Lincoln
Railway
Kerrs
Wards
Walkers
Hoskyns
Manion
Manion
Larcombs
Robinsons
Waterholes
Cross
Selwyn
Selwyn
Shands
Runners
Dunns Crossing
Brookside
Edwards
Springston Rolleston
Boundary
Boundary
Tancreds
Birchs
Ellesmere
Voss
Tai Tapu
Tancreds
Perymans
Rattletrack
Shands
East Maddisons
Selwyn
Swamp
Leighs
Goulds
Bethells
Leeston
Days
Collins
Marshalls