

FARM REPORT

Farm: Calder Stewart Property – Hornby Quadrant

Date: 27 July 2023 (version 4 - Final)

Consultant: Mark Everest

TOPICS: Calder Stewart Property, Hornby Quadrant – Agricultural Viability Report

1. Introduction

This report assesses the productive and economic viability of the approximately 23ha of land between State Highway 1 and Marshs Road in Templeton proposed to be re zoned from Rural Urban Fringe to Heavy Industrial. While the total site is approximately 23 ha in size, there are only five lots totalling 19.5ha within the subject site that are not residential in size and have and available for primary production. My analysis considers the productive potential of the 5 lots that could support primary production.

As the proposal of the applicant is located on land currently classified as LUC 2 by the New Zealand Land Resource Inventory, the land is deemed highly productive. The National Policy Statement for Highly Productive Land (NPS-HPL) provides guidance to protect land that has highly productive characteristics from inappropriate use (loss).

I conclude from my analysis, that while the 23ha of land located between Marshs Road and State Highway 1 in Templeton is classed as highly productive, it is sufficiently constrained that it is not capable of being used for economically viable productive purposes. While the applicants proposal would result in a loss of highly productive soil as classified by the NZLRI LUC, the loss of land from primary producing purposes would not likely result in a loss of productivity in the region when assessed against a 30 year timeframe.

2. Summary

In this assessment I have considered four different farm systems and assessed them against my indicators of economic viability.

The farm systems I have assessed are:

1. Dryland livestock grazing
2. Pipfruit production (apples).
3. Viticulture production (grapes for wine).
4. Berryfruit (strawberries) in rotation with cut and carry silage.

In summary, all four options assessed fail to meet the Economic Viability Objectives as set out in Section 3.1 of this report. All three farm system options return less than the target 4.0% Return on Capital, with pipfruit production being the most profitable but only achieving 1.2% RoC.

The soils on the subject site have high water holding capacities of approximately 110mm in the top 60 centimetres of soil depth (Appendix 6.7). While irrigation water may be available, it would come at considerable cost and any use would need to comply with the Christchurch-West Melton nutrient discharge regulations. The probability of attaining groundwater for the purposes of irrigation and the associated nutrient discharge allocation to use the irrigation water is highly unlikely.

Below is a summary table of economic returns and return on capital for the assessed systems.

Table 1: Economic viability of assessed land use options

	Dryland livestock trading	Apples	Grapes	Strawberries and Silage Sales
Operating Budget				
Nett Farm Income	\$3,117 /ha	\$54,945 /ha	\$22,246 /ha	\$27,076 /ha
Total Expenses	\$6,328 /ha	\$46,268 /ha	\$16,675 /ha	\$21,315 /ha
Earnings Before Interest, Tax and Rent (EBITR)	-\$3,211 /ha	\$8,677 /ha	\$5,571 /ha	\$5,761 /ha
EBITR/13.5ha	-\$43,349	\$117,145	\$75,213	\$77,769
Pro-Rata Owner Remuneration (included in cash expenses)	\$20,759	(contract labour)	(contract labour)	\$1,066
Capital				
Land (Rating Valuation)	\$385,471 /ha	\$385,471 /ha	\$385,471 /ha	\$385,471 /ha
Capital Livestock	\$0 /ha	\$0 /ha	\$0 /ha	\$0 /ha
Irrigation Water (additional)	\$0 /ha	\$143,986 /ha	\$143,986 /ha	\$143,986 /ha
Land Improvements	\$0 /ha	\$149,507 /ha	\$103,507 /ha	\$13,589 /ha
Plant and Machinery	\$0 /ha	\$20,741 /ha	\$1,111 /ha	\$0 /ha
Total Capital	\$385,471 /ha	\$707,546 /ha	\$641,916 /ha	\$556,635 /ha
Return on Capital	-0.8%	1.2%	0.9%	1.0%

I conclude that the 23 hectare (13.5 hectares effective) Subject Site between Marshs Road and State Highway 1, Templeton is not suitable for, or capable of economically viable land based primary producing activities when considering a 30 year timeframe.

3. Viability Assessment

3.1. Economically Viable Definition

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

Objective One:

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

Objective Two:

Generate a Return on Capital (RoC) acceptable for the class of country. On flat land in Canterbury, RoC should be at least 4.0%.

3.2. Land Areas

3.2.1. Effective Area

Of the total 23 hectares within the subject site, there are approximately 19.5 hectares of titles that are not residential in size (Appendix 6.6). Of the 19.5 hectares within the Subject Site that could be used for primary producing purposes, 6 hectares are taken up by trees, lanes, buildings and supporting facilities. Only 13.5 hectares is available for land based primary producing activities.

3.2.2. Irrigatable Areas

The Subject Site has no history of historic irrigation and no titles within the Subject Site currently hold a resource consent for groundwater take or use for primary producing purposes.

Typically when irrigating land for primary producing purposes, infrastructure is able to be installed to cover up to 95% of the effective area. On the Subject Site this would translate to approximately 12.8 hectares of irrigated land.

There is no previous history of irrigation on the Subject Site, no groundwater allocation available in the zone and low likelihood of successfully transferring groundwater allocation to the Subject Site. I conclude that there is a very low probability of successful acquisition of water for irrigation from a groundwater bore at the Subject Site. Due to the small effective area of only 13.5 hectares, and due to nutrient loss restrictions constraining irrigated land-based primary production to horticulture, I conclude that the only practical irrigation systems would be a moveable gun or dripline.

To irrigate the land at the Subject Site, I assume that the land holders would work collectively to obtain one water take and use consent in the interests of cost efficiency. On the basis of land holders cooperating to collectively irrigate their land, I estimate the cost of applying for resource consent, installing a bore and associated infrastructure would cost \$249,836 as outlined in appendix 6.8.

3.3. Resources and Constraints

3.3.1. Soils

The soils on Subject Site (Appendix 6.7) are regarded by NZ Land Resource Inventory (Land Use Capability 2021) as being LUC 2 (Appendix 6.3).

The Subject Site is dominated by Waimakariri sibling Recent Soils, characterized by high water holding capacities and free draining properties.

All the soils on the property are regarded as well drained or free draining with no significant rooting barrier at depths less than 1 metre below ground level. The soils all have similar, high water holding capacities at depths to 60cm (108-137mm PAW to 60cm soil depth).

The high water holding capacity and free draining nature of the soils makes them very versatile and suited to growing a wide range of plants, provided they are complemented with irrigation water. Without irrigation, the soils are constrained to low productivity, conservative production systems such as the dryland livestock system discussed in this report.

3.3.2. Nutrient Management

The Subject Site is located within the Christchurch – West Melton Nutrient Management Zone and is subject to Section 9 of the Canterbury Land and Water Regional Plan (CLWRP). Section 9 of the CLWRP determines that the Christchurch – West Melton Nutrient Management zone is over allocated for nutrients, and therefore requires all farms greater than 10 hectares to leach not more than their 2009-2013 nitrogen loss rate.

While the Subject Site contains titles of less than the reporting 10 hectare threshold I consider two additional factors necessary to evaluate in assessing requirements to comply with nutrient discharges.

1. In order for land management units to be economically viable, they typically need to be greater than 10 hectares in size. I therefore assume that if economically viable, land-based primary production was to be undertaken on the Subject Site, it would need to be undertaken as one contiguous land management unit, therefore being captured by the 10ha reporting and compliance threshold of Section 9 of the CLWRP.
2. It is important to consider that the Christchurch – West Melton Nutrient Management Zone is over allocated for nutrients and therefore any increase in nutrient losses threatens the community achieving water quality outcomes.

Irrigation always increases drainage as wetted soils are less capable of capturing rainfall. With additional drainage, if there is no change to farm system (crops, stock) there is additional nutrient (nitrogen) leaching.

If the community do not meet water quality outcomes due to increased nutrient losses from land based activities, additional nutrient discharge restrictions are likely to be imposed. If further nutrient discharge restrictions are imposed, the restrictions will likely apply to land holdings greater than 10 hectares leaving smaller land holders unaffected. In order for larger land holders to meet tighter nutrient discharge, they must reduce productive intensity.

By permitting small land holdings to increase intensity and consequently increase nutrient discharges in a catchment which is considered over-allocated for nutrients, the catchment productivity does not increase, the productivity merely moves from one regulated land manager to an un-regulated land manager.

In order to increase productivity in the catchment, the land holding must engage in a land based activity which does not result in an increase in nutrient losses.

I have modelled a nutrient discharge baseline for the property using OverseerFM. The baseline nutrient discharge for the property is estimated to be 6kg Nitrogen per hectare per year, I therefore

have only considered enterprises that can comply with the 6kg Nitrogen per hectare per year loss rate.

3.3.3. Irrigation Water Availability

The Subject Site currently holds no consents to take water from surface or groundwater sources for the purposes of irrigation.

The Subject Site is located outside the Central Plains Water Ltd (CPWL) command area and therefore not eligible to apply for a water allocation from the scheme. Furthermore, CPWL have confirmed that there is no additional capacity at the bottom of the scheme, therefore even if CPWL resource consents were changed to provide for an increased command area, the scheme is unable to physically supply the water to the Subject Site.

The only viable source of irrigation water is from a consent transfer from another ground water consent. The Site is located within the Christchurch-West Melton groundwater allocation zone which is deemed over allocated by Canterbury Regional Council, and therefore no additional groundwater take consents can be granted.

A groundwater allocation for the Subject Site could be purchased if the following criteria are met:

- a) The annual volume was purchased from other consented water users in Christchurch-West Melton Groundwater allocation zone, and,
- b) the abstraction of the water did not result in any aquifer degradation or interfere with the reliability of any neighbouring bores, and,
- c) the abstraction and use meets the objectives of 1.3 (4) and 1.3 (5) of the National Policy Statement for Freshwater Management.
 - i. Under section 1.3 (5) of the National Policy Statement for Freshwater Management, the Te Mana o te Wai hierarchy of obligations prioritises first, the health and wellbeing of water bodies and freshwater ecosystems before any use of water. From my perspective, it is difficult to see how additional water will be made available for The Site on the basis of the current environment and the application of this policy in future.
 - ii. The National Policy Statement for Freshwater Management also sets out National Bottom Line's for water quality with respect to nutrients for rivers and lakes as:
 - 1. Rivers: Annual median concentration of 2.4 mg Nitrate Nitrogen/litre (Table 6 – Nitrate (toxicity))
 - 2. Lakes: Annual median concentration of 750mg Nitrogen per cubic metre (Table 3 – Total nitrogen (trophic state)).

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

Land, Air, Water Aotearoa (LAWA) record a five-year median nitrate nitrogen concentration of 4.5mg/litre in well BX24/0347 which is located within the Christchurch – West Melton groundwater allocation zone.

While the LAWA water quality data suggests the water quality objectives of the of the National Policy Statement for Freshwater Management and the Water Services (Drinking Water Standards for New Zealand) Regulations 2022 are currently being met in the Christchurch-West Melton zone, it is still unlikely a groundwater consent will be granted if the proposed land use was likely to result in degradation of ground or surface water quality. A potential degradation of ground or surface water resulting from increased irrigation could curtail the granting of a resource consent to take and use water for irrigation as:

- a) the first priority of Te Mana o te Wai would not be met,
- b) the activity would be threatening the community meeting the water quality objectives of the of the National Policy Statement for Freshwater Management and the Water Services (Drinking Water Standards for New Zealand) Regulations 2022.

While purchasing and transferring groundwater for irrigation purposes to the site is technically achievable, I have spoken with groundwater consent transfer specialist Matt Bubb (Aqualinc Research Ltd), who has advised that chances of a successful transfer are very low as:

- a) it is highly likely nearby groundwater bores would be affected by the transferred take, which provides grounds for Canterbury Regional Council to decline the water transfer application,
- b) it is highly likely that Canterbury Regional Council will deem that the first priority of Te Mana o te Wai is not met as permitting the transfer of groundwater in an over allocated zone directly contradicts the first priority,
- c) if there is any perceived risk of increased nutrient or biological contamination to the ground or surface water as a result of increased irrigation, this would threaten zone water quality outcome objectives and the first priority of Te Mana o te Wai and therefore water consent transfer should not be granted.

I therefore conclude that a groundwater transfer to the Subject Site is highly unlikely. Due to the overallocated nature of the groundwater zone, and over allocated nature of the nutrient allocation zone, I consider the absence of water availability for the purposes of irrigation to be permanent for the Subject Site.

Notwithstanding the above, assuming that it is possible to buy and transfer water to the Subject Site, I estimate that the cost of acquiring additional groundwater to sufficiently irrigate the available 12.8ha area with groundwater would cost \$249,836 as outlined in Table 2 below.

Table 2: Estimated costs of acquiring groundwater

Cost to Purchase Annual Volume	89,510 m3	\$93,986
Consenting	PC sum	\$50,000
Well and Pump establishment	1 unit	\$105,850
Total Cost		\$249,836

3.3.4. Reverse Sensitivity

As urban land uses encroach on areas traditionally used for rural production, there is increased social pressure on farmers to comply with the convention of a residential setting and associated expectations. Commonly these arise through crop residue burning, animal odours, noise and light at night or spraying.

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

- a) The Canterbury Regional Policy Statement, Rule 14.3.4 requires operators to avoid adverse effects of agrichemical sprays drifting beyond property boundaries or onto non-targeted properties.
- b) Canterbury Air Regional Plan, Rule 7.77 requires that fertiliser spreading and agrichemical spraying does not cause an offensive or objectionable effect beyond the boundary of the property.

Even though Canterbury Regional Council rules create provision for the control of activities, the interpretation of the term 'objectionable' can vary depending on the setting.

A recent example of interpretation of 'objectionable' resulted in the halting of spraying gorse in Wellingtons Belmont Regional Park farm in 2022. The spraying was halted primarily due to objectionable odour. The Regional Park is both a farm and partially open to the public, similar circumstances to a primary producing unit being located adjacent to a residential setting.

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

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

The Subject Site shares boundaries in common with residential or lifestyle-residential dwellings to the West and South-West. A prudent primary production operator assessing the viability of the Subject Site for land-based, primary production would likely expect to have to operate a more conservative farm programme in coming years in order to meet residential amenity expectations. A more conservative production programme, results in poorer profitability and often makes properties economically unviable.

It is my opinion that the close proximity of the Subject Site to residential and lifestyle-residential properties will result in increase reverse sensitivity effects on agricultural practices if undertaken the Subject Site in the coming years.

3.4. Viable Opportunities

In this assessment I have assessed both dryland and irrigated primary production systems. For the irrigated systems, I assumed that groundwater is able to be sourced for irrigation purposes and have considered only economically viable opportunities currently available in Central Canterbury.

Small size land holdings are very difficult to develop functional farm systems for as they require as much investment in machinery and infrastructure as a much larger property. Typically I see:

- land holdings of greater than 20 hectares used for productive purposes, and are economically viable.
- land holdings of between 10 and 20 hectares used partly for productive purposes (often leased to a neighbour to include in their operation) and partly for lifestyle amenity (not productive agriculture).
- Land holdings under 10 hectares not used for productive purposes, generally used primarily for residential function and are rarely productive.

I have considered a number of land-based, primary production options and discounted those impractical as outlined below.

Non-viable options (not considered):

1. Dairy Farming: discounted due to lack of scale and nutrient loss constraints of the catchment. Nutrient losses from dairy farming are typically greater than 35kgN/ha/year, which exceeds the baseline loss rate of 6kgN/ha/year.
2. Vegetable Farming: discounted due to nutrient loss constraints of the catchment. Nutrient losses from vegetable farming are typically greater than 25kgN/ha/year, which exceeds the baseline loss rate of 6kgN/ha/year.
3. Livestock Finishing: discounted due to high capital cost associated with developing stock handling facilities for small scale land holding and nutrient loss constraints of the catchment. Nutrient losses from livestock finishing are typically greater than 20kgN/ha/year, which exceeds the baseline loss rate of 6kgN/ha/year.
4. Intensive dryland grain and seed production. discounted due to high capital cost associated with developing grain and seed handling facilities for small scale land holding and nutrient loss constraints of the catchment. Nutrient losses from intensive dryland grain and seed production are typically greater than 15kgN/ha/year, which exceeds the baseline loss rate of 6kgN/ha/year.
5. Intensive irrigated grain and seed production. discounted due to high capital cost associated with developing grain and seed handling facilities for small scale land holding and nutrient loss constraints of the catchment. Nutrient losses from intensive irrigated grain and seed production are typically greater than 20kgN/ha/year, which exceeds the baseline loss rate of 6kgN/ha/year.
6. Lease to, or amalgamate with neighbours: discounted due to geographical constraints of a state highway on one boundary, small scale lifestyle neighbours to the south west of Marshs road and commercial subdivision to the north east and south east of the Subject Site. While the Subject Site could be incorporated with management of a bare land site at 55 Marshs

Road, the nutrient loss and irrigation constraints of the Subject Site preclude any significant intensification resulting from amalgamation.

Viable options considered:

7. Dryland livestock grazing
8. Pipfruit production (apples).
9. Viticulture production (grapes for wine).
10. Berryfruit (strawberries) and cut and carry silage.

I have analysed and collated four farm systems and cash budgets for the businesses to demonstrate profitability of the options listed above.

3.4.1. Viable Option – Dryland Livestock Grazing

For an intensive dryland livestock grazing system to comply with the 6kgN/ha/year baseline Nitrogen loss rate for the Subject Site, a combination of sheep and cattle trading is required with an all grass wintering system using only some baleage.

This production system would buy and finish approximately 250 lambs per year and 50 store cattle per year.

3.4.2. Viable Option - Pipfruit Production

For Pipfruit to be economically viable from a labour management perspective, orchards need scale of between 25 and 30 hectares. I have assumed that there will be other orchards develop in the area to share labour and make the pipfruit orchard viable.

The pipfruit orchard is irrigated and is assumed to cover the full 13.5 available hectares on the Subject Site.

Pipfruit has a projected nutrient loss rate of 6kg N/ha/year which is equal to the baseline loss rate for the property and therefore can be considered as growing productivity of the catchment.

As labour is provided on a contract basis, this viable option only needs to satisfy the RoC economic viability assessment.

3.4.3. Viable Option - Viticulture

Viticulture is viable on much smaller sizes of land, although it is more viable for management if areas are 10 hectares or more. As for the pipfruit I have assumed there would be additional uptake of viticulture in the area to enable harvesting machinery to be purchased and management expertise would be developed.

The vineyard is irrigated and is assumed to cover the full 13.5 available hectares on the Subject Site.

Viticulture has a projected nutrient loss rate of 5kg N/ha/year which is less than the baseline loss rate for the property and therefore can be considered as growing productivity of the catchment.

As labour is provided on a contract basis, this viable option only needs to satisfy the RoC economic viability assessment.

3.4.4. Viable Option – Berryfruit and cut and carry silage

Berry fruit has been used as a proxy for high value horticultural production. As strawberries have a high nutrient loss rate, and are highly susceptible to host specific diseases, they need to form part of a rotation.

To recognize longevity of a 30 year land use, I have implemented a four year rotation where strawberries are only planted in the soil one in every four years. The other four years are modelled as cut and carry pasture silage (pasture sold off farm). Pasture silage sales are necessary to keep nutrient loss rates under the baseline loss rate of 6kgN/ha/year and reduce the need to stock handling facilities capital investment.

As the berryfruit would be managed by contract managers, the only wages required to meet the owners remuneration would be shifting irrigation on the pastures.

Crop Rotation

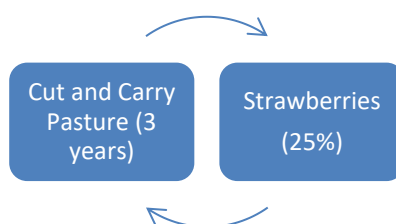


Figure 1: Berry fruit crop rotation

3.4.5. Viable Options Performance Summary

	Dryland livestock trading	Apples	Grapes	Strawberries and Silage Sales
Operating Budget				
Nett Farm Income	\$3,117 /ha	\$54,945 /ha	\$22,246 /ha	\$27,076 /ha
Total Expenses	\$6,328 /ha	\$46,268 /ha	\$16,675 /ha	\$21,315 /ha
Earnings Before Interest, Tax and Rent (EBITR)	-\$3,211 /ha	\$8,677 /ha	\$5,571 /ha	\$5,761 /ha
EBITR/13.5ha	-\$43,349	\$117,145	\$75,213	\$77,769
Pro-Rata Owner Remuneration (included in cash expenses)	\$20,759	(contract labour)	(contract labour)	\$1,066
Capital				
Land (Rating Valuation)	\$385,471 /ha	\$385,471 /ha	\$385,471 /ha	\$385,471 /ha
Capital Livestock	\$0 /ha	\$0 /ha	\$0 /ha	\$0 /ha
Irrigation Water (additional)	\$0 /ha	\$143,986 /ha	\$143,986 /ha	\$143,986 /ha
Land Improvements	\$0 /ha	\$149,507 /ha	\$103,507 /ha	\$13,589 /ha
Plant and Machinery	\$0 /ha	\$20,741 /ha	\$1,111 /ha	\$0 /ha
Total Capital	\$385,471 /ha	\$707,546 /ha	\$641,916 /ha	\$556,635 /ha
Return on Capital	-0.8%	1.2%	0.9%	1.0%

Figure 2: Economic Viability Assessment Summary

The Subject Sites 13.5 effective hectare size is constrained by high overhead costs and lower productivity induced by nutrient loss constraints. While the Apple, Grape and Berryfruit models

generate the greatest RoC's of 1.2%, 0.9% and 1.0% respectively, they fall short of achieving the targeted 4.0% as set out in Objective Two above.

I assess the Subject Site as being economically unviable from a land based primary production perspective.

While the soils at Subject Site between Marshs Road and State Highway 1, Templeton are classified as being highly productive, I consider that the land is so constrained, and will continue to be constrained by reverse sensitivity, nutrients and irrigation, that the land is not capable of producing land based primary products at a highly productive level. I do not consider that the constraints will be overcome when considering a 30 year timeframe.

4. NPS-HPL

The National Policy Statement for Highly Productive Land (2022) objective is to protect highly productive land for use in land-based primary production, both now and for future generations.

4.1. Relevant Clauses

The relevant policies and clauses of the NPS-HPL that are applicable to the Subject Site application are:

- Clause 3.10 (1)(a)
- Clause 3.10 (1) (b)
- Clause 3.10 (2)

I provide the following assessments against the identified applicable clauses below.

Clause 3.10 Exemption for highly productive land subject to permanent or long-term constraints, requires that:

(1) Territorial authorities must avoid the subdivision of highly productive land unless one of the following applies to the subdivision, and the measures in subclause (2) are applied:

(a) 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:

(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; and

(ii) avoids the fragmentation of large and geographically cohesive areas of highly productive land; and

(iii) avoids if possible, or otherwise mitigates, any potential reverse sensitivity effects on surrounding land-based primary production from the subdivision, use, or development; and

(2) In order to satisfy a territorial authority as required by subclause (1)(a), an applicant must demonstrate that the permanent or long-term constraints on economic viability cannot be addressed through any reasonably practicable options that would retain the productive capacity of the highly productive land, by evaluating options such as (without limitation):

- (a) alternate forms of land-based primary production:
- (b) improved land-management strategies:
- (c) alternative production strategies:
- (d) water efficiency or storage methods:
- (e) reallocation or transfer of water and nutrient allocations:
- (f) boundary adjustments (including amalgamations):
- (g) lease arrangements.

4.2. Application Relevance:

3.10(1)(a): The land at the Subject Site is constrained by nutrient discharge allocations and irrigation water availability. The constraints preclude the land from undertaking economically viable, land based primary producing activities at commercial scale. The property is constrained by a commercial subdivision to the North East, high use roading to the West and residential-lifestyle sections to the South. The only viable opportunity to increase scale would be to manage the Subject Site in conjunction with the property at 55 Marshs road, however I do not believe the inclusion of the Subject Site with 55 Marshs road would increase economic viability or productivity as the Subject Site is more constrained by irrigation water and nutrients.

The assessment in 3.4.5 above outlines that the land is not capable of economically viable, land based primary production and will continue to remain unviable when considering a 30 year timeframe, satisfying Clause 3.10 (1)(a).

3.10 (1)(b)(i): While there will be a loss of productive land as defined by NZLRI, there will be no cumulative or individual loss of productive capacity of highly productive land in the catchment because the land is sufficiently constrained (as discussed in 3.3.2 above) such that it is incapable of being managed for highly productive purposes, satisfying Clause 3.10 (1)(b)(i).

3.10 (1)(b)(ii): The Subject Site proposed to be rezoned as Heavy Industry is adjacent to an industrial subdivision on the north eastern boundary. While there is farm land adjacent to the site on the eastern boundary, the Subject Site rezoning as proposed by the applicant, will

not fragment the use of the area, it will only shift the boundary between rural and commercial. I assess that this application satisfies Clause 3.10 (1)(b)(ii).

3.10 (1)(b)(iii): The proposed rezoning of the Subject Site is unlikely to impact adjoining residences on rural land and other commercial sites. The assessment of adverse effects on the environment and affected persons in consent application RMA/2022/2739 for the Subject Site details setbacks and shelter plantings to mitigate any potential impacts on surrounding land holdings. I do not foresee any reverse sensitivity effects being impressed upon the adjoining rural land as a result of the applicants proposal, nor do I foresee any probable reverse sensitivity effects of the adjoining land impacting the applicants proposed activity. I assess that the application satisfies Clause 3.10 (1)(b)(iii).

3.10 (2)(a): In section 3.4 of this report I assess 10 different highly productive, land based primary producing activities that could suit the location. I assess that only four are suitable given the permanent constraints the land is subject to, satisfying Clause 3.10 (2)(a) that alternative form of land based primary production have been explored.

3.10 (2)(b)(c): In section 3.4 of this report I discuss the merits of different production systems. The budgets show that with good management there are no viable management regimes that generate more profit or economically viable uses of the land to be engaged due to the permanence of the constraints discussed in 3.3 of this report. I believe there are no alternative production strategies to make this land capable of economically viable, land-based primary production, satisfying Clause 3.10(2)(b)(c).

3.10 (2)(d): In section 3.3.3 of this report I discuss that irrigation water is available, however the acquisition and use of the water does not make the land-based, primary production economically unviable at the Subject Site. This analysis satisfies Clause 3.10(2)(d) that irrigation or water use efficiency is not a pathway to making this land capable of economically viable, land-based primary production.

3.10 (2)(e): Section 3.3.23.3 of this report discusses the nutrient resource constraints of the Christchurch-West Melton nutrient allocation zone. The constraints of the over-allocated zone preclude the transfer of nutrients as a tool to increase productivity. I believe this application satisfies Clause 3.10(2)(e).

3.10(2)(f)(g): Lease arrangements or boundary adjustments provide little scope for increased productivity of the Subject Site land as the Subject Site is constrained by high use roads, residential dwellings and a commercial subdivision. While the land could easily be leased, the constraints of nutrient allocation and irrigation water availability precludes any lessee from undertaking any activity that would be more productive or economically viable than this assessment concludes. The management described in Section 3.4 above discusses the enterprise selection based on irrigation feasibility and nutrient loss constraints on the Subject Site. I conclude that boundary adjustments or lease arrangements would not assist the land in undertaking any more productive or economically viable uses than discussed in this report. I assess that Clauses 3.10 (2)(f)(g) is satisfied by the applicants proposal.

5. Conclusion

The proposed rezoning of 23 hectare of land between Marshs Road and State Highway 1, Templeton from Rural Urban Fringe to Heavy Industrial will not result in a loss of productive capacity of highly productive land in the community as the land is sufficiently, and permanently constrained that it is unsuitable for economically viable, land -based, primary producing activities.

I conclude that the land holding is economically unviable as a land based primary producing unit and will continue to remain economically unviable when considering a 30 year time scale given the constraints of resource availability and likely increasing reverse sensitivity effects. I conclude this as none of the assessed farm or horticultural systems meet the Return on Capital threshold while meeting the pro-rata owner remuneration target, necessary to be defined as economically viable.

The applicant's proposal to rezone 23 hectares of land currently zoned Rural Urban Fringe to Heavy Industrial between Marshs Road and State Highway 1, Templeton will not result in a reduction of land available for economically viable, highly productive, land-based primary production.

Mark Everest

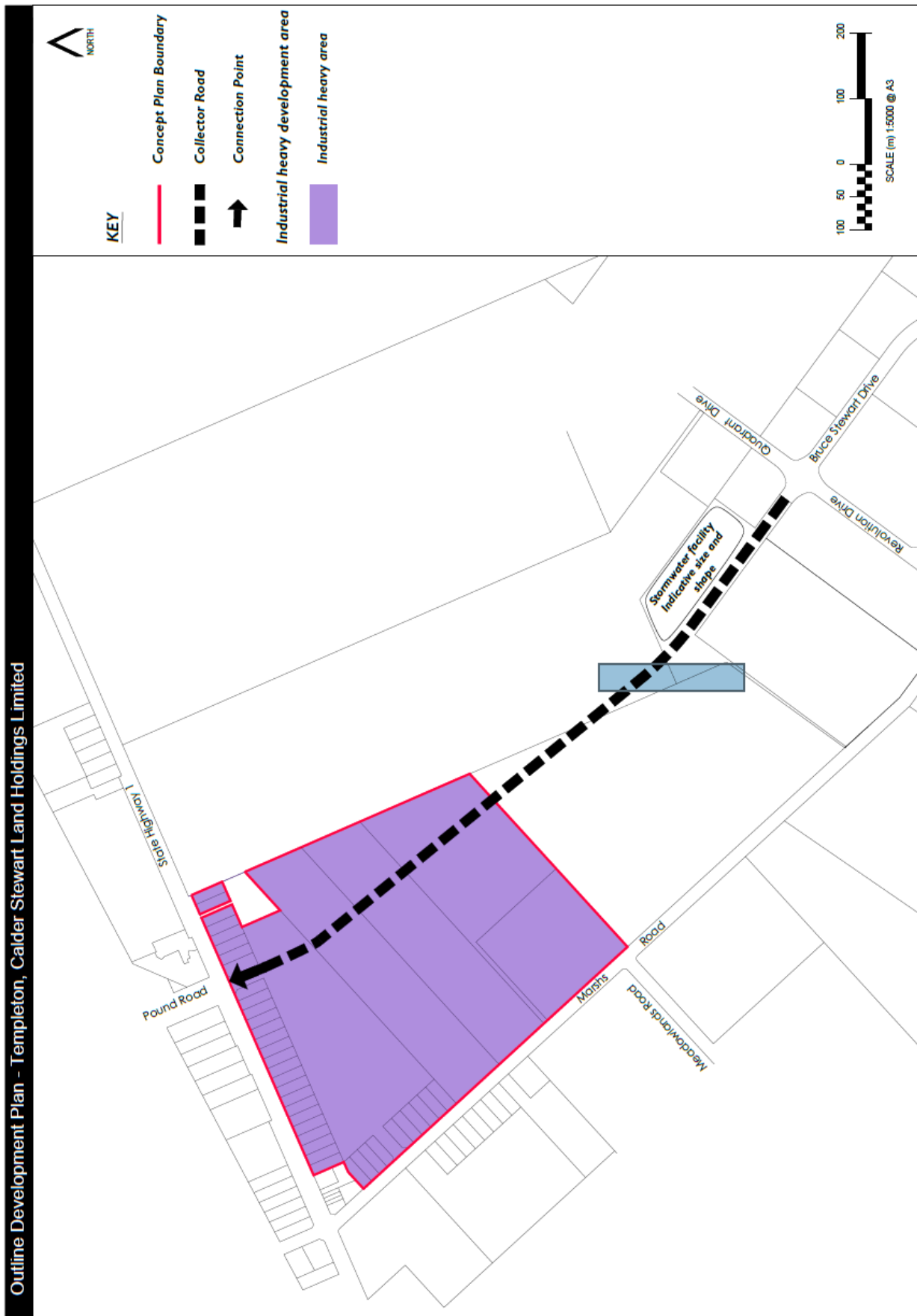
Farm Management Consultant

MACFARLANE RURAL BUSINESS LTD

027 418 6559

6. Appendices

6.1. Outline Development Plan

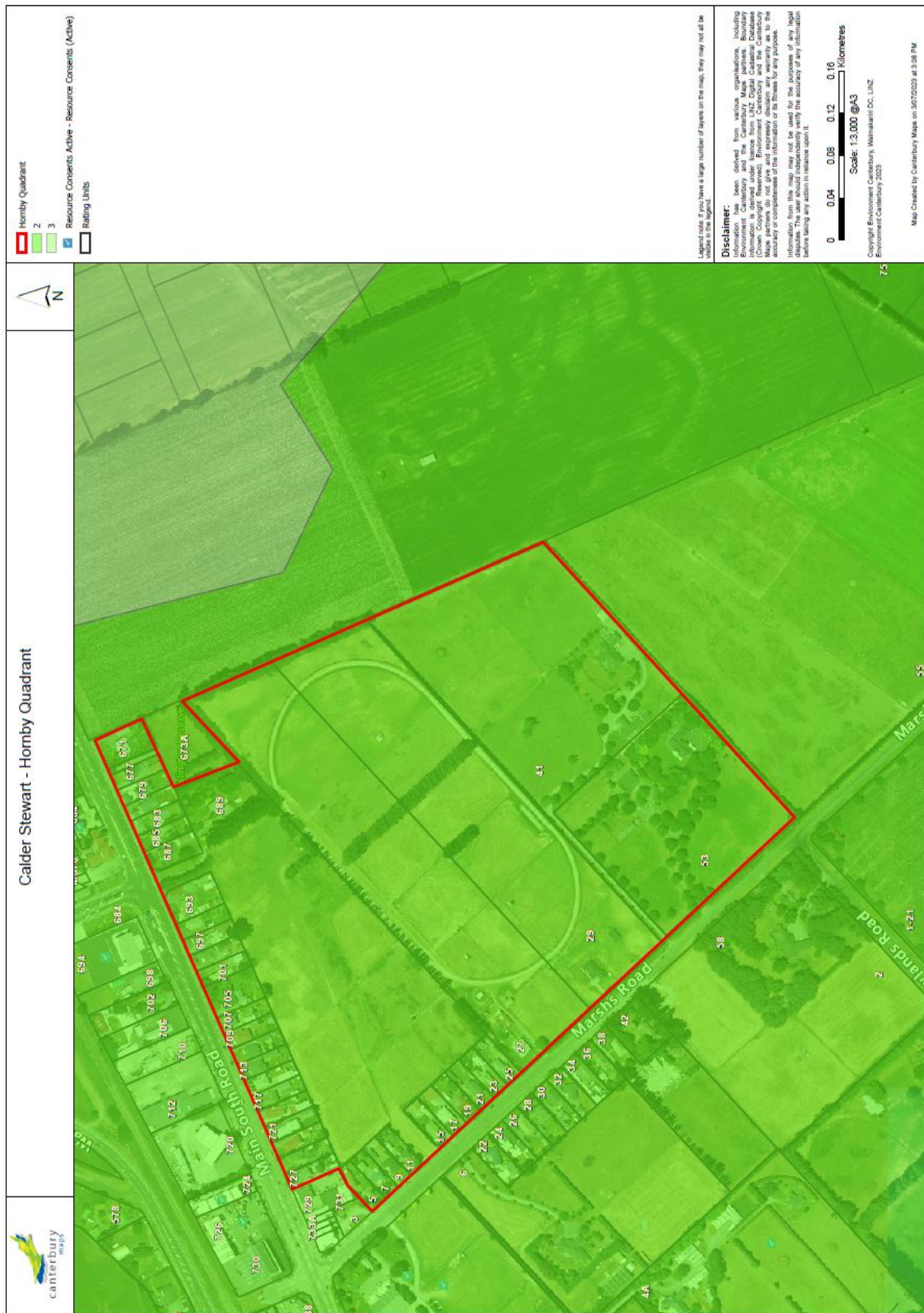


6.2. Current Land Zoning



Source: CCC, Property Economics, Calder Stewart

6.3. Highly Productive Land (LUC 2,3)



6.4. Nutrient Allocation Status



6.5. Groundwater and Nutrient Allocation Zones

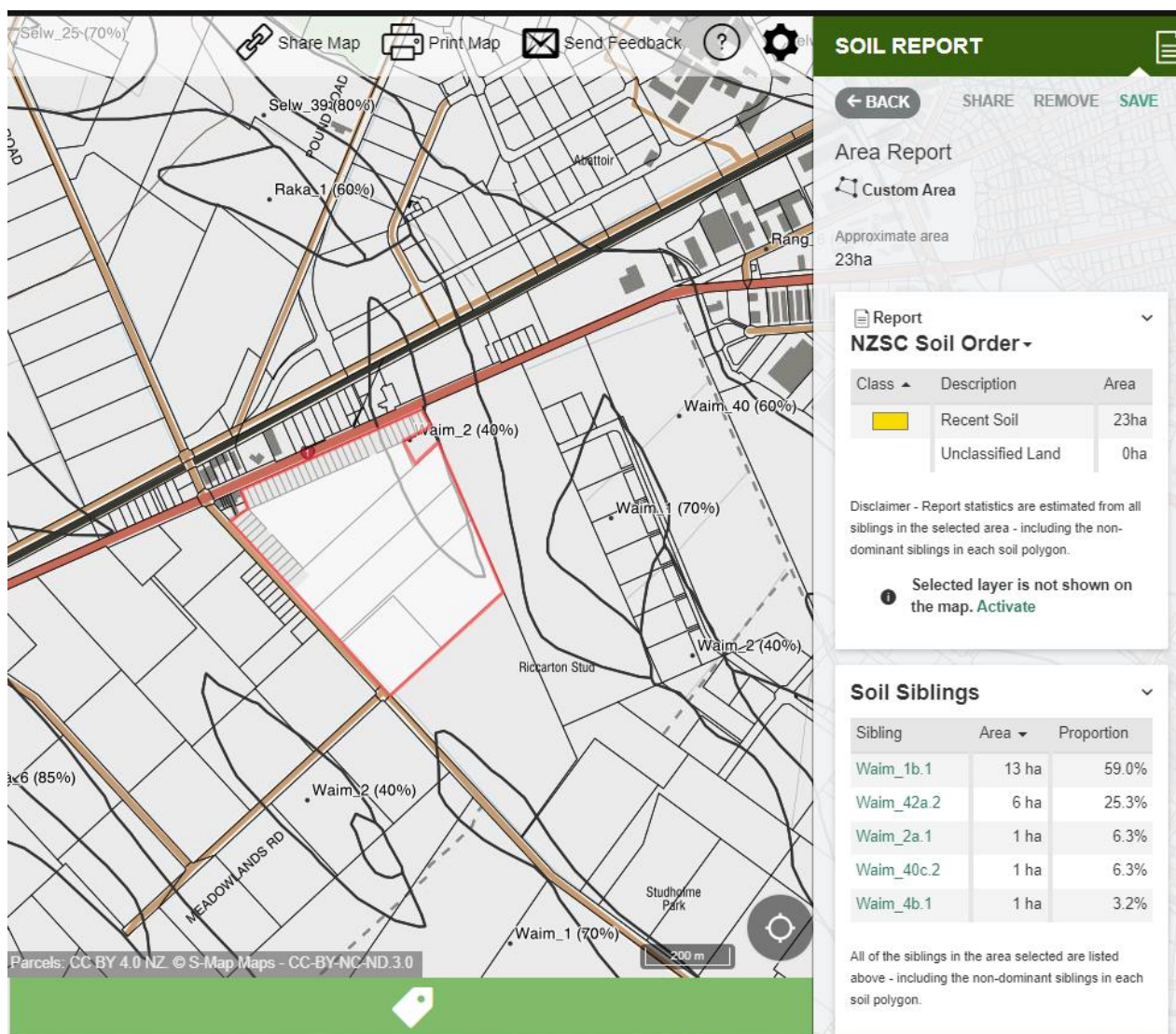


6.6. Rating valuation

689 MAIN SOUTH ROAD ISLINGTON CHRISTCHURCH	\$1,330,000	\$1,110,000	\$220,000	4.7 ha	4.0 ha	\$280,303
27 MARSHS ROAD TEMPLETON CHRISTCHURCH	\$1,190,000	\$1,080,000	\$110,000	4.1 ha	3.0 ha	\$363,636
29 MARSHS ROAD TEMPLETON CHRISTCHURCH	\$1,480,000	\$1,080,000	\$400,000	4.0 ha	2.6 ha	\$421,875
41 MARSHS ROAD TEMPLETON CHRISTCHURCH	\$2,420,000	\$1,080,000	\$1,340,000	4.0 ha	2.8 ha	\$385,714
53 MARSHS ROAD TEMPLETON CHRISTCHURCH	\$2,480,000	\$850,000	\$1,630,000	2.7 ha	1.2 ha	\$708,333
Total	\$8,900,000	\$5,200,000	\$3,700,000	19.5 ha	13.5 ha	\$385,471

(Sourced from Christchurch City Council Website on 3/7/23)

6.7. Soil types



(Sourced from S-MAP ONLINE Website on 3/7/23)

Waimakariri_4b.1

Soil physical properties				
Depth class (diggability) Moderately deep (45 - 90 cm)		Texture profile Loam		Drainage class Well drained
Potential rooting depth Unlimited		Topsoil stoniness Stoneless		Permeability profile Moderate over rapid
Rooting barrier No significant barrier within 1 m		Topsoil clay range 8 - 18 %		Depth to slowly permeable horizon No slowly permeable horizon
Depth to hard rock No hard rock within 1 m				Permeability of slowest horizon Moderate (4 - 72 mm/h)
Depth to soft rock No soft rock within 1 m				Aeration in root zone Unlimited
Depth to stony layer class Moderately deep				
Profile available water			Dry bulk density	
(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)	topsoil	subsoil
High (65 mm)	Very high (123 mm)	High (160 mm)	1.09 g/cm ³	1.30 g/cm ³

Waimakariri_40c.2

Soil physical properties				
Depth class (diggability) Moderately deep (45 - 90 cm)		Texture profile Silt		Drainage class Well drained
Potential rooting depth Unlimited		Topsoil stoniness Stoneless		Permeability profile Moderate over rapid
Rooting barrier No significant barrier within 1 m		Topsoil clay range 10 - 18 %		Depth to slowly permeable horizon No slowly permeable horizon
Depth to hard rock No hard rock within 1 m				Permeability of slowest horizon Moderate (4 - 72 mm/h)
Depth to soft rock No soft rock within 1 m				Aeration in root zone Unlimited
Depth to stony layer class Moderately deep				
Profile available water			Dry bulk density	
(0 - 30cm or root barrier)	(0 - 60cm or root barrier)	(0 - 100cm or root barrier)	topsoil	subsoil
High (64 mm)	High (108 mm)	Moderate to high (134 mm)	1.09 g/cm ³	1.30 g/cm ³

Waimakariri_2a.1

Soil physical properties

Depth class (diggability)

Moderately deep (45 - 90 cm)

Potential rooting depth

Unlimited

Rooting barrier

No significant barrier within 1 m

Depth to hard rock

No hard rock within 1 m

Depth to soft rock

No soft rock within 1 m

Depth to stony layer class

Moderately deep

Texture profile

Silt

Topsoil stoniness

Stoneless

Topsoil clay range

10 - 20 %

Drainage class

Well drained

Permeability profile

Moderate over rapid

Depth to slowly permeable horizon

No slowly permeable horizon

Permeability of slowest horizon

Moderate (4 - 72 mm/h)

Aeration in root zone

Unlimited

Profile available water

(0 - 30cm or root barrier)

(0 - 60cm or root barrier)

(0 - 100cm or root barrier)

High (68 mm)

Very high (126 mm)

High (164 mm)

Dry bulk density

topsoil

1.09 g/cm³

subsoil

1.30 g/cm³

Waimakariri_42a.2

Soil physical properties

Depth class (diggability)

Deep (> 1 m)

Potential rooting depth

Unlimited

Rooting barrier

No significant barrier within 1 m

Depth to hard rock

No hard rock within 1 m

Depth to soft rock

No soft rock within 1 m

Depth to stony layer class

Moderately deep

Texture profile

Loam over sand

Topsoil stoniness

Stoneless

Topsoil clay range

10 - 20 %

Drainage class

Well drained

Permeability profile

Moderate over rapid

Depth to slowly permeable horizon

No slowly permeable horizon

Permeability of slowest horizon

Moderate (4 - 72 mm/h)

Aeration in root zone

Unlimited

Profile available water

(0 - 30cm or root barrier)

(0 - 60cm or root barrier)

(0 - 100cm or root barrier)

High (69 mm)

Very high (127 mm)

High (170 mm)

Dry bulk density

topsoil

1.09 g/cm³

subsoil

1.30 g/cm³

Waimakariri_1b.1

Soil physical properties

Depth class (diggability)

Deep (> 1 m)

Potential rooting depth

Unlimited

Rooting barrier

No significant barrier within 1 m

Depth to hard rock

No hard rock within 1 m

Depth to soft rock

No soft rock within 1 m

Depth to stony layer class

No significant stony layer within

Texture profile

Silt

Topsoil stoniness

Stoneless

Topsoil clay range

10 - 20 %

Drainage class

Well drained

Permeability profile

Moderate

Depth to slowly permeable horizon

No slowly permeable horizon

Permeability of slowest horizon

Moderate (4 - 72 mm/h)

Aeration in root zone

Unlimited

Profile available water

(0 - 30cm or root barrier)

(0 - 60cm or root barrier)

(0 - 100cm or root barrier)

High (70 mm)

Very high (137 mm)

High (226 mm)

Dry bulk density

topsoil

1.09 g/cm³

subsoil

1.30 g/cm³

6.8. Estimated irrigation water source costs

Water Volume and Purchase Cost

Total Annual Volume	6993	m3 total	12.8 ha =	89,510 m3
Cost to Purchase Annual Volume	89,510	m3 @	\$1.05 /m3 =	\$93,986

Irrigation Infrastructure Development Costs

Well	75	m @	750 /m =	\$56,250
pump	21.6	kw Pump	1000 /kw =	\$21,600
Consenting				\$50,000
Pumpshed etc				\$4,000
Power Connection				\$10,000

Total Estimated Costs of sourcing irrigation water \$235,836 (18,424/irrigated hectare)

6.9. Estimated annual irrigation requirements (Pastures)

IRRIGATION REASONABLE USE DATABASE

5 STEPS - TO GET THE IRRIGATION REQUIREMENTS INFORMATION YOU NEED FOR IRRIGATION PLANNING, CONSENTING AND DESIGN



Sustainable Farming Fund



Manatū Ahu Matua





1 Enter the address or coordinates (latitude, longitude) of your farm and click 'Locate' or click on the map

Locate

Map **Satellite**



2 Select Crop

Pasture

3 Select Plant Available Water

(a) Most likely PAW in this area

4 Select Irrigation Method

80% Efficient Irrigator

5 Fetch Data

Farm Details		Plant Available Water Details		Irrigation Requirements		
Description		PAW(mm)	Indicative Likelihood	Area (hectares)	Per Hectare	Total Area
Latitude	-43.552	140	35.2	1	System Capacity	0.61 (l/s/ha) 0.61 (l/s)
Longitude	172.495			0	System Capacity	5.3 (mm/day)
Council	Canterbury			0	Daily Volume	53 (m³/ha) 53 (m³)
Climate Site ID	P130081			0	7 Day Volume	(m³/ha) (m³)
Distance to Climate Site (km)	3.02			0	28 Day Volume	(m³/ha) (m³)
Rainfall (mm)	630	Total area =		1	90% ile Annual Volume	6,993 (m³/ha) 6,993 (m³)

IRRIGATION REASONABLE USE DATABASE

5 STEPS - TO GET THE IRRIGATION REQUIREMENTS INFORMATION YOU NEED FOR IRRIGATION PLANNING, CONSENTING AND DESIGN



1 Enter the address or coordinates (latitude, longitude) of your farm and click 'Locate' or click on the map
 Locate



2 Select Crop: Apples **3** Select Plant Available Water: (a) Most likely PAW in this area **4** Select Irrigation Method: 80% Efficient Irrigator **5** Fetch Data

Farm Details		Plant Available Water Details		Irrigation Requirements	
Description		PAW(mm)	Indicative Likelihood	Area (hectares)	
Latitude	-43.552	140	35.2	1	System Capacity
Longitude	172.495			0	System Capacity
Council	Canterbury			0	Daily Volume
Climate Site ID	P130081			0	7 Day Volume
Distance to Climate Site (km)	3.02			0	28 Day Volume
Rainfall (mm)	630			0	90% ile Annual Volume
		Total area =		1	
				Per Hectare	Total Area
				0.61 (l/s/ha)	0.61 (l/s)
				5.3 (mm/day)	
				53 (m³/ha)	53 (m³)
				6,993 (m³/ha)	6,993 (m³)

Detailed Results: Annual and Monthly Volumes

Annual Volumes (m³/ha)

Average Annual	5 %ile	10 %ile	20 %ile	30 %ile	40 %ile	50 %ile	60 %ile	70 %ile	80 %ile	90 %ile	95 %ile
5,760	3,780	4,410	4,410	5,040	5,670	5,980	6,300	6,300	6,300	6,993	7,590

Monthly Volumes (m³/ha)

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Average	0	0	60	550	760	1,290	1,290	1,070	470	270	0	0
90 Percentile	0	0	60	1,260	1,260	1,890	1,890	1,890	630	630	0	0

7 Day Volumes (m³/ha)

Mean Annual	630
90 Percentile	630

28 Day Volumes (m³/ha)

Mean Annual	1,760
90 Percentile	1,890

Average System Efficiency (%)	82
% of time Soil Moisture > 50% full	100