8th March 2023

North Block Farming Assessment
177 Ferry Road, Kaiapoi [the 'site']

Legal Description

LOT 2 DP 4532, LOT 1 DP 5010, LOT 5 DP 313322

28.48 hectares, an approximate-square block of land with a long history of agricultural use owned and managed as part of a larger farming enterprise. Current farming activity is to the north and east only, with residential housing to the west and south.

A Legal Road (Paper Road) runs east, approximately 360m from the western boundary of the site, and is managed as part of the farm.

A Waimakariri District Council Storm Water Utility Reserve of 1.3403 hectares (Lot 3005 DP 342273) is located on the western margin of the site.

Picture A: Site boundary outlined in red, and location east and north of residential housing

Purpose of Report

This report considers the suitability of the above property, zoned Rural in the Waimakariri District Council Operative District Plan, and zoned Rural Lifestyle under the Proposed District Plan, for both rural use and rural lifestyle use.

Rural Farming Uses & Considerations

Farming land use found in the wider district include.

- Dairy
- Dry stock sheep, beef, and deer
- Arable
- Dairy support grazing
- Horticulture – vegetables and flowers
- Horticulture – shrub and tree crop

Factors to consider in assessing the attributes and suitability of the site for these potential uses.

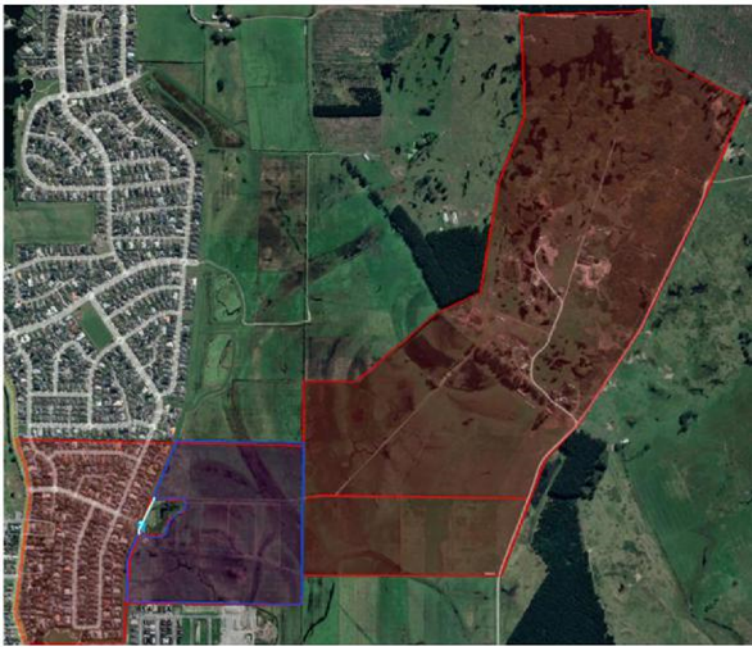
- Land resources
    - Soils
    - Drainage
    - Water – livestock
    - Water – plants
    - Physical attributes – topography, aspect, altitude

- Shelter
- Size

- Infrastructure
  - Fencing and boundary security
  - Stock water
  - Irrigation
  - Stock handling facilities
  - Machinery, plant, supplementary feed storage & security
- Climate
  - Rainfall
  - Sunshine (thermal heat units)
  - Wind
  - Evapotranspiration
- Environmental
  - Environment Canterbury – Land & Water Regional Plan
  - National Environment Standards – Freshwater
- Other
  - Health & Safety – land user, neighbours and other activities that intersect with any part of land activity or support activities.
  - Support services and suppliers' availability
- Financial viability
  - Capital investment.
  - Cashflow requirements
  - Net Cash Surplus / Return on Investment
  - Risk mitigation

History of Site

Approximately 206 hectares of land east, north-east, and west of the site, and including the site has been farmed by the Moore family since about the mid 1930's. The location of the site is identified in purple. The land has been farmed as a dairy farm and dry-stock beef and sheep unit.



Picture B: Site identified in purple, located in original Moore Family farmland holdings identified in red.

Site Location

Access for farming purposes is from Ferry Road approximately 770m east of the site. This farm track access (red line in Picture C below) is a shingled all-weather track and facilitates all farm machinery and paddock access such as fertiliser application, and so on.

Picture C: Eastern access over all-weather track (red line) to site from Ferry Road; western access from Magnolia Boulevard (blue rectangle and line)

Access to the western side of the site is from Williams Street and Magnolia Boulevard over an embankment. The embankment is approximately between 3.3 – 3.7m high, close-mown grassed-down sloping to the east, and is primarily access for walkers, but provides access (wide blue line in Picture C) for Waimakariri District Council to its Reserve directly from the end of Magnolia Boulevard. Access to the farmland (light blue line in Picture C) is possible by farm utility vehicles but is not a practical access route for larger trucks or farm machinery as its over and along the grassed slope of the embankment and allows dry weather access at best.

Picture D: Location of site in red with key access roads for current access (east to west) from Ferry Road, Beach Road, Williams Street

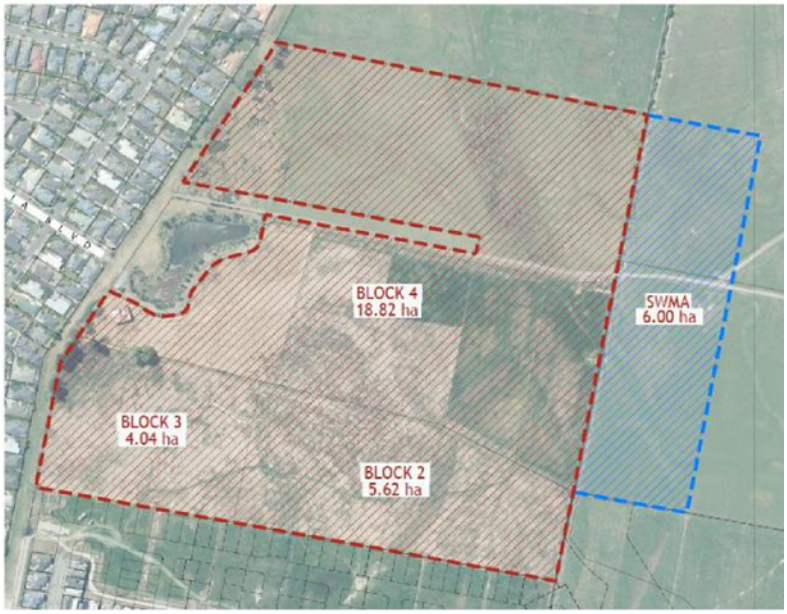
Neighbours

West Residential housing separated from the site by the embankment located on a legal road. (Paper Road)

North Farmland (not owned by Moore family)

East A storm water drain (McIntosh Drain) lies along the boundary between the site and farmland farmed by the Moore Family, noting that the site is still managed by the Moore Family as one farming operation.
To the east is also a 6.0-hectare rectangular area identified for future relocation of McIntosh Drain and for storm water treatment. See blue area in Picture E. This area is not included in this report as it is not part of the site.

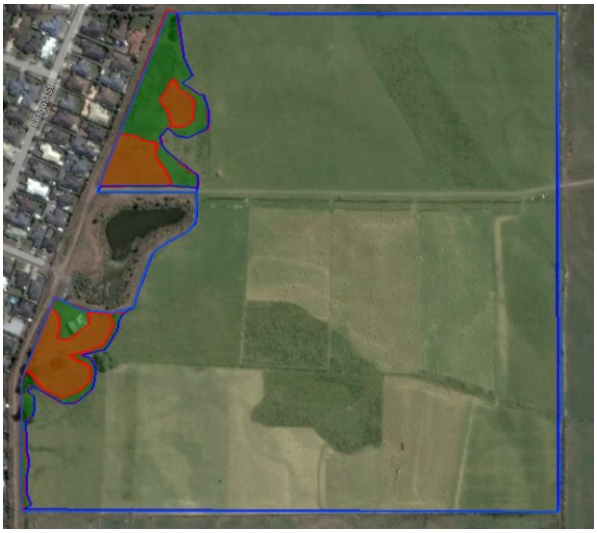
South Residential housing (Beachgrove)



Picture E: Storm Water Management Area (blue); site (red)

Topography of site and surrounds

The site has a narrow strip of sand dunes running north-south along the western boundary, while the majority of the site is flat, approximately:



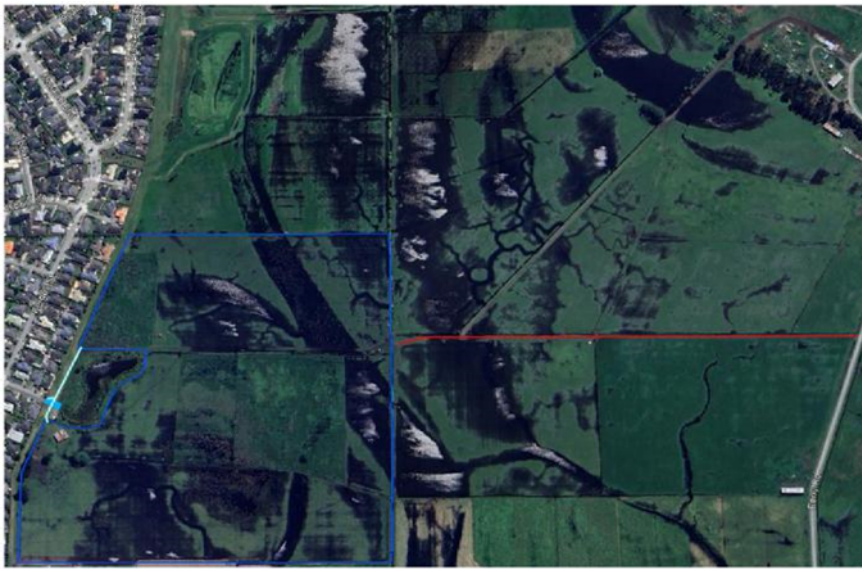
1.0 ha (3.5%) higher dunes up to 3.3m high - dark brown

1.1 ha (3.9%) lower dunes between 1.0m and 1.5m - dark green

26.38 ha (92.6%) flat paddocks between 0.7m and 1.0m elevation - light green

Picture F: High sand dunes (brown), lower sand dunes (green), flat paddocks outlined in dark blue line.

The farmland to the north and east of the site lies within the same elevation range as the site paddocks.



Picture G: Aerial image showing by water lying over paddock indicating a very narrow elevation range across both the site and neighbouring farmland [Google Earth Flyover Map; Dated: December 2021; Site identified in blue outline]

The paddock (26.38 ha) elevation primarily varies by approximately 20cm between 0.7m and 0.9m [ref: Woods Surveyors File: P21-517-00-100-EW_EXISTING CONTOURS.DWG Date: 17 February 2023]. The land does not lie as a gently sloping flat, instead it is a constantly changing mosaic of higher and lower areas within the approximately 20cm elevation range.

This means that depending on the time of the year and soil moisture levels the paddocks can be pockmarked with many small areas of water lying on the surface in the lower elevation areas, in amongst small areas of paddock that are wet but without water lying on the surface (Picture G).

In this respect the site is similar to surrounding farmland (Picture G).

Drainage

The site has two main drains running west-east through the middle of the site and one across the eastern half of the south boundary. All three are > 1.0m deep and drain into McIntosh Drain on the eastern boundary and flows south and east. See red marked drains in map below.

Shallower (0.5m – 1.0m deep) internal drains flow into the main drains. See blue drains marked on map below (not a complete list of all drains on site).

There are also shallow surface drains (<300mm deep) that connect to the blue drains but vary in location depending on the cultivation activities and on the degree of soil moisture at cultivation time. This means that shallow drains vary in number, length and location depending on the degree of soil moisture conditions at cultivation time, resulting in a greater or lesser degree of surface drains being formed.

Many old no-longer-required surface drains are noticeable when walking across most of the paddocks.

Picture H: Deep main drain (red line in Picture J)

Picture I: Shallow surface drain (light blue line in Picture J.

Picture J: Location of main drains (red), some internal shallow surface drains (light blue).

Soils, Natural Soil Water Table, Drainage

Map ONE [Ref: S-Maps]

Map TWO [Google Earth Map adapted from S-Maps]

Map ONE: flat paddocks of deep, poorly drained silt over clay (blue), and the sand soils of the dunes along the western side of the site (fawn brown). Site outlined in red.

Map TWO: further differentiates two different types of sand soils (yellow and blue respectively) on sand dunes; paddocks are marked green in Map TWO.

The soils are deep heavy, poorly drained silt over clay soils. The silt loams are variable in depth between 20-40cm. These clay soils are gley soils in that they are strongly affected by being waterlogged for prolonged periods of time, typically remaining saturated from early winter until late spring/early summer, or periodically such as this year, into late summer/early autumn. These are highly structurally vulnerable soils, very easily damaged by pugging or ill-timed vehicle or machinery activities; both pugging and vehicle tracks being widely visually evident across these areas.

There are approximately 26.34 hectares (93%) of Temuka and Flaxton soils.

Sand Dunes #1 (marked blue & yellow in north-west corner in Map TWO)

There is a small area that is close to raw sand being geologically very young, formed from wind-blown and deposited sandstone parent materials. They have very little organic matter and no to extremely weak topsoil structure. Consequently, they drain rapidly, hold very little plant available soil moisture, and pasture plants are short lived and plants that do survive are not suitable for farming purposes.

These are Kairaki & Burwood soils, comprising approximately 1.1 hectares (4%).

Sand Dunes #2 (marked yellow in south-west corner in Map TWO)

This is a small area that is 97% sand and approximately 3% clay content. The consequence of the clay fraction is to form a mixture of well drained and imperfectly drained soils. In all other respects they behave the same as the first category of dune soils.

These are Waikuku & Burwood soils, comprising approximately 1.05 hectares (3%).

Discussion

While the silt loams overlying the clay are sufficiently deep for cultivation activities and for adequate rooting zone for typically used pastoral grasses and legumes, and have potential to drain naturally, they are low lying and very flat at about 3.0m above sea level. This means that natural drainage of the underlying clay layers is impeded and very slow, effectively resulting in excess water lying on top of the clay layers and leaving the silt loams saturated for excessive periods.

Man-made drains and ditches are of limited value as the site is very flat and very low lying, so it is difficult to get off-site drains with a water table low enough to create fall from the site into the network of interlinked on-site and off-site ditches. Surplus surface water does flow slowly into drains, and then along drains, but it is much slower than the volume of water contained within the catchment range of these drains on-site requires. At inspection the water in main drains and in the lateral drains was very slow moving despite carrying a lot of water.

Note photographs on Page 6 with the drainage dich water table lying approximately 300-400mm below paddock level (left photo), and 100-150mm below paddock level (right photo).

Even if the land had sufficiently higher elevation than the main drains, the upper soil layers would still be waterlogged because of the slow to moderately-slow permeability of the clay layer 20 cm – 130cm down the soil profile, which results in very poor lateral soil drainage. This significantly limits survival and productivity of desirable pasture species and exposes roots and growing shoots to physical damage. The result is predominance of weeds and species of low suitability for livestock grazing.

Using farming definitions, the site is flat and is suitable for all farming options, but its low elevation relative to surrounding land means that natural and artificial drainage systems are ineffective and significantly limit viable farming options.

Soil management implications

Crop or pasture cannot be drilled with any confidence until the top 10-15cm of soil is sufficiently dry to cultivate and create a fine firm seed bed and soils are warm enough to strike the drilled species. Typically, these water-logged soils will not be sufficiently dry to cultivate until early summer or into late summer periodically. This leaves insufficient growing days after drilling to allow arable or seed crops to get to maturity before either moist autumn weather causes crops to deteriorate (sprouting before harvest) or soil conditions become too wet to reliably undertake mechanical harvest.

If in the unlikely situation that a viable yield could be harvested, there would be insufficient time post-harvest to establish a follow-up pasture or crop that could be grazed, or survive long periods of saturated soil, severely limiting the range of viable crop rotation option, and land sitting idle for long periods of time is uneconomic.

Soils waterlogged from winter through to and including early summer means that heavy livestock cannot be grazed without deep pugging occurring, resulting in very poor utilisation of green feed crops (e.g., kale, rape, fodder beet), or destruction of target pasture grasses and legumes to a degree that they require replacement after every winter.

Heavy livestock include all cattle over one year old (during winter), and horses.

Water-logged soils or even the high chance of becoming waterlogged also means that any perennial horticultural crops or root vegetable crop are not a viable proposition.

In summary, the combination of difficult to manage soil types, and low-lying flat topography on the site and surrounding land resulting in ineffective artificial drainage means that arable cropping, dairy farming, growing of winter green feed crops (dairy support or beef), horse agistment, and perennial horticulture crops are not feasible.

Sheep grazing and young light to medium weight cattle could be considered.

Farming Activity

The farming activities on the site are very restricted by the large part of the year that soils are saturated, or with soil moisture content that is below saturation but still too high to facilitate grazing or machinery activities without damaging the soils or without very high pasture wastage during grazing.

The historic and current management of the site is used as part of the whole farm enabling the site to be left alone until soil moisture conditions are more suitable.

A snapshot of farming activities on the site over approximately the last 17 years since 2005 are recorded in Google Earth which has 35 different fly-over dates (ignoring cloudy events). **Appendix B** contains a selection of historical photographs and a summary of the 35 photographs examined between April 2002 and February 2022. All months are represented but not equally in frequency.

At date of inspection (Pictures K and L) the site was in new ryegrass, after the old pasture cover was herbicide sprayed and cultivated in late-November 2022.

Picture K: Cover at inspection [24th February 2023], view north from eastern side of southern site boundary.

Picture L: land cultivated in preparation for sowing new pasture, noting overly wet soils (too wet to cultivate without soil structural damage) and water lying on surface [Photograph 25th November 2022]

Summary of Google Earth Photographic Records

Supplementary feed
Not harvested every year but is always in February.

Pasture renewal
Occurs approximately once every five years and no more than one-third of the site. Ploughing, herbicide chemicals, and discing are all used to remove old vegetation and prepare for new pasture drilling. These activities are typically during January, with late November herbicide (once) and April herbicide (once).

Cattle grazing
Cattle grazing is typically November to February (usually extensively grazed over 20-30% of the site) but can be as late as April-May-June in very dry autumns (twice), and usually break fed on small areas of approximately 5-6% of the site.

No activity
In 40% of the flyover months there was no activity of any kind, and 70% of these months were late autumn to late summer (May to November).

Conclusions
All these activities are relatively late compared to normal seasonal activities on freer-draining soils. First supplement harvest is February compared to more usual late-October.

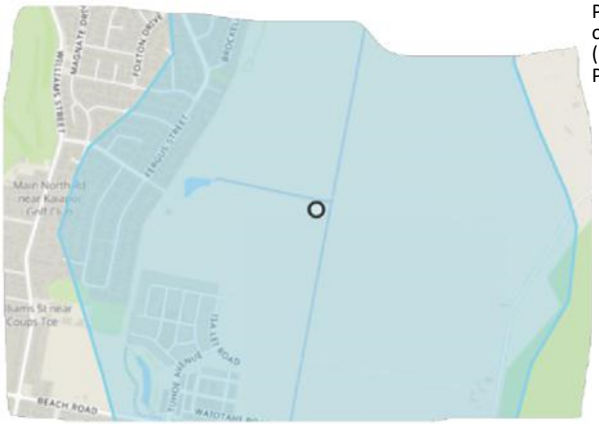
Pasture renewal activities are delayed until the soils are dry enough with spraying and/or cultivation occurring in December to January without any stock grazing beforehand; typically, on freer draining soils there is grazing in early spring, followed by ground preparation in October – early November, and then drilling.

Cattle grazing is delayed until late- November at the earliest to dry out sufficiently to start cattle grazing, and more usually December or January in wetter years. Cattle grazing can extend into late autumn if there is very low summer & autumn precipitation, but this is unusual (twice in 17 years).

There is no evidence of arable crops (cereals, peas, small seeds) being grown, nor green feed crops for direct feeding to livestock (kale, rape, swedes, turnips, green feed oats, fodder beet). This is most likely to be due to lengthy periods of saturated soils and uncertainty about harvest reliability of when crops are mature when soils are very wet during late autumn to late spring.

Consequently, farming activities have been limited to harvesting supplementary feed (hay and baleage) as the timing can be shifted to suit soil moisture content as it varies season by season, and grazing cattle for the same reasons.

Land Use Capability



Picture M: spot-circle is located in northeast corner of site, with same Land Use Capability polygon (blue) across site and surrounding land. [Map: LRIS Portal: NZLRI Land Use Capability 2021]

Picture M shows the site in the LUC mapping is covered by one category which is the same as the 310 Beach Road site – '2w1'. Refer to **Appendix A** for Land Use Capability Definitions.

The map above contains the site, positioned to the right of the Waimakariri District Council Reserve (blue-filled area west of the circle-spot) located left of the map centre, and left of McIntosh Drain (blue line) running north south.

Interpretation

Land Class	2	[versatility class]
Land Class Unit	2w	[restrictions to versatility]
Land Class Units	2w1	[degree of versatility restriction compared to other 2w polygons]

Discussion

The site is '2w' land with slight limitations for arable use and suitable for cultivated crops, pasture, or forestry *but where soil wetness resulting from poor drainage or a high-water table, or from frequent overflow from streams or coastal waters first limits production.*

The key point here is that the wetness limitations override the broad versatility that the Land Class 2 designation implies.

The third numeral can be disregarded as it simply allows location of land polygons with similar

Specific site data of Land Use Capability Polygon

Picture N: 2w1 polygon details

NZLRI Land Use Capability 2021

luc	lcorr
2w 1	2w 1

tmu_legend	
si_legend	2w1
marl_legend	
nzcu_description	Flat to gently undulating floodplains and low-lying alluvial terraces below 150 m with winter wet Gley, Recent Gley, and imperfectly drained Pallic (gley and yellow grey earth) soils in low to moderate (<800 -1600 mm) rainfall areas in seasonally moisture-deficient districts.
orig_ni_si_unit_descr	Floodplains and low-lying parts of terraces, with wet soils in winter, in seasonally moisture-deficient districts.
the_geom_Length	38959.55557873763
the_geom_Area	1802999.94120721

Direct access onto site, and location

As a standalone rural block, the only access to the site is from the west off Magnolia Boulevard (see Picture O below) which is not an all-weather access and has considerable limitations for manoeuvrability of larger vehicles on a mown grass slope (see Picture P) effectively making it dry-weather access only for smaller machinery and vehicles. Vehicles must cross the embankment to the eastern edge which has the flattest slope, then progress north onto the only established formed track (see red arrow). Access into paddocks north if this point or south of the WDC Reserve are directly onto paddocks and restricted by wet soils and are not viable for vehicles or machinery.

Picture O - Magnolia Boulevard site access

Picture P - Access across embankment

Service access from outside Kaiapoi is through urban streets (see yellow lines in Picture Q, below)

Access from north, west, or south of Kaiapoi to the site is either off State Highway 1 north of Kaiapoi or off State Highway 1 at the Lineside Road – Smith Street ramps.

Picture Q: Kaiapoi street service routes to site

Discussion

Any land user considering undertaking agricultural activities at very close proximately to residential housing must consider a number of potential conflicts that will vary in degree according to the activities. Assuming farming activities meet the Environment Canterbury Land and Water Regional Plan requirements, and land user and contractors are qualified (such as Registered Agricultural Chemical Applicators), the areas of potential conflict will include.

- Noise from machinery and heavy vehicle activity potentially early in the day (agricultural spraying while wind run is low) or late in day (evening depending on wind drying conditions for making supplement or harvesting)
- Agricultural chemical application will almost inevitably raise complaints from neighbours even when applied by accredited applicators using best practise conditions.
- Dust from soil cultivation, harvesting activities, and from making of supplements.
- Mud on access lane and on Beach Road from agricultural vehicles leaving the site.

Long experience with farming activities on the peripheries of Christchurch City and surrounding towns, suggest that there will be complaints no matter how careful the land user and contractors are. A prudent farmer operating an agricultural business would be very unlikely to place the business in a situation of high direct potential conflict unless the site had particular merits that would justify the risks and potential impact.

Any prudent land user considering grazing livestock will also take into account the high probability of neighbourhood dog harassment of livestock and impact from injury and deaths through to reduced productivity.
Vandalism and theft are also more frequent in locations close to residential areas. Livestock and machinery security will need to be at higher levels than more rural located farms with similar farm policies.

This access configuration is a significant limitation and disincentive to current and potential site land users.

Access for service providers and suppliers

Access to the site by rural contractors and suppliers for purposes such as cultivation, making supplementary feed (silage and hay), chemical application, fertiliser application, etc, will be from the western and northern rural farming hinterland areas of Ohoka, Cust, Rangiora, and Amberley.

The most direct route to the site is from the west along approximately 2.70 kilometres of urban road along Smith Street from State Highway 71 (Lineside Road). The next most likely route is from the north off State Highway 1, along 2.50 kilometres of urban Williams Street to the site, or off SH1 at the Smith Street off ramp. There is no access from the east; southern access also along Williams Street passes through Kaiapoi CBD and is highly unlikely to be used.

Contractors servicing the site will in all cases be hesitant about transporting large machinery through urban areas. Access timing window will also be restricted by high urban traffic volumes during the day especially school hours (Kaiapoi North School is on the route from the south) and noting that Williams Street is the main access route through Kaiapoi north south.

To minimise access difficulties and work within urban traffic flows, the majority of contractors will try to access the site early in the morning or in the evening and will also be conscious of mud being transferred onto urban roads.

Given that the paddocks on site are relatively small, and each job is not likely to be more than 2 or 3 paddocks (so no more than 2-3 to 10-12 hectares in total) almost all contracting jobs will by definition be small and only take a short time to complete. Therefore, it is most likely that contractors will not be able to avoid site access for at least one journey during the high urban use times of the day (7.30am to 6.30pm).

From experience of similar situations, many contractors will not want to take on work opportunities at the site because firstly the jobs will be small and relatively low margin, and secondly have the additional problems of traveling urban streets during the day and trying to minimise mud transfer onto roads. Contractors will prioritise larger clients without the high potential site access problems. This means that there is high potential for time-sensitive activities to be delayed which will affect outcomes (e.g., late spraying of chemical applications, missing ideal weather and soil cultivation or harvesting conditions, etc).

In summary, the range of experienced contractors available to the site user is highly likely to be less than normally available and will be dearer than normal to remunerate the contractors sufficiently to put up with traffic and mud problems.

A prudent potential land user will be very unlikely to establish a business where critical inputs and activities are compromised in availability and timing for the majority of agricultural machinery activities required to make the business a success.

Infrastructure

Subdivision & fencing

The site has been sheep & beef fenced into ten paddocks (excluding two small holding paddocks) with a mixture of old totara post, barbed wire & No8 wire in average to poor condition. Some boundary fences are treated wood post & HT wire, in good condition.

Not all drains are fenced off from livestock.

The subdivision is orientated north-south either side of the two main drains running east-west.

- Four rectangular paddocks approximately 1.8 ha
- Four squared blocks approximately 4.7 ha
- One 'dunes' paddock approximately 1.5 ha.
- One small paddock 0.6 ha

The fencing is currently stock proof for cattle grazing (but not sheep grazing) if supplemented with temporary electric wires using tread-in standards, particularly during break feeding grass at the end of autumn prior to soils becoming too wet to graze.

Most of the grazing over summer months has been set stocked over larger areas of several paddock, so that stock can get sufficient feed intake while grazing at a sufficiently low density to minimise any pugging damage.

While the timing and intensity of cattle grazing is dictated by soil moisture levels the fencing even in its current average to below average condition is broadly fit for purpose.

The build-up of rank pasture and weeds in lower lying areas of paddocks is due mostly to these areas being too wet to graze all year round. Only in drier summers and autumns when soil moisture levels are moderate, and cattle grazing can be of benefit in cleaning up rank pasture. The use of temporary electric wire is sufficient to make up for the lack of permanent fencing.

Any other livestock grazing such as sheep or more intensive cattle grazing management would find the fencing inadequate.

Stock Water

The reticulated stock water system is old and uses small rectangular concrete 'coffin' troughs, which are few in number and some are under fences, servicing two paddocks at the same time.

Historically they have been supplied with water from two old artesian wells – see map below. There is no information of designations of these well in the Environment Canterbury Consent Database.

The two wells have been capped off and are currently not in use, so the troughs are not in use.

This would normally be inadequate for cattle grazing but the prevalence of surface water and drains mean that cattle can find sufficient water as long as they are extensively grazed as appears to be the case. This would also hold true if sheep were grazed.

A complete stock water system would need to be built from scratch if a viable stock-grazing land use was to be operated.

Picture R: Location of artesian wells

Wells

There is a well [M35/18505] identified as being on the site in Canterbury Maps, see Picture Q below.

This well is incorrectly located and is actually located to the east of the site.

Picture S: Environment Canterbury – Well Consent locations

Stock Handling Facilities

There are no cattle or sheep handling facilities on the site.

Any future sheep and or beef land use would require a small set of yards for animal welfare purposes in which to administer animal health products and treat wounds and injuries and prepare for livestock for sale.

There is no woolshed or other shed that could be adapted for shearing, which would limit the ability to farm sheep, unless a neighbouring wool shed could be rented as required. This does occur but is not common and could not be relied upon.

Shelter

There is no shelter planted on the site.

Lack of shelter is not considered a limitation to any future cattle of sheep grazing considering the relatively mild winds prevalent at the site.

Buildings

There is one small 285m2 corrugated iron shed. There is single phase power to the site but is understood to not be live. The power pole line continues east from the shed along the line of the southern main drain. The size and shape and low roofline mean that the shed is not suitable for storage of plant and equipment. It is also likely a target for theft and vandalism given its location away from other farm buildings and activity hubs.

It has little value for any future agriculture activities.

Effective Area

Gross area of 28.48 hectares, net area estimated at 26.0 hectares after allowance for dunes and tracks and drains.

Pasture cover

At date of inspection paddocks, the whole site was in recently drilled young ryegrass, with no to minimal legume content. Despite the comprehensive establishment process there is still quite a lot of broad leaf weed in the base of the pasture which will compete for nutrients and sunlight and will contribute significantly to deterioration of pasture quantity productivity performance and feed quality. This is typical of heavy poor-draining silty soils.

There is no data available on fertiliser nutrient applications, but it is understood that there has been little if any phosphate, sulphur, or lime applied in the medium-term history apart from a fertiliser application made in February 2023 to support the new ryegrass.

While the current cover is of good quality it is expected that the long periods of the year with saturated soils will lead to rapid deterioration on the very wet low-lying areas, The constantly wet root systems and pugging damage, and generally semi-extensive cattle grazing practise currently in use will require ryegrass renewal within four to six years, broadly in line with the history of the site.

Annual dry matter production is expected to be moderate and utilised yields low. Low pasture quality (averaged through a full year) in turn leads to low animal productivity and economic returns.

Any financially viable animal grazing enterprise would require better pastures on average, better grazing control by subdivision fencing (permanent or temporary electrical), and a regular pasture renewal programme. This would be difficult to achieve consistently given that too-wet soils commonly occur during times that are best suited to achieving good pasture renewal outcomes.

Infrastructure Discussion

Adding new fences and upgrading existing fencing to stock proof standard, new troughs in each paddock, and small set of stock handling facilities is estimated to cost $85,000 - $90,000 assuming land user does some of the installation work.

Alternatively for a cattle-only system a two-wire fence electrified system would be feasible. This would approximately halve the development cost to about $45,000.

Ongoing renewal of pasture on average every (say) five years by spray-and-drill is the cheapest way to get reasonable but not ideal pasture production and longevity. Two herbicide sprays, direct drill with cheap generic seed, establishment fertiliser), is estimated at $16,000.

Annual maintenance fertiliser is estimated at $3,800/year, not including any nitrogenous fertilisers.

Current Stock Carrying Capacity

There was no stock grazing at inspection, and it is understood that there has been no stock grazing on site for approximately 12 months.

Estimating the average stocking rate for the last four to five years prior to the recent pasture upgrade is calculated by using the number of bales harvested from the February 2022 harvest (142 bales from 4.49 ha) and using the average area cut at 6.8 hectares. Cattle grazing is based on 63 head at 5.0 su/hd for four months from December to March inclusive.

This combined dry matter consumed and harvested is equivalent to approximately 7.5 su/ha, however this is not cannot be compared to conventional stocking rates which is typically based on year-round grazing. In this case the majority of area for the majority of the year is not growing any feed because it is too wet, or growth cannot be utilised effectively because of treading and pugging wastage, and as a result of both these factors, the average feed quality is low.

The bales per hectare used at 32/ha is very high (more typically 10-12 big bales/ha) and only achieved because the pasture has been shut up for a long time and is of maintenance feeding quality only (long and rank). Cattle grazing is also very high at 25 su/ha (more typically 8-12 su/ha) for the four months, again only achievable because a very high cover of grass has been built up.

This dual harvest (one of hay and one of consuming standing grass) approach is only achievable because the land manager integrates the site land with their other farmland.

If this site was the only land being managed as a small farm, then either stock would need to be bought and sold or short-term grazing agistment undertaken in order to fit into the variable sequence of months when the land is sufficiently dry. Both would be difficult to manage and be of marginal economics. Making hay or baleage could continue as is but over as big an area as soil moisture will allow.

Grazing as a stand-alone small farm would be expected to have a stocking rate less than 7.5 su/ha, in the range of 5.0 – 6.5 su/ha. This is because when the land is wet there is nowhere dry for stock to go unless the dune paddock is used and stock are fed hay or baleage, but this cannot be expected to occur for up to six months at stretch. It would raise animal welfare concerns and would not be economic.

Given the quality of the pastures, poor infrastructure, and predominantly winter-spring wet soils this is a fair representation of the numbers that could be grazed in its current state. Productivity cannot be expected to be very high given the poor pasture species generally available over the site.

Economic Viability

The most likely policy to be run by a land user is beef grazing and sale of hay or baleage. Deer are discounted with the absence of deer fencing, and the farm is too wet for deer, and for sheep farming.

Assuming that the infrastructure and pastures are improved along the lines discussed, and assuming it results in a slightly above district average stocking rate (11.6 su/ha) then the economic return is estimated as follows.

Guideline benchmark data: Beef & Lamb NZ Economic Service: Class 6 Forecast Model FY2022-23.

Effective Hectares	26.00	
SU/ha	12.50	
Total SU	325.0	
Gross Income		**$36,940**

Direct Farming Expenses					
Rates & Insurance	$2,500				
Animal health	$195				
Shearing	$0				
Annual fertiliser	$3,800				
Annual Pasture renewal	$3,200				
R&M	$650				
Freight IN	$1,625				
ACC	$393				
Administration contribution	$1,000				
Vehicle Opex Contribution	$1,000	**$14,363**		**$22,577**	A
Livestock Loan Interest	$1,517		$65,000		
Livestock Loan Principle	$0	**$1,517**	Overdraft	**$21,060**	B
Improvements Loan Interest	$3,150		$45,000		
Improvements Loan Principle	$9,000	**$12,150**	5-years	**$8,910**	C

Discussion

Assuming the land user follows the same basic policy as currently run but at a higher stocking rate (12.5 su/ha is about 1.0 su/ha higher than the district average but with much more difficult land to manage than the district average), uses own capital for land purchase, but requires loan capital for livestock and infrastructure improvements (7%, and repayment over five-years), then the Net Cash Surplus (before tax) is approximately $9,000 [C].

This is effectively the reward for own labour.

Financial viability is breakeven or a little above breakeven at best, and highly risky as totally dependent on when and how much of the effective area dries out sufficiently to graze and harvest.

It is unlikely a prudent farmer would view this as an adequate return on investment or an adequate return on the risks associated with farming at this site.

Conclusions

It is very highly unlikely that a prudent farmer would assess the site as a good opportunity to establish and operate a rural farming business operation or for rural lifestyle purposes.

- The soils on the site are predominantly unusable for 5-6 months of the year and up to 7-8 months in some years, being either waterlogged or at excessive moisture content that prevent grazing and or land management activities without soil or pasture damage. The same elevation of the site as the neighbouring land means that the high-water tables are always going to be the predominant situation.

- The infrastructure is poor and requires significant upgrade to allow better management practise to be used and increase productivity.
- The location of the site for agricultural services support and access onto the site are a major disincentive that will restrict the quality and timing of work undertaken.
- Of all the possible farming enterprises, the most likely is cattle; all the others are precluded because of the wet soils.
- There is insufficient scale or enough land class diversity on the site with which to manage and mitigate farming risk.
- Even at high stocking rates the financial returns are likely to be little better than breakeven, and with little chance of recouping any capital invested into land improvement.
- It is difficult to see any prudent land user placing themselves under these kinds of risks to farm the land on this site.
- While a Rural Lifestyle use has less of the financial imperative, the land use is still restricted to livestock including horses, with plants or orchard of gardening having the same obstacles of waterlogged soils.

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APPENDIX A

Land Use Capability Definitions

Land Classes 1 to 4 are suitable for arable cropping (including vegetable cropping), horticultural (including vineyards and berry fields), pastoral grazing, tree crop or production forestry use.

Land Classes 5 to 7 are not suitable for arable cropping but are suitable for pastoral grazing, tree crop or production forestry use, and, in some cases, vineyards and berry fields. The limitations to use reach a maximum with LUC class 8.

Land Class 8 land is unsuitable for grazing or production forestry and is best managed for catchment protection and/or conservation or biodiversity.

LUC 1	Land with virtually no limitations for arable use and suitable for cultivated crops, pasture, or forestry.
LUC 2	Land with slight limitations for arable use and suitable for cultivated crops, pasture, or forestry.
LUC 3	Land with moderate limitations for arable use and suitable for cultivated crops, pasture, or forestry.
LUC 4	Land with moderate limitations for arable use and suitable for occasional cultivated crops, pasture, or forestry.
LUC 5	High producing land unsuitable for arable use, but only slight limitations for pastoral or forestry use
LUC 6	Non-arable land with moderate limitations for use under perennial vegetation such as pasture or forestry
LUC 7	Non-arable land with severe limitations for use under perennial vegetation such as pasture or forestry
LUC 8	Land with very severe to extreme limitations or hazards that make it unsuitable for cropping pasture or forestry.

Land use capability subcategory

Each LUC unit has a subcategory of the LUC class through which the main kind of physical limitation or hazard to use is identified. Four limitations are recognised:

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

APPENDIX B - attached.

Selection of historical photographs and summary of the 35 aerial photographs examined between April 2002 and February 2022