Before the Selwyn District Council

under: the Resource Management Act 1991

in the matter of: Proposed Private Plan Change 80 to the Operative District Plan

and: **Two Chain Road Limited**
Applicant

Evidence of Victor Mthamo (versatile soils and water supply)

Dated: 5 October 2022

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EVIDENCE OF VICTOR MTHAMO

INTRODUCTION

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 (Reeftide). I have been in this role for almost 10 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:

2.1 Bachelor of Agricultural Engineering (Honours) with a major in Soil Science and Water Resources (University of Zimbabwe); Master of Engineering Science in Water Resources (University of Melbourne in Victoria, Australia); Master of Business Administration (University of Zimbabwe). I hold an Advanced Certificate in Overseer Nutrient Management modelling qualification. 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 (i) Water New Zealand and (ii) New Zealand Land Treatment Collective (NZLTC).

3 My experience and expertise includes:

3.1 The design and implementation of numerous on-farm irrigation schemes, soil investigations, land use assessments in New Zealand. Prior to this I was involved in irrigation scheme development projects and water resource investigations in most southern African countries and parts of Asia. As a Consultant for the Food and Agricultural Organisation (FAO), I have worked on land use projects in Papua New Guinea and The Maldives. I was also involved in the preparation of an irrigation design and management manual for FAO. While working as a Senior Consultant for the audit and consulting firm PricewaterhouseCoopers (Harare Office), I was involved in the preparation of feasibility studies for large scale irrigation/land use projects, conceptual and detailed designs, environmental impact assessments, capacity building, cost-benefit analyses and providing sustainable management expertise to the beneficiary communities. Some of the infrastructure development projects and assessment of environmental effects/environmental impact assessments, I

have been involved in New Zealand include Hunter Downs Irrigation Scheme, North Bank Hydro Project, Mararoa-Waiau Rivers Irrigation Feasibility Study, North Canterbury Lower Waiau Irrigation Feasibility Assessment.

4 I have also been involved in the assessment of 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. This work is relevant to my input in this hearing as it demonstrates the ability to assess and present soil mitigation strategies associated with earthworks and rehabilitation of sites post development.

5 I am familiar with private plan change 80 (*PC80*).

CODE OF CONDUCT

6 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the Code of Conduct for Expert Witnesses contained in Part 7 of the Environment Court Practice Note 2014. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where relying on the opinion or evidence of other witnesses. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

7 My evidence covers the following:

7.1 Highly Productive Soils:

(a) The productivity of the existing soils within the PC80, the long-term constraints associated with the highly productive soils within the PC80 area and their effects on the soil's productive potential.

(b) Consideration of the proposal against the National Policy Statement of Highly Productive Land 2022.

7.2 Water Supply – I provide a discussion in support of **Mr Tim McLeod**'s evidence by looking at the:

(a) Water supply requirements for the proposed plan change area.

(b) Existing water supply availability.

(c) Proposed solutions to meet the Plan Change 80 water supply requirements.

8 In preparing my evidence I have reviewed:

8.1 National Policy Statement on Highly Productive Land 2022.

8.2 Selwyn District Council Rolleston Master Plan 2017-2048 which outlines the proposed future upgrades;

8.3 SDC Water Supplies Activity Management Plan Volume 2. 2018;

8.4 The Rolleston Structure Plan (RSP);

8.5 The evidence of **Ms Natalie Hampson**, **Mr Mark Everest** and **Mr Tim McLeod** prepared in support of the proposed plan changes on behalf of the Applicants;

8.6 Section 42A report prepared by the Selwyn District Council officers including that of **Ms Elizabeth White** and **Mr Murray England**; and

8.7 Submissions on the proposed plan change relevant to my area of expertise.

SUMMARY OF EVIDENCE

Highly Productive Soils

9 PC80 comprises an area that has 18.1 ha of LUC Class 3 soils and 80.2 ha LUC Class 4 soils. Under the NPS-HPL only 18% or 18.1 ha of the soils are classed as highly productive.

10 As the proposal is a plan change, therefore, Clause 3.6 of the NPS-HPL will be relevant to the 18.1 ha of LUC3 soils.

11 Clause 3.10 provides exclusions that territorial authorities may use to allow highly productive land to be subdivided, used or developed.

12 For this reason, I reviewed the site and considered site specific factors to see what long-term constraints apply to the site under Clause 3.10. I identified the following as long-term constraints that will have an impact on the site's long-term productivity and economic viability:

12.1 Moisture deficits and irrigation availability. I consider the availability of water for irrigation as a long-term productivity constraint on the site. This is because:

(a) The zone is fully allocated and there is no new water for irrigation purposes.

(b) Transfer of consents for irrigation purposes is getting more difficult due to the lack of readily available consents for sale. This will only get worse or impossible in future due to the shortage of these consents to transfer and the increases in water demand on properties with consented takes.

(c) Dry land farming of land-based activity is not economically viable for this site. Yields are generally low due to moisture deficits. Water is essential for economic viability. This is discussed in more detail in the evidence of **Mr Mark Everest**.

(d) Lack of water will get worse over the next 30 years because:

(i) There will be no more water for sale because of supply constraints.

(ii) Water deficits will increase with climate change.

12.2 Nutrient Limits. Future nitrogen leaching rates are required to not exceed the baseline rates and where they exceed the 15 kg N/ha/year. I view these limits as long term constraints because:

(a) The groundwater nutrient concentrations being observed now within the groundwater catchment are primarily from activities of the past several decades – since the 70s, 80s, 90s and early 2000s. The effects of the more recent (1980s to the present day) intensification in dairying and other farming activities will manifest over the next several decades (20, 30, 40 years). The effects will be considerably worse than what the catchment is experiencing now because of this intensification.

(b) Mitigation measures being implemented in compliance with the CLWRP will unlikely restore the nutrient levels to the pre-intensification levels. For these reasons, I see limits on nutrient use and applications as a permanent constraint. It is also not unreasonable to expect further policies and regional rules to be tightened to try and reduce the use of nutrients.

(c) Therefore, nutrient limiting policies and rules are a permanent long-term constraint for the site.

12.3 Fragmentation.

(a) The fragmentation of 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. On this basis, it is unlikely that the productive potential of the LUC Class 3 soils will ever be realised for the Two Chain Road site even assuming other constraints such as lack of irrigation water are addressed.

(b) The existing fragmentation will persist into the future given the multiple ownership of the land.

(c) Therefore, because of the land fragmentation, the site is not as highly productive as the default LUC classes imply.

13 The reduction of highly productive land in the region and district as a result of the applicant's proposal will be 0.0022% and 0.013% respectively. I consider these percentages alone to be insignificant.

14 The cumulative potential reduction in productive soils since January 2018 (PC49) up to September 2022 and including the proposed plan change site is:

14.1 0.77% within the Selwyn District.

14.2 0.13% within the region.

15 I consider the above proportions relevant to the assessment under clause 3.10 of the NPS-HPL and should be taken into account because:

15.1 Clause 3.10(1)(b)(i) enables territorial authorities to allow "*…highly productive land to be subdivided, used, or developed for activities not otherwise enabled under clauses 3.7, 3.8, or 3.9 if satisfied that: (b) the subdivision, use, or development: (i) avoids any significant loss (either individually or cumulatively) of productive capacity of highly productive land in the district*". It is my view that the changes in the proportion of highly productive land as a result of the proposed rezoning and other plan changes since 2018 is small. There will be no significant loss in the amount of highly productive land in the district.

Water Supply

16 There is no site-specific available water supply for the PC80 area. The site does not have any existing consents to take and use groundwater.

17 To supply water to the site the applicant is proposing to transfer consents from the groundwater consents it has control over in the Plan Change 69 (*PC69*) area.

18 The consents have an estimated annual volume of 856,299 m^3/year estimated using the Canterbury Land and Water Plan Schedule 13.

19 The PC69 proposal will require 430,664 m^3/year. This leaves a surplus of 425,636 m^3/year.

20 In his evidence, **Mr McLeod** has estimated the required demand within the PC80. This ranges from 36,500 to 182,500 m^3 /year.

21 Therefore, the 425,636 m^3/year surplus available from the PC69 area is more than what is required for the PC80 development.

22 For completeness I also estimated the potential volumes that could be harvested from stormwater. I concluded that if stormwater from 10% of the area was collected and stored, this was sufficient to provide the minimum volumes required for firefighting. If the area of stormwater collection was increased >10% there would be sufficient volumes for firefighting, irrigation and other non-potable water uses.

23 I, therefore, conclude that the proposed PC80 site can be adequately provided with water.

DESCRIPTION OF THE SITE, CURRENT LAND USE, CURRENT ZONING AND REZONING REQUEST

24 The Two Chain Road site comprises a total of around 98 ha of land. 77 ha of that land (at 77, 113/139, 183 Two Chain Road) is under single ownership. The remainder (#7, 15, 25, 93, 97 Two Chain Road) has multiple ownership comprising lifestyle blocks ranging in size from 3.77 ha to 4.59 ha.

25 The site is bound by Two Chain Road, Walkers Road and Main South railway line to the south. A paper road runs parallel to the railway line and provides access onto Walkers Road. The location of the site is shown in **Attachment 1**.

26 The land has a flat topography. There are no special features on the land and currently only has dwellings and shelterbelts.

27 The site generally has a long history of use for lifestyle living and low intensity dryland grazing purposes. More specific land uses include:

27.1 Low stocking rate grazing for dairy cows or yearling steers and bulls on winter feed, oats and grass or kale.

27.2 A horse training establishment.

27.3 Sheep and small livestock grazing on some of the lifestyle blocks.

28 The land across and north of Two Chain Road is generally lifestyle blocks with grazing and some home businesses.

DESCRIPTION OF SITE SOILS

29 S-Maps Online[1] and Canterbury Maps[2] provide details of the soils under the site. The soils are primarily Lismore, Eyre and Templeton soils. **Attachment 2** shows the location of the soil types, areas of each soil sub class and the properties of the soils.

30 78.8% of the soils on the site are the shallow stony Lismore soils. These do not hold water very well being very permeable and this affects the soils productive potential.

DEFINING HIGH PRODUCTIVE LAND AND VERSATILE SOILS

Introduction

31 The primary purpose of my evidence is to discuss the effect of the proposed rezoning of the land on the site's productive potential. Land productive potential encompasses many facets of which soil is one of them.

32 High productive land or versatile soils are regarded as the best possible land or soils for agricultural production because of their properties.

National Policy Statement for Highly Productive Land 2022 (*NPS-HPL*)

33 The NPS-HPL was gazetted on Monday 19 September 2022 and is in effect from Monday 17 October 2022. The policy:

33.1 *"…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,*

[1] https://smap.landcareresearch.co.nz/
[2] https://canterburymaps.govt.nz/

and manage the subdivision, use and development of this non-renewable resource".

34 The NPS-HPL defines highly productive land as:

34.1 "*…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)".*

34.2 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:*

(a) *Is*
  (i) *zoned general rural or rural production; and*
  (ii) *LUC 1, 2, or 3 land; but*
(b) *is not:*
  (i) *identified for future urban development; or*
  (ii) *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".*

Estimated Quantities of LUC1-3 within the Selwyn District and Canterbury Region

35 I noted above that the NPS-HPL defines Land Use Capability Classes (LUC) 1-3 land as highly productive land. The estimated quantities of LUC Classes 1-3 based on information from various sources is summarised below:

35.1 Canterbury Region has 293,700[3] ha of Class 1 and 2 soils and 543,000 ha[3] of LUC Class 3 soils giving a total of 836,700 ha of Classes 1, 2 and 3 soils.

35.2 Selwyn District has 6,522 ha of Class 1 land, 46,111 ha of Class 2 land and 87,927 ha of Class 3 soils giving a total of 140,560 ha[4] of LUC Classes 1-3 soils.

[3] https://www.tandfonline.com/doi/full/10.1080/00288233.2015.1092996
[4] https://www.mpi.govt.nz/dmsdocument/36624/direct

LUC Classes within the PC80 Area

36 The New Zealand Land Resource Information System (NZLRIS) Portal[5] and Canterbury Maps (which uses the NZLRIS Portal layers for this purpose) provide details of the default LUC Classes within the site.

37 The NZLRIS Portal maps show that the proposed plan change area is comprised of LUC Classes 3 and 4. **Attachment 3** has been extracted from the portal and it shows the extent of the LUC Classes 3 and 4. The areas of each LUC Class within the proposed plan change area is summarised in Table 1.

Table 1 – Area Under Each LUC Class

LU Class	Soil Types	Area (ha)	Percentage
LUC3	Eyre (16 ha) & Templeton[1] & Lismore	18.1	18.4%
LUC4	Lismore, Templeton	80.2	81.6%
Total Area		**98.3**	**100%**

1 – The LUC boundary encroaches into the Templeton and Eyres Soils – as a result some Templeton and Lismore Soils are in LUC 4

38 Table 1 shows that only 18.4% or approximately 18.1 ha of the PC80 area is in LUC Class 3 and thus falls under the NPS definition of high productive land.

39 The Eyre soils make up most of the LUC3 soils and are described as:

39.1 Moderately shallow and/or stony soils.

39.2 They are marked by summer moisture deficit.

ASSESSMENT OF THE SITE SOILS AGAINST THE NPS-HPL

Introduction

40 Clause 3.10 provides exclusions that territorial authorities may use to allow highly productive land to be subdivided, used or developed for activities not otherwise enabled under Clauses 3.7-3.9 if:

40.1 *"…there are permanent or long-term constraints on the land that mean the use of the highly productive land for land-based primary production is not able to be economically viable for at least 30 years; and*

40.2 *….if subdivisions avoids significant loss (either individually or cumulatively) of productive capacity of highly productive land in the district."*

41 Having reviewed the site and considered site specific factors, in my opinion there are some short term and long term constraints that

[5] https://soils.landcareresearch.co.nz/soil-data/the-lris-portal/

qualify the site for exclusion under Clause 3.10. I discuss these factors below.

Effects of Soil Moisture Deficits and Irrigation Availability on Long Term Productivity of the PC80 Land

Moisture Deficits

42 The Selwyn District climate can be very hot and dry during spring and summer at a time when most agricultural production needs moisture the most.

43 These weather conditions significantly affect crop production and ultimately compromises the soil's natural capital or productive potential as it will not matter how inherently fertile or productive the soils are as moisture or irrigation is critical to support crop growth.

44 To better understand the soil moisture deficits and the need for irrigation within the site I assessed the soil moisture deficits using data from the NIWA climate database (Cliflo[6]).

45 I looked at and used data from the Selwyn District Council Burnham Wastewater Treatment Plant (Agent No 4880) climate station because of its proximity to the PC80 area and the long historical data available (1953 to 2022). Tables 2, 3 and 4 provide summaries of statistics on the following for this particular station:

45.1 Moisture deficit days;

45.2 Mean moisture deficits; and

45.3 Maximum moisture deficits.

Table 2 – No of Monthly Deficit Moisture Days

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Days /Yr
Mean	21	18	14	9	3	0	0	0	1	6	15	19	109
Min	7	5	0	0	0	0	0	0	0	0	0	1	62
Max	30	26	30	28	21	1	8	0	18	28	28	31	167

46 Table 2 shows that 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. For some crops peak growth occurs in the December, January and February and this is when soil moisture is most limiting to crop growth. The average number of deficits in January is 21 days out of 31 days in the month. There were a few

[6] https://cliflo.niwa.co.nz/

times over the years when deficits were experienced every day in January.

Table 3 – Monthly Mean Moisture Deficits (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	122	123	109	91	62	29	13	11	27	57	94	113
Min	60	44	35	18	2	1	0	1	2	8	26	55
Max	146	142	143	143	124	104	66	63	87	129	133	138

Table 4 – Monthly Maximum Moisture Deficits (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	135	135	127	112	84	47	23	21	45	81	115	129
Min	101	75	61	46	5	2	2	4	6	23	56	86
Max	149	147	146	146	144	112	88	74	105	142	140	146

47 Tables 3 and 4 show that:

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

47.2 The monthly maximum moisture deficits in the summer months range from 86-149 mm.

48 Paragraphs 42-47 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.

49 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.

Irrigation Requirements

50 To estimate the irrigation requirements, I have used IrriCal[7]. IrriCalc is a tool, approved in the Canterbury Land and Water Regional Plan (*CLWRP*), for calculating irrigation water demand. It estimates the irrigation requirements in 9 out of 10 years for pasture, assuming an irrigation system with an 80% efficiency. Table 5 summarises the monthly irrigation application depths based on long term climatic data.

Table 5 – Irrigation Requirements for Pasture on the Site (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	116	92	24	3	0	0	0	0	9	56	72	115
90%tile	132	132	88	44	0	0	0	0	44	88	88	132

[7] http://mycatchment.info/

51 Table 5 shows that 116-132 mm of irrigation is required in January to maintain a good pasture system. These irrigation requirements are consistent with the moisture deficits in Tables 3 and 4 with any differences due to the range of climatic data used by the different tools.

52 To get an understanding of the annual volume required for the area, I also used IrriCalc. I have summarised these volumes in Table 6 below:

Table 6 – Annual Volumes Required Over the Site

Irrigated Catchment	Irrigated Area (ha)	Annual Volume (m^3)
LUC3 land only	18.1	112,546
Whole site (LUC 3 + LUC4)	98.3	611,229

53 I note that the annual volume I presented in Table 6 is for a pasture crop (as there is limited arable crop data). However, use of a pasture system does give a good indication of the annual volume that would be required for other crops. The main difference between pasture and other crops is their water use and this is reflected by their crop factors. A pasture system will have a crop factor close to 1.0 while those of the other crops range from 0.9-1.1.

Availability of Irrigation Water

54 I then interrogated the Canterbury Maps GIS[8] to ascertain if there were any water take consents within the site that could be used to meet the water deficits or provide the annual irrigation volumes in Table 6.

55 There are no resource consents for taking groundwater for irrigation in any of the properties within the site. This means that the high evapotranspiration rates and low rainfall and the accompanying moisture deficits significantly reduce the productive potential of the land. Therefore, irrigation is critical for production.

Permanency of the Unavailability of Irrigation Water

56 The site is within the Selwyn-Waimakariri Groundwater Zone. This zone is overallocated and consequently new applications to take groundwater for irrigation are prohibited activities under the CLWRP. In other words, no new consents to take water for irrigation will be granted.

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

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

57.1 The CLWRP Subregional Plan (Chapter 12) requires 50% of any volume transferred be surrendered. That is, a consent or consents with twice the volumes in Table 6 would be needed to meet the crop demand for maximum productivity.

57.2 That is, a consent or consents with a combined annual volume of 225,092 m^3/year would have to be purchased to provide the annual volume of 112,546 m^3/year required for the LUC3 area within PC80.

58 Consents to transfer water are becoming difficult to get. I expect this to worsen with time due to:

58.1 Climate change induced increases in irrigation water demand.

58.2 Increasing shortages in consents available for transfer due to demand for these consents as there are no new consents for irrigation purposes granted within the zone.

Summary

59 I consider the availability of water for irrigation as a long term productivity constraint on the site. This is because:

59.1 The zone is fully allocated and there is no new water for irrigation purposes.

59.2 Transfer of consents for irrigation use is getting more difficult due to the lack of readily available consents for sale.

59.3 Dry land farming of land-based activity is not economically viable. Yields are generally low due to moisture deficits. Water is essential for economic viability. This is discussed in more detail in the evidence of **Mr Mark Everest**.

59.4 Lack of water will get worse over the next 30 years because:

(a) There will be no more water for sale because of supply constraints.

(b) Water deficits will increase with climate change.

60 I, therefore, conclude that:

60.1 Without irrigation both the LUC Class 3 and 4 soils will never achieve their full productive potential. Without irrigation, the 18.1 ha of LUC Class 3 soil loses its natural capital as potential highly productive land.

Effects of Regional Statutory Provisions on Land Productivity

Introduction

61 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:

61.1 Policies 4.34-4.36 relates to management of nutrient loss from farming among other activities.

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

61.3 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.

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

61.5 Policy 4.74 requires resource consents for the use of land for farming activities and the associated discharge of nutrients in catchments that are zoned Red. The proposed plan change area is a Red Nutrient Allocation Zone.

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

63 The CLWRP requires that baseline nutrient budgets be established based on the farming activities during the period 2009-2013. For the blocks making up the PC80 productivity has always been low. Therefore, the baseline nitrogen leaching rates are also very low.

Permanency of the Nutrient Limit Constraints

64 Future nitrogen leaching rates are required to not exceed the baseline rates and where they exceed the 15 kg N/ha/year, the plan requires reductions be implemented by 2022 on the following basis:

64.1 *"…dairy farmers being required to reduce by 30%, dairy support by 22%, pigs by 20%, irrigated sheep, beef or deer by 5%, dryland sheep and beef by 2%, arable by 7%, fruit, viticulture or vegetables by 8% and all other sectors 0%. Properties do not need to reduce if their nitrogen loss is below 15kgN/ha/yr"*.

65 The groundwater nutrient concentrations being observed now within the groundwater catchment are primarily from activities of the past several decades – since the 70s, 80s, 90s and early 2000s. The effects of the more recent (1980s to the present day) intensification in dairying and other farming activities will manifest over the next several decades (20, 30, 40 years). The effects will be considerably worse than what the catchment is experiencing now because of this intensification.

66 Mitigation measures being implemented in compliance with the CLWRP will unlikely restore the nutrient levels to the pre-intensification levels. For these reasons, I see limits on nutrient use and applications as a permanent constraint. It is also not unreasonable to expect further policies and regional rules to be tightened to reduce the use of nutrients further in the future.

67 Therefore, nutrient limiting policies and rules are a permanent long term constraint for the site.

Impacts of Nitrogen Limits on Productivity and Farm Economic

68 **Mr Everest** provides a more detailed discussion on the effects on economic viability associated with limits on nutrient applications. However, in the following paragraph I discuss some the observations I have made from my personal experience and from literature.

69 From my experience reducing nitrogen applications is accompanied by a decrease in yields, revenues and profitability. There is literature that supports this. A few examples of such literature are:

69.1 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[9] concluded that loss in productivity could result in revenue reductions of up to 41% with an average of 14% across the farming systems studied.

69.2 Reports prepared by the Agribusiness Group (2014)[10,11] on behalf of Ministry for Primary Industry found significant

[9] *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

[10] *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.

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

reductions in yield and profitability resulting from nutrient reductions.

69.3 I have extracted Figure 1 below from the Agribusiness Report[11] reports. It shows the corresponding yield reductions associated with reductions in nitrogen.

Appendix One: Average Estimated Reduction in yield with reduction in applied N.

Reduction in N	Potato (Summer), Onions, Carrots,	Squash, Broccoli, Lettuce,	Cabbage, Spinach, Cauliflower	Potato (Winter)	Barley
10%	10%	15%	15%	25%	25%
20%	20%	25%	30%	35%	35%
30%	30%	40%	40%	50%	45%

Figure 1 – Yield Reductions Due to Reductions in N Applications

69.4 The Agribusiness reports also include budgets showing losses for some crops with the conclusion that "*At the 10% reduction in the amount of N 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*".

69.5 Samarasinghe et al (2011)[12] carried out research in 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.

70 Therefore, any natural capital that the 18.1 ha LUC Class 3 soils on the site is negated by the statutory constraints relating to nutrient application imposed by the statutory planning rules.

Effects of Land Fragmentation

71 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*"[13].

72 The site comprises a number of small lifestyle blocks (1-8 ha). The small lots are owned by different individuals and entities.

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[12] *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*

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

Consolidating ownership to create a large contiguous block that can be farmed intensely will be difficult.

73 The fragmentation of 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.

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

75 On this basis, it is unlikely that the productive potential of the LUC Class 3 soils will ever be realised for the Two Chain Road site even assuming other constraints such as lack of irrigation water are addressed.

76 Therefore, because of the land fragmentation, the site is not as highly productive as the default LUC classes imply.

Proportion of productive soils and potential reduction resulting from the rezoning

Introduction

77 Clause 3.10(1)(b)(i) enables territorial authorities to allow "…*highly productive land to be subdivided, used, or developed for activities not otherwise enabled under clauses 3.7, 3.8, or 3.9 if satisfied that: (b) the subdivision, use, or development: (i) avoids any significant loss (either individually or cumulatively) of productive capacity of highly productive land in the district*".

78 I assess the significance or otherwise of the potential reduction in LUC Class 3 soils within the PC80 area below.

Estimation of Proportional Losses

79 In Table 7, I give a sense of the proportional loss of highly productive soil as a result of rezoning the site under the NPS-HPL definition.

Table 7 – Potential Loss in HPL As a Result of the Site Rezoning

LU Class	Canterbury (ha)	Selwyn (ha)	Rezoning Area (ha)	Percentage of HPL Loss	
				Canterbury	Selwyn
LUC 1	23,200	6,522	0	0.0022%	0.013%
LUC 2	270,500	46,111	0		
LUC 3	543,000	87,927	18.1		
Total Area	**836,700**	**140,560**	**18.1**		

80 Therefore, the reduction of highly productive land in the region and district as a result of the applicant's proposal will be 0.0022% and 0.013% respectively. I consider these percentages alone are insignificant.

81 These potential reductions in highly productive land are important given recent case law. In *Gock v Auckland Council*[14], the High Court in that case found the Environment Court in error for not considering the proportion of soils on the site relative to the wider region. I summarise the bench's ruling in Paragraphs 91-93 of the case as follows:

81.1 The Environment Court, in assessing whether the relevant areas of premium soils were significant for their ability to sustain food production, had erred by failing to take into account the insignificant area of such soils involved in the present case (100 ha) in the context of the total area of such soils in the Auckland region (63,000 ha).

Cumulative Changes in Highly Productive Land

82 I have also reviewed the potential cumulative changes in highly productive land since 2018 (when Selwyn District published the baseline report[15] on versatile soils which quantified the amount of versatile soils). This covers Plan Changes 49 to 82 (inclusive). I have summarised the areas associated with these plan changes in **Attachment 4**.

83 I have also searched through the Selwyn District Council and Canterbury Regional Council websites for land use consents that may have resulted in the reduction in LUC 1-3 soils between 2018 and July 2022 (at the time of writing this evidence):

83.1 Finding all the relevant information from these websites was difficult. Therefore, it is possible that my list is not exhaustive as there may be some small land use change consents that I may not have been able to pick up.

83.2 If there are, it is my opinion that these would be few and of such a small scale that they would not change the total areas in **Attachment 4** by anything greater than a percentage point.

84 Tables 8 and 9 below are summaries of the total reduction in LUC 1-3 land in Selwyn and the cumulative reduction from the regional pool.

Table 8 – District Changes in LUC1-3 Soils from 2018 to July 2022 (PC49-PC82)

LUC	Area (ha)	PC49-82	Net HPL after PCs	%age HPL Losses
LUC 1	6,522	86.07	6,436	1.32%
LUC 2	46,111	555.70	45,555	1.2%
LUC 3	87,927	444.85	87,482	0.51%
Total	**140,560**	**1,086.62**	**139,473**	**0.77%**

[14] [2019] NZHC 276.

[15] *Selwyn District Council. 2018. Baseline Assessment. Versatile Soils. Report DW015.*

Table 9 – Regional Changes in LUC1-3 as a Result of the PCs from 2018 to July 2022 (PC49-PC82)

LUC	Area (ha)	PC49-82	Net HPL after PCs	%age HPL Losses
LUC 1	23,200	86.07	23,114	0.37%
LUC 2	270,500	555.70	269,944	0.21%
LUC 3	543,000	444.85	542,555	0.08%
Total	**836,700**	**1,086.62**	**835,613**	**0.13%**

85 In summary, cumulative potential reduction in productive soils since January 2018 (PC49) up to September 2022 and including the proposed plan change site is:

85.1 0.77% within the Selwyn District.

85.2 0.13% within the region.

Summary

86 The above proportions are relevant and should be taken into account because:

86.1 Clause 3.10(1)(b)(i) enables territorial authorities to take the significancy of the loss into account. The proportions estimated above show that the reductions in LUC1-3 will be insignificant.

86.2 Recent case law (*Gock v Auckland Council* [2019] NZHC 276, the High Court found the Environment Court) that is discussed in Paragraph 81 above. As previously discussed, the issue of proportionality should, also be taken into consideration for the proposed plan change.

87 It is my view that the changes in the proportion of highly productive land as a result of the proposed rezoning and other plan changes since 2018 is small. There will be no significant loss in the amount of highly productive land in the district.

WATER SUPPLY

Introduction

88 In his evidence **Mr McLeod** has discussed the water supply requirements for the development.

89 **Mr McLeod'**s evidence concludes the potable water volume required is 36,500 to 182,500 m^3 /year.

Existing Council Supplies

90 Having reviewed the s42A Report I note that one of the concerns raised by **Mr England** and **Ms White** is the unavailability of water

supply to service the development. Mr England notes that SDC has a total consented volume for the Rolleston scheme of 7,183,440 m^3/year. Over the last three years the average annual use has been 3,300,000 m^3/year. The difference between the consented volume and the demand is 3.88 Mm^3/year. However, all the consented flows are already committed to planned future developments. This does not include the PC80 site.

91 This section of my evidence discusses how these requirements will be met.

Supply from the Applicant's Other Consents

92 Two Chain Road Limited has access to or control over a number of resource consents that are part of the Plan Change Area 69 (*PC69*) proposal. I have listed these consents in Table 10 below.

Table 10 – Existing Consents the Applicant Will Have Control Over

Consent #	Point of Take	Consented Rate (L/s)	Consented Volume (m^3)/Cycle
CRC001158	Well M36/1419	42	73,030 / 21 days
CRC152245	Well M36/3531	26.3	978 / day 119,044 / year
CRC042703	Surface water take from Springs Creek	70 L/s 42 L/s (when flow falls below 200 L/s) 0 L/s (when flow falls below 120 L/s)	N/A
Total (excluding surface water take)		**68.3**	

93 CRC152245 has an annual volume of 119,044 m^3/year but CRC001158 does not have an annual volume.

94 Schedule 13 of the CLWRP provides a number of methods to estimate annual volumes. I used some of these methods to estimate what might be the available annual volumes and I summarise these below:

94.1 Using IrriCal, 1.2 Mm^3 would be required for irrigation within the PC69 area based on 167 ha (my assumed net irrigable area) or 1.3 Mm^3 based on the gross 197 ha.

94.2 CLWRP Schedule 13 (Groundwater allocation regimes - Method 2b(i)) also provides for the assumption that the daily volume can be multiplied by 212 days to estimate the annual volume on a consent. Using this method, the annual volume for CRC001158 is 737,255 m^3 (daily volume x 212 days) Therefore, the combined annual volume of the groundwater consents in the PC69 area is 856,299 m^3 (737,255 m^3 + 119,044 m^3).

94.3 The CLWRP requires that the annual volume from the groundwater takes be the lesser of the volumes in Paragraphs 94.1 and 94.2. Therefore, the available annual volume from the two groundwater consents is 856,229 m^3.

95 Table 11 summarises the PC69 water demand estimates and the annual volume required for the development.

Table 11 – Plan Change 69 Water Demands (based on 1710 lots)

Demand	Total PC69 Daily Water Use (m^3/day)	Total PC69 Annual Water Use (m^3/year)	Estimated Annual Volume (m^3)	Surplus from the PC69 Site (m^3)
690L/day/lot[a]	1,179.9	430,663.5	856,299	425,635

a - SDC Recommendation (average residential connection)

96 Therefore, the applicant has access to at least 425,635 m^3 that can be transferred from the PC69 area. This is more than the potable and firefighting water requirements required for PC80 discussed in **Mr Mcleod**'s evidence.

Onsite Water Reuse

97 For completeness I discuss water supply from other sources in particular water reuse. For example, stormwater generated from the site could be reused for firefighting or irrigation purposes if this became necessary.

98 Fire flows will be designed according to SNZ PAS 4509:2008 New Zealand Fire Service Fire Fighting Water Supplies Code of Practice. The code of practice notes a water supply classification (FW1-FW7) which can be assessed based on the fire hazard category for the building, floor area of the building or size of the largest firecell and whether it has sprinklers or not. The fire hazard category ranges from FHC1 for motels, hotels and hostels of less than 100 people to FHC4 for working/business/storage activities with high fire load.

99 Taking a conservative approach, I consider that the fire hazard categories FHC2-FHC4 would be most appropriate for this development. Fire Water Classification Number (FW) will range from FW3 to FW7 depending on the nature of the business, general building sizes and/or fire cells and whether or not the buildings are sprinklered.

100 The required firefighting flows where the system is reticulated or storage volumes where a reticulated system is not feasible are provided in Figure 2 below which I have extracted from the fire code (Table 2 of the firefighting code of practice).

	Reticulated water supply			Non-reticulated water supply	
Fire water classification	**Required water flow within a distance of 135 m**	**Additional water flow within a distance of 270 m**	**Maximum number of fire hydrants to provide flow**	**Minimum water storage within a distance of 90 m** (see Note 8)	
				Time (firefighting) (min)	**Volume** (m^3)
FW1	450 L/min (7.5 L/s) (See Note 3)	–	1	15	7
FW2	750 L/min (12.5 L/s)	750 L/min (12.5 L/s)	2	30	45
FW3	1500 L/min (25 L/s)	1500 L/min (25 L/s)	3	60	180
FW4	3000 L/min (50 L/s)	3000 L/min (50 L/s)	4	90	540
FW5	4500 L/min (75 L/s)	4500 L/min (75 L/s)	6	120	1080
FW6	6000 L/min (100 L/s)	6000 L/min (100 L/s)	8	180	2160
FW7	As calculated (see Note 7)				

Figure 2 – Firefighting Water Supply (Extracted from the Firefighting Code)

101 Figure 2 shows that the use of stormwater or a non-reticulated system would require 180 m^3 (for FW3) to 2,160 m^3 (for FW6). FW7 volumes would require specific design but the FW6 volumes can be adequate depending on the firecell sizing.

102 Roof stormwater is considered to be "clean" for most roofing materials. Stormwater from roofs could be collected and conveyed to onsite storage for firefighting or irrigation purposes.

103 Stormwater from hardstanding areas could be collected and conveyed to storage. Trafficable hardstanding (e.g. carparks) stormwater could be collected and treated to remove the first flush contaminants prior to discharge into storage.

104 Being an industrial development I expect the site impervious areas to be considerable. This will comprise both roofs and hardstand areas (trafficable and non-trafficable). While these areas will be determined at the subdivision and building consent stage for this site, to illustrate my point I note the impervious areas assumed in the Christchurch City Council Waterways, Wetlands and Drainage

Guide (WWDG)[16]. The WWDG adopts an effective impervious area of 90% for business and industrial developments.

105 In Table 12 below I conservatively estimate the stormwater volumes that would be generated from hardstanding areas only (I have deliberately excluded roof areas to be conservative) assuming 1-90%[16] impervious area coverage and a rainfall depth of 25 mm (which is equivalent to the minimum first flush contaminant removal depth required by Canterbury Regional Council).

Table 12 – Storage Volumes Generated from Stormwater from Trafficable Assuming 25 mm Rainfall Depth

Impervious Area Coverage (%)	Impervious Area (m^2)	First Flush Depth (mm)	Volume Generated (m^3)
1%	9,800	25	245
2%	19,600	25	490
5%	49,000	25	1,225
10%	98,000	25	2,450
20%	196,000	25	4,900
90%	882,000	25	22,050

106 Table 12 shows that stormwater generated from 10% hardstanding areas if stored will be sufficient to meet the firefighting requirements for FW6.

107 Stormwater generated from >10% of the hardstanding areas and roofs can also be able to be used for other uses such as irrigation.

Summary and Conclusion

108 Based on my assessment and discussions in Paragraphs 92-107, I conclude that the site can be serviced with water supply.

RESPONSE TO SUBMISSIONS

109 In their submission to PC80 Fire and Emergency New Zealand (FENZ) supports the proposal to upgrade the water supply network along Two Chain Road and recommended that the extension or installation of a new Ø300mm main throughout the proposed subdivision would be needed in accordance with the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (SNZ PAS 4509:2008).

109.1 Mr McLeod addresses this specific submission in Paragraph 35 of his evidence.

[16] *https://www.ccc.govt.nz/assets/Documents/Environment/Water/waterways-guide/WaterwayswetlandsandDrainageGuideWWDGchapter6Stormwatertreatmentsystems May2012.pdf*.

109.2 However, I also add that it is feasible as I have discussed in Paragraphs 97-107 to provide the firefighting requirements within the site. If this becomes the final solution, the firefighting system and network will be designed in compliance with the FENZ standards and code of practice.

RESPONSE TO OFFICER'S REPORT

110 Paragraph 88 of **Ms White**'s report notes that "*The Site is outside of the RSP area he states that should the plan change be approved, consented water needs to be made available for this plan change area to be developed. Mr England also notes that "high water use industries" will require specific agreement with Council to take water from the reticulated network, noting that this is managed through the Selwyn District Council Water Supply Bylaw 2008.53".* In response to these comments:

110.1 I have demonstrated in Paragraphs 88-107 that the site can be serviced adequately with water supply. The Council's requirements will be able to be met.

CONCLUSION

111 I consider there are multiple long-term constraints to the 18.1 ha of LUC Class 3 soils on the PC80 site and that the loss of these soils would not result in a significant loss (even when considered cumulatively) of productive soils to the region.

112 I consider that the proposed PC80 site can be adequately provided with water.

Dated: 5 October 2022

_____

Victor Mthamo

ATTCHMENT 1 – LOCATION OF THE SITE

ATTACHMENT 2 – SOILS

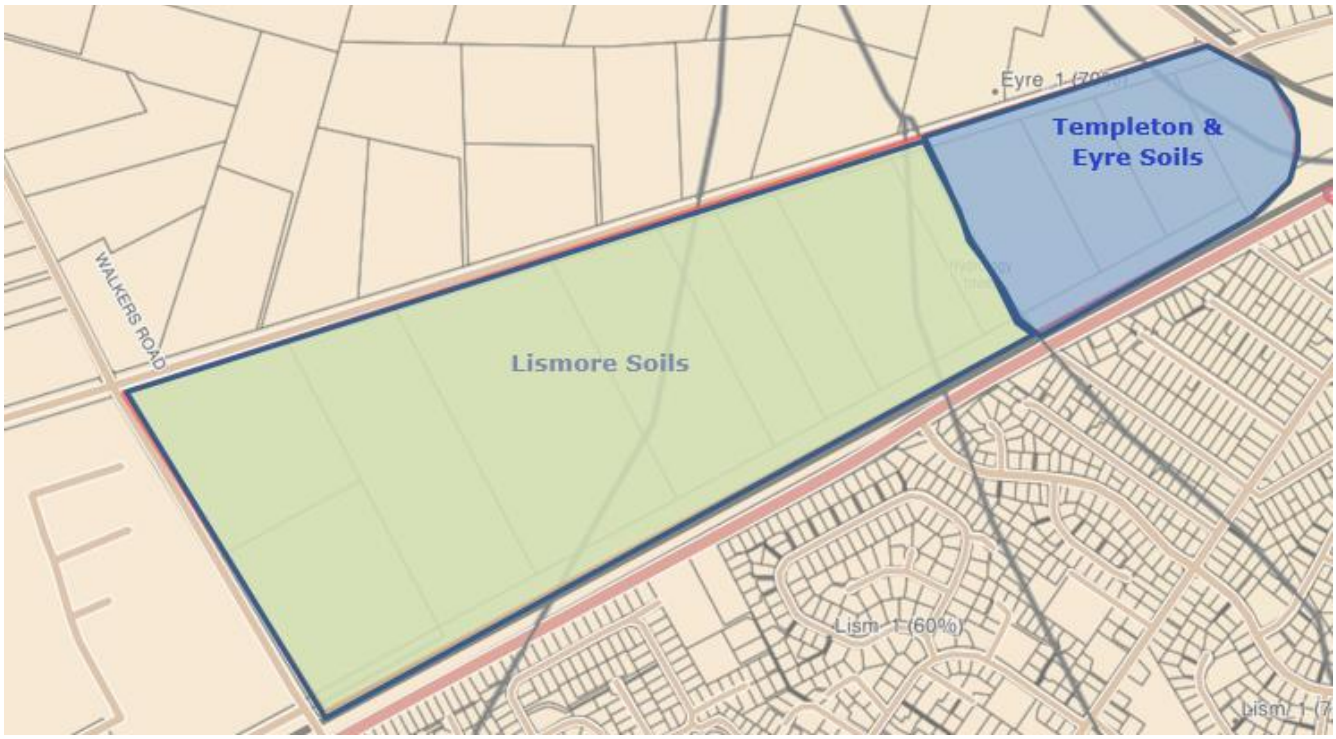
Area Under Each Soil Type

Soil Name	SMap Name	Area (ha)	Percentage
Lismore Soil	Lism_1a.1	54	54.9%
Lismore Soil	Lism_2a.1	23.5	23.9%
Eyre Soil	Eyre_1a.1	12.5	12.7%
Eyre Soil	Eyre_3a.1	2.9	3.0%
Templeton	Temp_2a.1	2.8	2.8%
Eyre Soil	Eyre_2a.1	1	1.0%
Eyre Soil	Eyre_4a.1	1	1.0%
Templeton	Temp_4a.1	0.6	0.6%
Total Area		**98.3**	**100**

Soils Characteristics and Properties

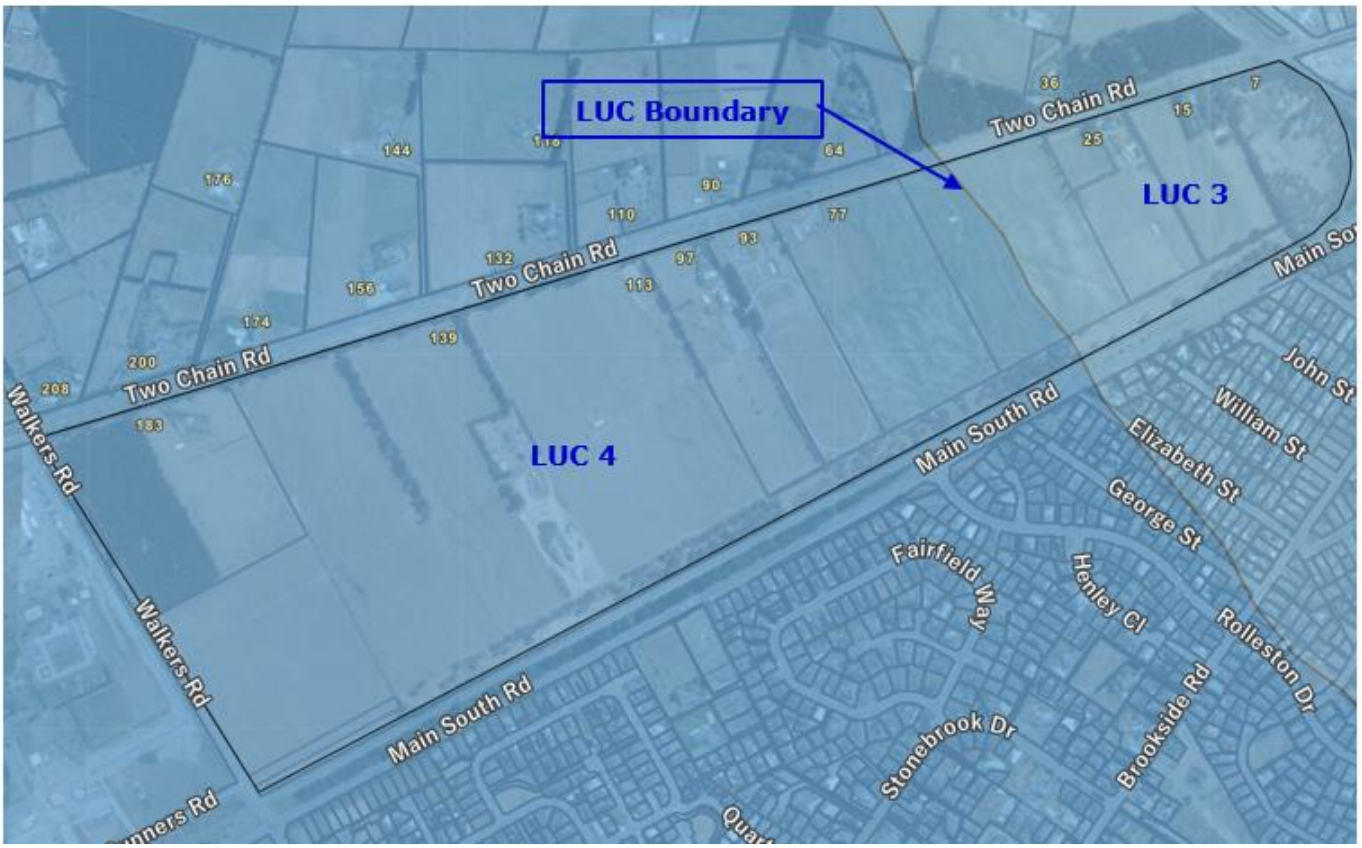
Soil Type	Lismore Soils	Templeton Soils	Eyre Soils
Area (ha)	77.5	3.4	17.4
Soil Long Name	Lismore stony silt loam or shallow silt	Templeton moderately deep silt	Eyre shallow loam/stony silt
Soil Texture	Silty Loam	Silty Loam	Loam-Silty Loam
Permeability	Moderate over rapid	Moderate over slow	Moderate over rapid
Soil Depth	Shallow (20-45 cm)	Shallow (45-100 cm)	Shallow (20-45 cm)
Soil Drainage	Well drained	Moderately well drained	Well drained
Root Barrier	No barrier	No barrier	Extremely gravelly
Run Off Potential	Very Low	Low	Very Low
PAW – 0.6 m	75.6	105.3-107.2	61-103.3
PAW – 1.0 m	115.8	141.0-153.8	77.3-118.8

PAW – Profile available water



General Location of the Main Soil Types

ATTACHMENT 3 – LUC CLASSES WITHIN THEN PC80 AREA



ATTACHMENT 4 – QUANTIFICATION OF CHANGES IN VERSATILE SOILS IN SELWYN

Plan Change	LUC 1	LUC 2	LUC 3	Total	Comments
PC49	2.3	5.8		8.1	
PC50					Fonterra Darfield - no new loss of land
PC54			31.3	31.3	
PC59			19.5	19.5	Total PC59 area = 31.4 ha but 11.9 ha developed prior to 2018.
PC60			17.9	17.9	
PC61			30.76	30.76	Industrial
PC62		42.9	17.1	60	
PC63			60.6	60.6	
PC64	0	0	0	0	All in LUC Class 4
PC66		27.28		27.28	Industrial
PC67		13.7	19.7	33.4	
PC68		36.13	7.57	43.7	23.8 ha in LUC4. No LUC1
PC69	33.8	111.1	45.3	190.2	
PC70	0	0	0	0	All in LUC Class 4
PC71		51.85	2.04	53.89	
PC72	5.7	6.46	0	12.16	There are no LUC 3 soils. The rest of the soils >LUC1-3.
PC73	0	0	0	0	All in LUC Class 4
PC74		3.15	17.5	20.65	
PC75		16.26	8.44	24.7	
PC76	0	0	0		All in LUC Class 4
PC77		17.86	32.44	50.3	
PC78		22.9	37.4	60.3	
PC79	4.97	31.61		36.58	
PC80			18.1	18.1	The remaining 80.2 ha is all LUC4
PC81	0	0	0		All LUC 4 soils
PC82			0	0	The rest of the site is LUC4
Roydon Quarry		99.7	68.2	167.9	Fulton Hogan. 2.9 ha is in LUC4
Lincoln Rolleston Road	0	21.3	0	21.3	YourSection's proposed plan change area
1153 Springs Road and Tancreds Road	26.7	0	11	37.7	Stewart & Townsend proposed plan change area
Tosswill/Trices & Leadleys Road	12.6	47.7	0	60.3	Urban Estates
Total	**86.07**	**555.7**	**444.85**	**1086.6**	

Notes
There are no details on PC51-53, PC55-58 and PC65