What we will cover:

1 Influence of the landscape

2 What is radiometric survey?

3 Why do we need better data?

4 How can we use the data?

5 Rangitata Dairies' experience

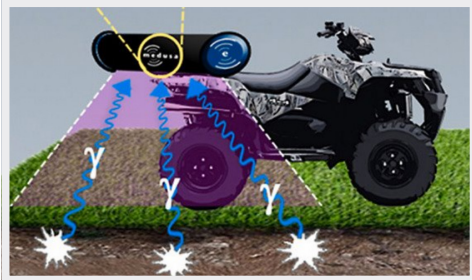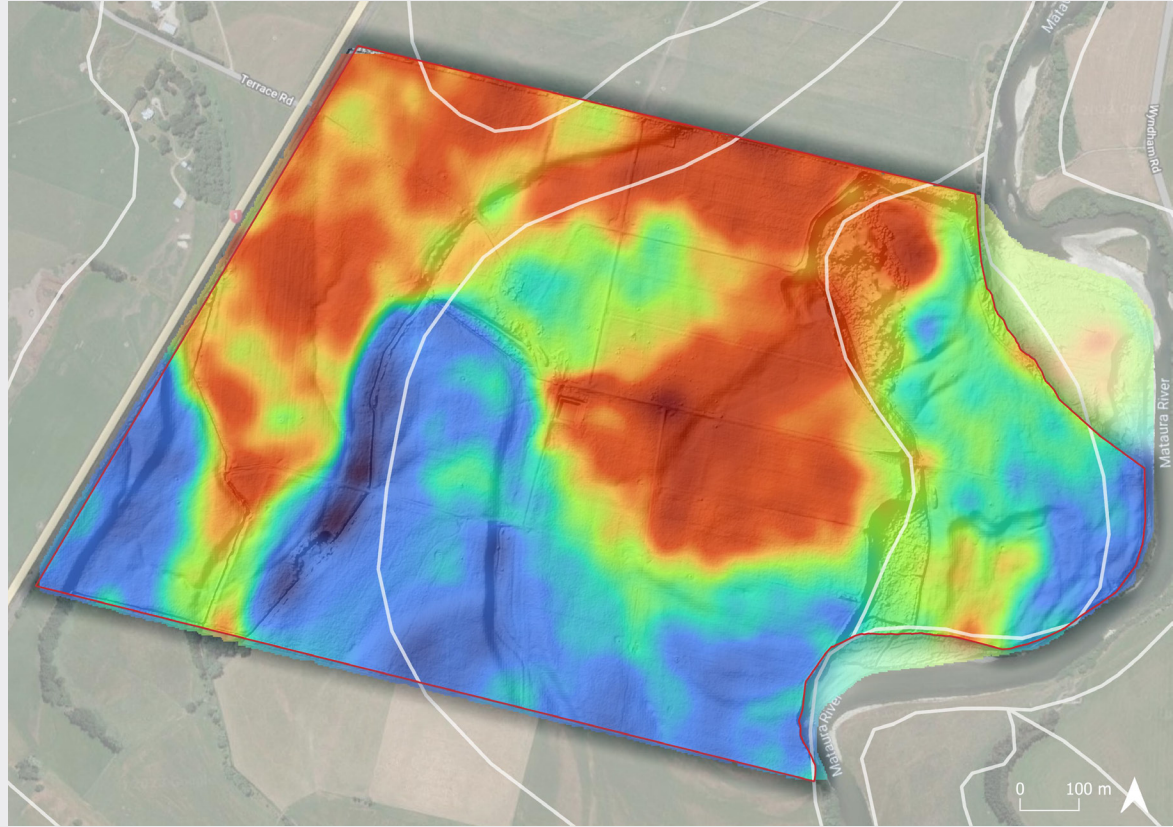**The landscape has a significant influence on water quality compared to land use alone.**

You could have two identical farms side-by-side, but if the landscape settings beneath the farms are different, there will be different water quality outcomes.

What is radiometric survey?
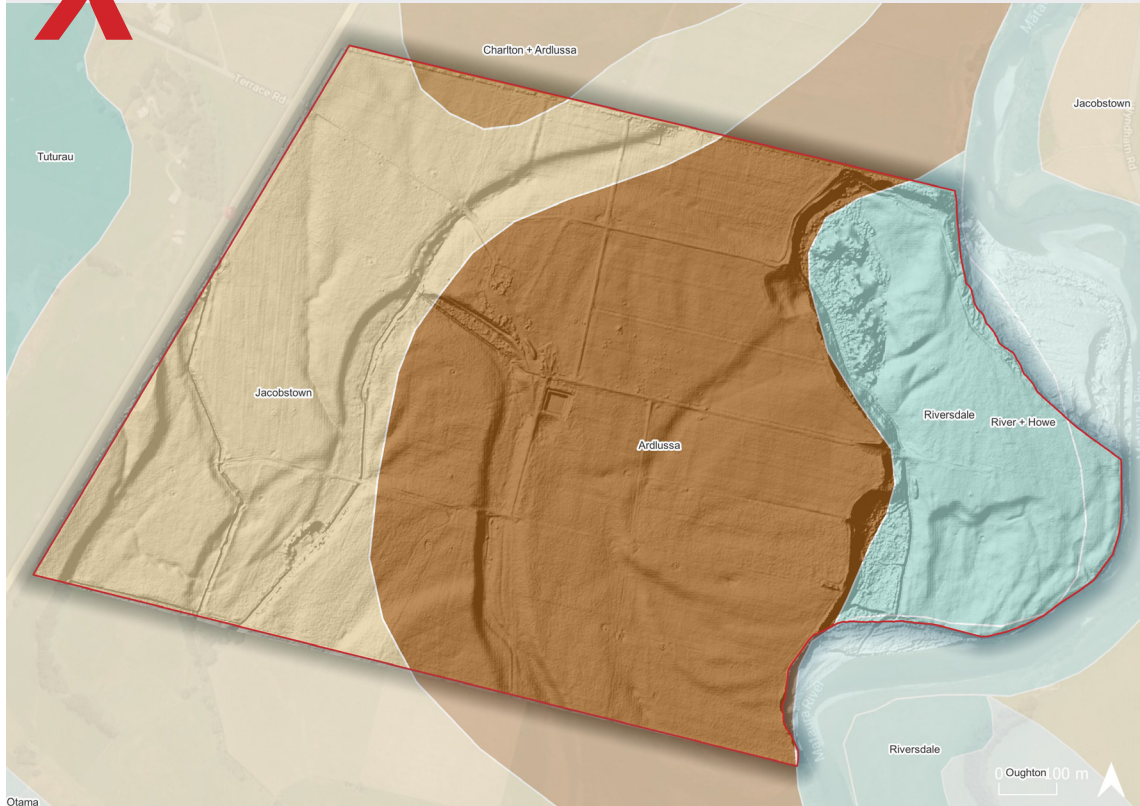

- soil texture
- drainage class
- bulk density
- organic carbon
- soil chemistry
- water content

= High resolution soil info
(more accurate)
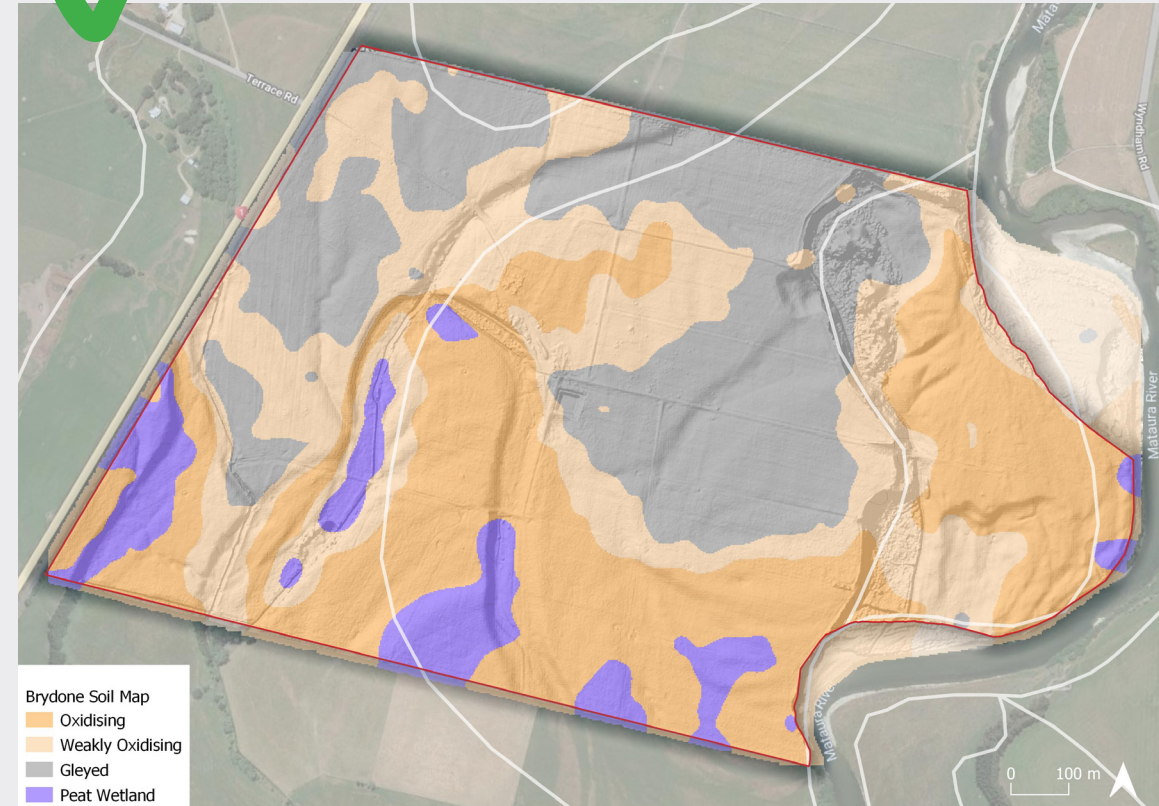
Why survey your soils?

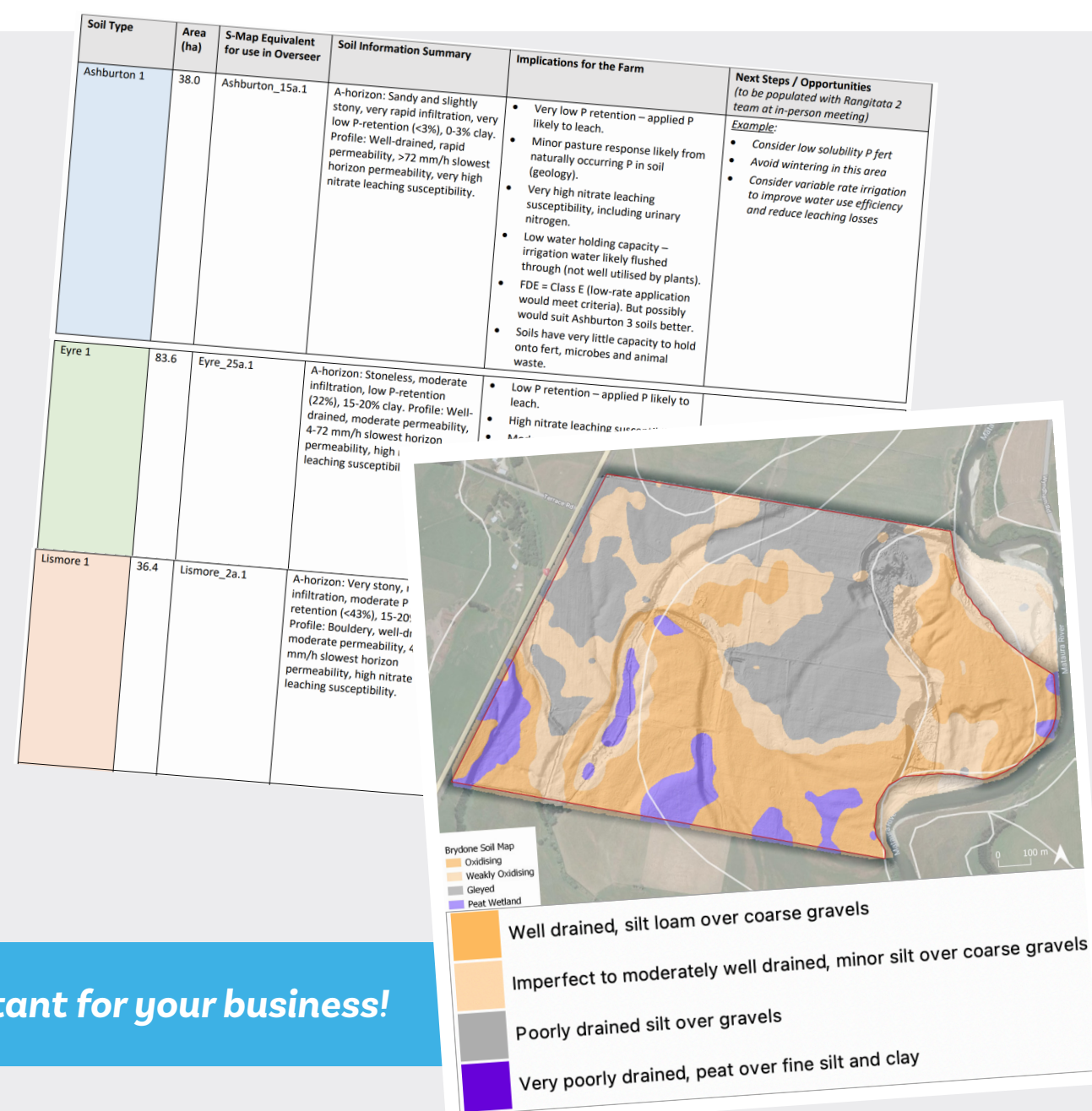❌ *Currently available soil information*

✔ *New soil map from radiometric survey*

Brydone Soil Map
- Oxidising
- Weakly Oxidising
- Gleyed
- Peat Wetland

Improved accuracy of soil type, location and area (ha)

What do you get?

- New data-driven farm soils map

- Each soil type defined with implications for the farm system

- Report summarising the survey & results

Understanding your core asset = hugely important for your business!

Soil Type	Area (ha)	S-Map Equivalent for use in Overseer	Soil Information Summary	Implications for the Farm	Next Steps / Opportunities (to be populated with Rangitata 2 team at in-person meeting)
Ashburton 1	38.0	Ashburton_15a.1	A-horizon: Sandy and slightly stony, very rapid infiltration, very low P-retention (<3%), 0-3% clay. Profile: Well-drained, rapid permeability, >72 mm/h slowest horizon permeability, very high nitrate leaching susceptibility.	• Very low P retention – applied P likely to leach. • Minor pasture response likely from naturally occurring P in soil (geology). • Very high nitrate leaching susceptibility, including urinary nitrogen. • Low water holding capacity – irrigation water likely flushed through (not well utilised by plants). • FDE = Class E (low-rate application would meet criteria). But possibly would suit Ashburton 3 soils better. • Soils have very little capacity to hold onto fert, microbes and animal waste.	Example: • Consider low solubility P fert • Avoid wintering in this area • Consider variable rate irrigation to improve water use efficiency and reduce leaching losses
Eyre 1	83.6	Eyre_25a.1	A-horizon: Stoneless, moderate infiltration, low P-retention (22%), 15-20% clay. Profile: Well-drained, moderate permeability, 4-72 mm/h slowest horizon permeability, high leaching susceptibil...	• Low P retention – applied P likely to leach. • High nitrate leaching susceptibi...	
Lismore 1	36.4	Lismore_2a.1	A-horizon: Very stony, infiltration, moderate P retention (<43%), 15-20% Profile: Bouldery, well-dr moderate permeability, 4 mm/h slowest horizon permeability, high nitrate leaching susceptibility.		

Brydone Soil Map
- Oxidising
- Weakly Oxidising
- Gleyed
- Peat Wetland

Well drained, silt loam over coarse gravels

Imperfect to moderately well drained, minor silt over coarse gravels

Poorly drained silt over gravels

Very poorly drained, peat over fine silt and clay

Decisions using data.

You can get quick wins from understanding the soil information, identifying the implications for your farm system and the opportunities to make adjustments.

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Decisions using data.

| Soil Type	Area (ha)	S-Map Equivalent for use in Overseer	Soil Information Summary	Implications for the Farm	Next Steps / Opportunities *(to be populated with Rangitata 2 team at in-person meeting)*
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Variable rate fert case study.

- Historic inputs unknown (new lease)

- Wanted info fast

- Goal of evening out fertility across property

Radiometric survey discovered high Olsen P's across the property. Opportunity to reduce applications and shift to lower solubility product.

**Saving approx $35k = 1 year payback on investment**
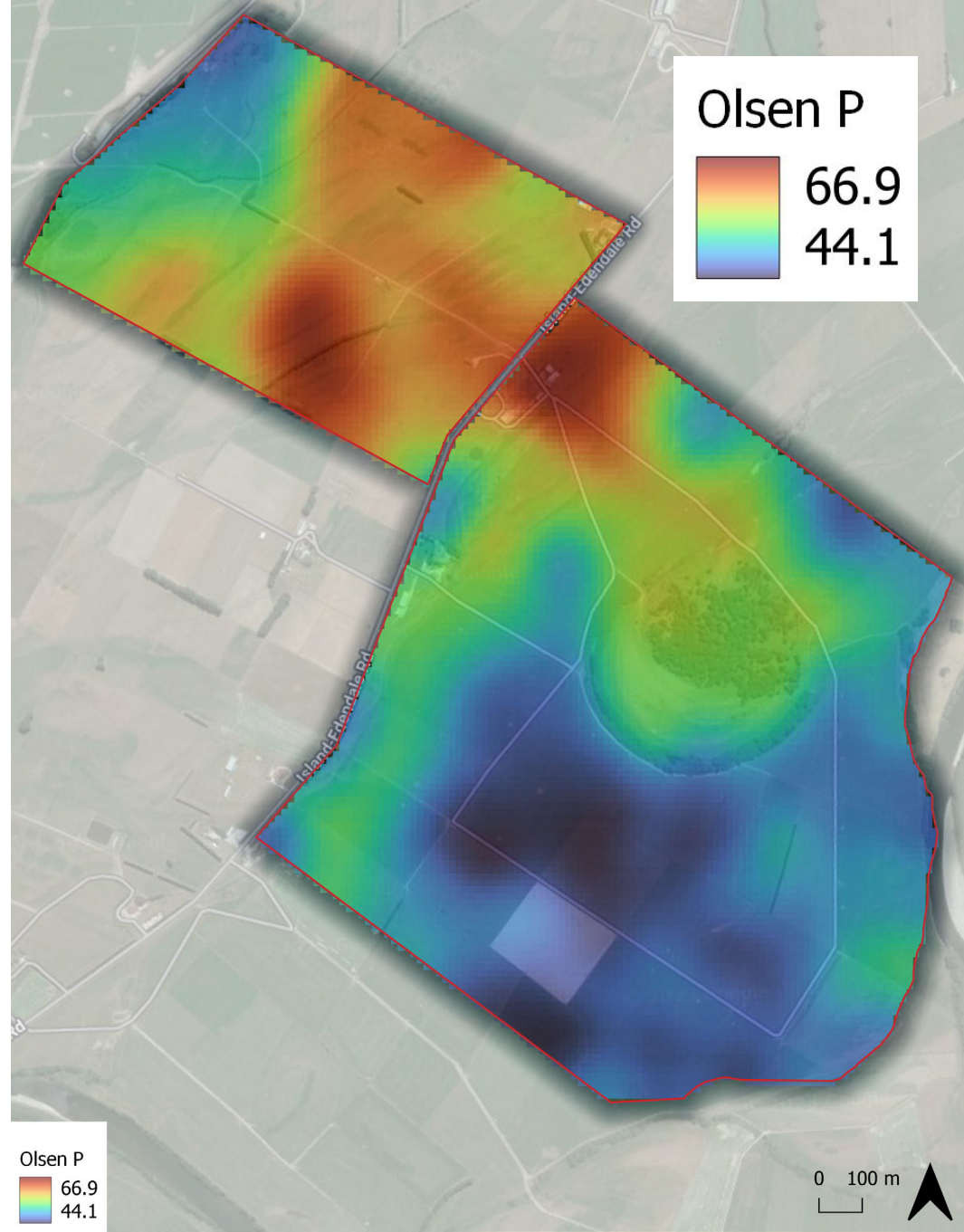
Variable rate irrigation case study.

- Wanting to improve pasture production

- Wanted to increase irrigation efficiency

- New on-farm team, limited knowledge of property

Far more accuracy in data-driven soil map. Lab analysis of soils determined the recommended irrigation return frequencies range from 4 days to 20 days across the farm.

**Validated next stage of updating irrigation infrastructure**

Soil Map
- Gore
- Riversdale
- Glenure
- Fleming WT
- Howe mod. - imp.
- Howe imp.

0   250 m
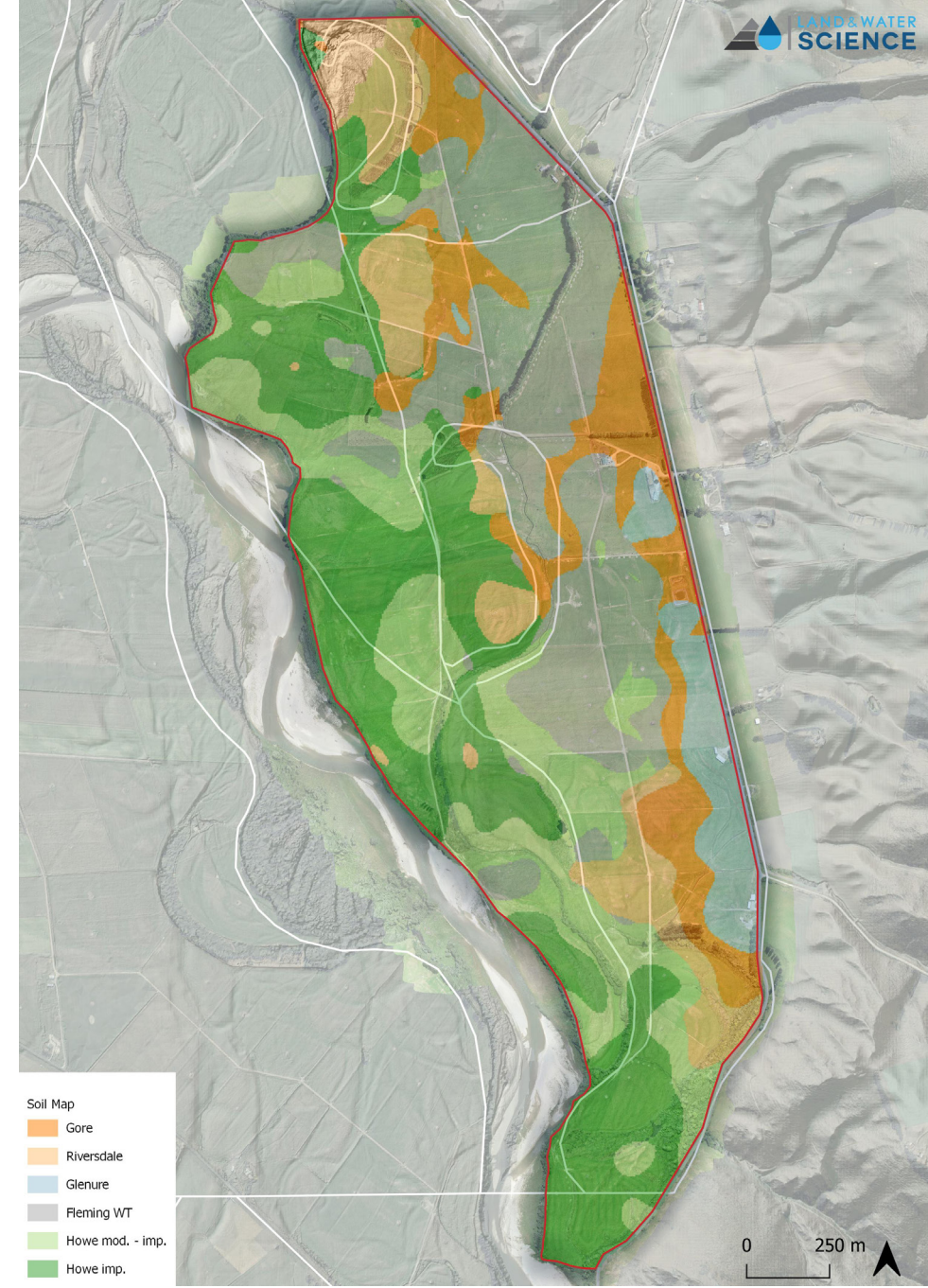
Farm dairy effluent case study.

- Part of re-consenting process

- Wanted to identify area suitable for spreading

- Highly accurate soils & slope data = 80ha suitable

Radiometric survey informed new data-driven soil map. Accurate soils information combined with slope data derived from LiDAR to classify land as suitable or not.
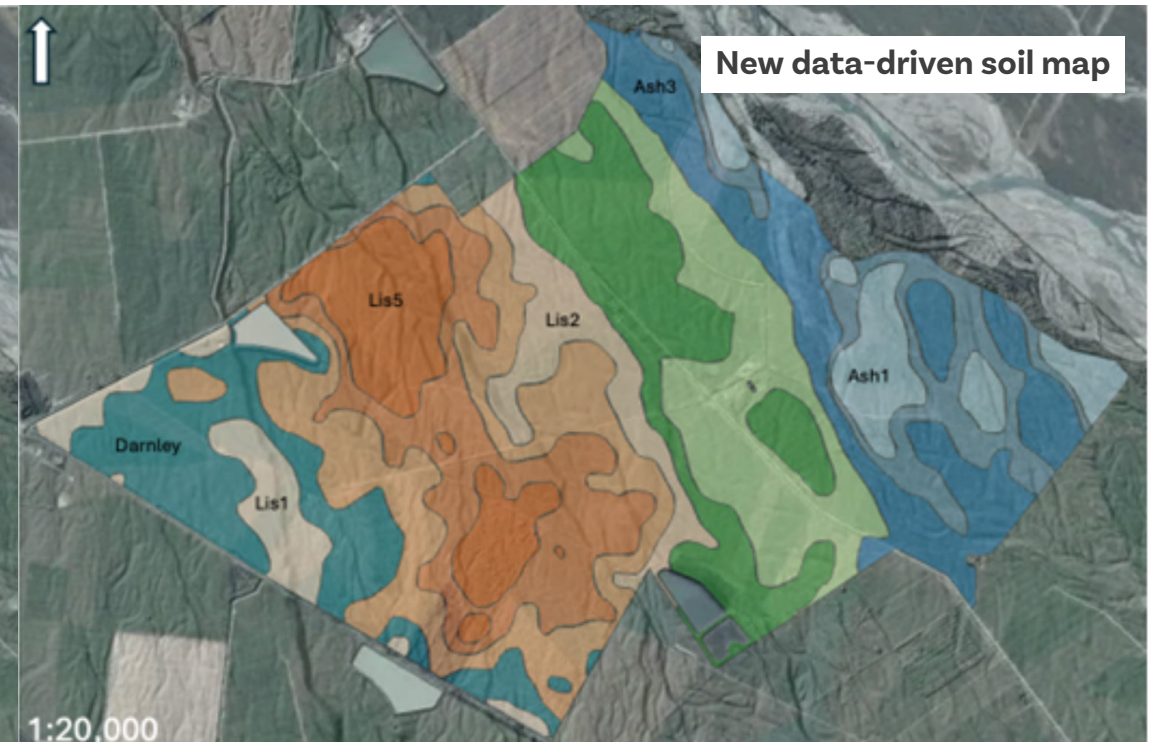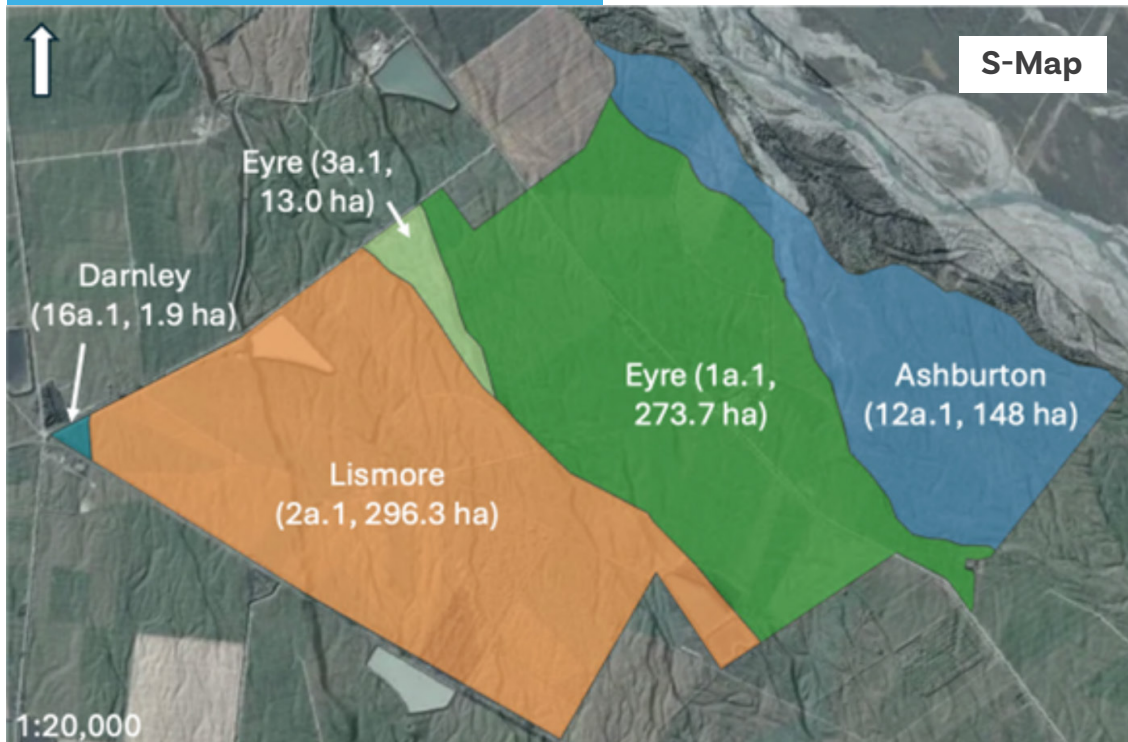
Went from being told no suitable area to 80ha
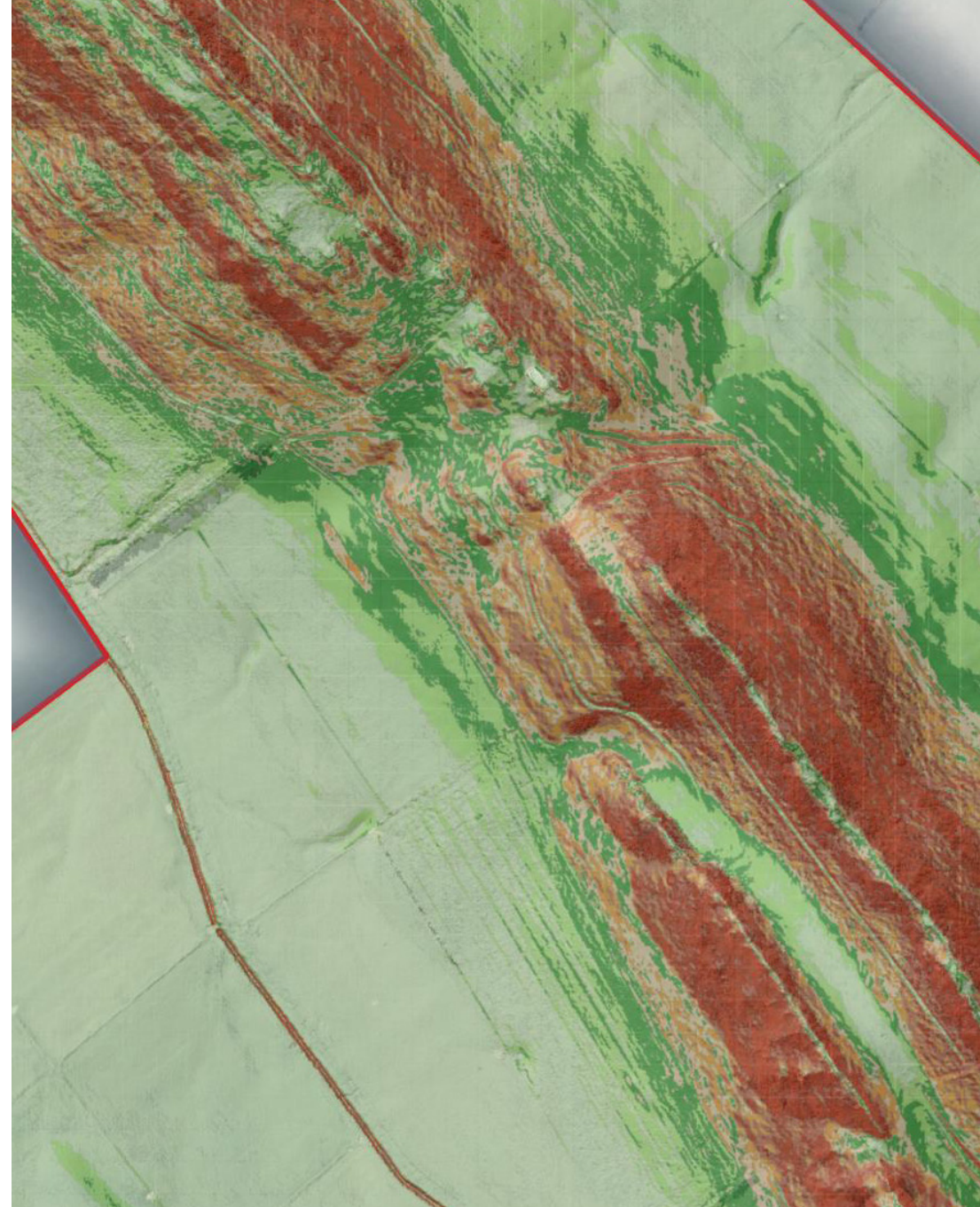
Rangitata Dairies Group.

Operating more efficiently, therefore more profitably, by farming in tune with the land.

Phase 1: Discovery *Managing risk and identifying opportunities*

*The data validated what we see of the land as farmers.*

- 4 terraces, aged young to old from the river headed west. 11 distinctive soil types.

- New, data-driven map significantly more accurate than S-Map *(Darnley soils S-Map 1.9ha, actually 72.6ha)*.

- Substantial variation in soils & geology mapped across the property.

Phase 3: Application

You don't have to go whole hog...

Next Steps

- Increase farm team soils knowledge

- Collect GPS referenced soil test data

- Discuss fertiliser products and application rates with fert rep

- Adjust the irrigation rate of each pivot to better match the soil type family they service. E.g., lighter applications more often on the free draining Ashburton soils. Reduce water being applied to the Darnleys.

- Farm system adjustments to suit soil types. E.g., The Eyre soils have a high susceptibility for compaction, so when soils are saturated consider strategic grazing.

- Review pasture cultivars to sow in future

- Update Overseer modelling with new soils information.

"many small wins will generate a return on investment"

0   250 m
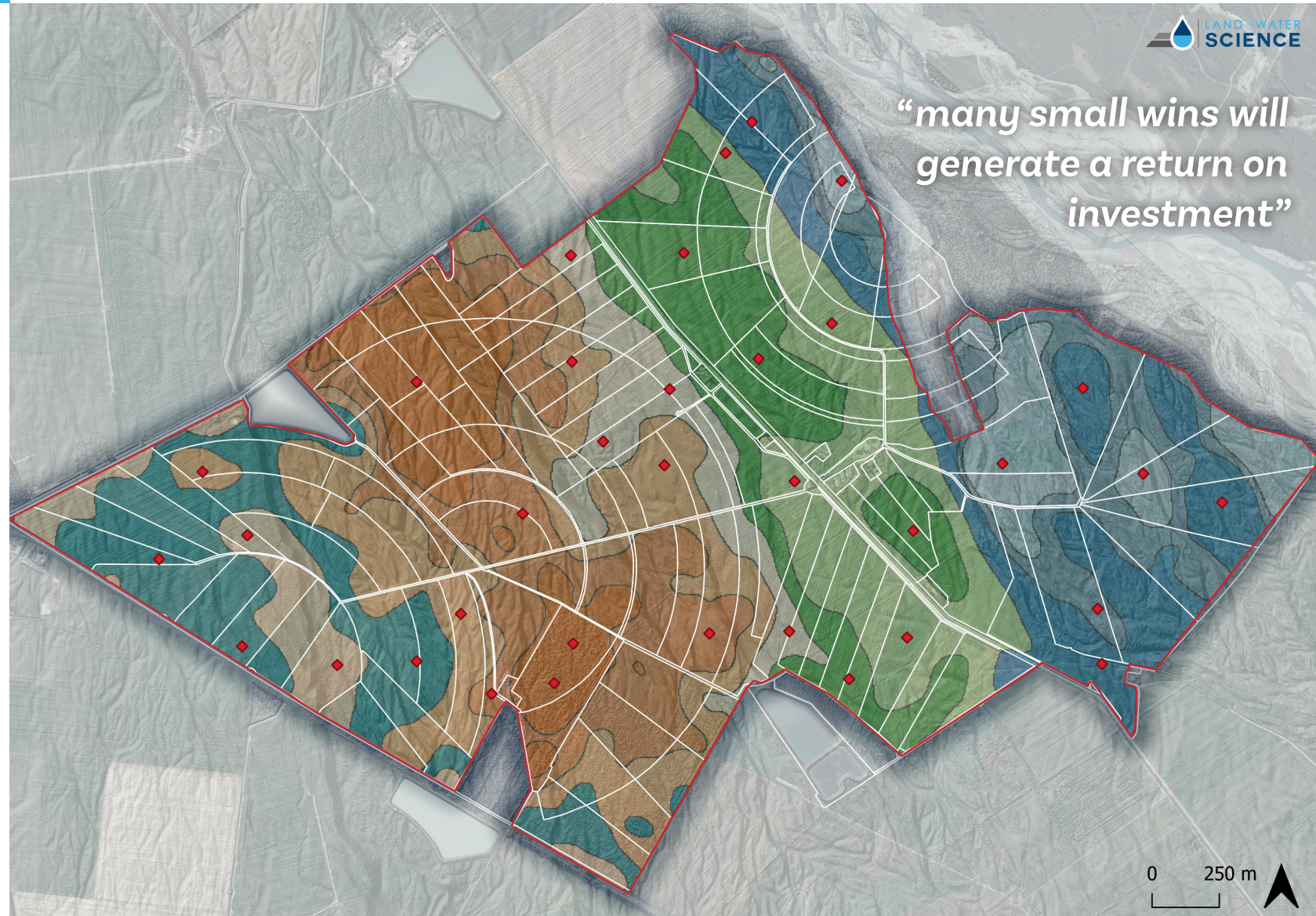
Summary.

- Available soils info is regional scale. Farmers make decisions at property & paddock scale.

- Soils are the engine room of the farm and control production, water quality, and soil GHG emissions

- Aligning your farm system to the soil environment saves money and makes your business more resilient *(AgMARDT Beyond Regulation)*

- Radiometric soil survey costs approx **$40-60 per hectare**

- Using data-driven soil info provides efficiency opportunities and environmental wins

- Radiometric soil survey is useful for all types of farming (dairy, beef, sheep, arable, orchards, horticulture, deer, etc)

LAND & WATER
SCIENCE