KEENAN & SLOAN
KS AGRI
AGRICULTURAL CONSULTANTS

STATE OF THE NATION MAKARA CATCHMENT MARCH 2024

CATCHMENT OVERVIEW

The Makara Stream is a large eastern hill country stream and is a tributary of the Tukituki River. The Makara Catchment and the Makara Catchment Group fall within the Tukituki Freshwater Management Unit (FMU).

The Tukituki Catchment Plan sets water quality limits for levels of Dissolved Inorganic Nitrogen (DIN). 17 sub-catchments, each of which has a monitoring site from which monthly samples inform the council as to the status of the sub-catchment. If a catchment exceeds the DIN limit of 0.8 mg/L (based on an average of 5 years of sampling data), then all properties (over 4 ha, excluding low-intensity farming systems) within the sub-catchment will be required to have a Land Use Resource Consent from 1 June 2020. Currently, the Makara catchment is compliant with an average DIN of 0.036mg/L

The Makara Stream is the main stream draining the eastern hills of the Makara Catchment and flows in a westerly direction through exotic forestry and pastoral land uses. The catchment is 124.7 km2.

The steep land in the Catchment lends itself to extensive Sheep & Beef farming, and two forestry operations farms in the upper reach of the catchment while the lower flats are also used for cash cropping.

25 Farms Completed	14,806ha	Average Stocking Rate 8.0su/ha
N Loss 14.7kgN/ha	P Loss 0.78kgP/ha	

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STATE OF THE NATION – MAKARA CATCHMENT

Farms that were part of the project ranged from 60ha to 3751ha. Most of the farms are dry stock operations with some cash cropping on the flats along with 2 forestry blocks. The total cropped area of the catchment was 3% (434ha) and of that winter cropping accounted for 0.34% with only 4 farms choosing to put in winter crops. Only two farms had irrigation for a total of 87ha under gun irrigators. 61% of the farms have sediment dams on their property. The catchment has 12% of its land area under production forestry with around 30ha due to be harvested in the next 5 years.

The catchment currently has an average total allowable Nitrogen Loss Limit of 18.7kgN/ha.

COLLECTIVE FOOTPRINT TO DATE

- 8767 Erosion Poles Planted Since 2018
- 63ha of wetlands Fenced over 8 farms.
- 54.5km of Riparian Fencing completed
- 0.5% (97ha) of the catchment is in QEII
- 110ha of Native bush and regenerating Manuka

WATER QUALITY PRESSURES & SURFACE WATER QUALITY STATE EXAMPLES

The main contaminants of concern are nitrogen (N), phosphorus (P), sediment, and faecal indicator organisms. The water quality of surface waterways is the result of a range of factors, including soil type and underlying geology, land use, climate, and hydrological characteristics. Catchment and site-specific characteristics are critical to determining the amounts and effects of contaminant losses on water quality, aquatic ecosystems and the uses and values of water.

Physical setting and soil risk factors in the Catchment: The catchment is predominately a mixture of Pallic, Brown, and Recent soils. Pallic soils have a weak structure and high density in subsurface horizons. Root extension is limited and the drainage of water through the soil is slow. Pallic Soils become dry in summer and wet in winter or spring. Brown Soils have relatively stable topsoils. Well, moderately well or imperfectly drained. Usually, well-developed polyhedral or spheroidal topsoil structure. Recent soils have good drainage and high natural fertility. Soil development is mostly confined to the topsoil, recent soils are susceptible to erosion and or sedimentation.

Water Quality Monitoring: Land Air Water Aotearoa (LAWA) (lawa.org.nz) is the most up-to-date national database which connects people with New Zealand's environmental monitoring data. There is one water quality testing site located on the Makara Stream not far from its confluence with the Tukituki River.

Biological health data includes surveys of freshwater invertebrates which are used as indicators of stream health. Biological indices are used as a proxy of stream health, and two key indicators include taxa richness and the MCI score.

Physical Setting and Soil Risk Factors LAWA has adopted a colour-coding traffic light (blue to red) system to aid the interpretation of data that corresponds to the status as determined in the National Policy Statement for Freshwater:

Blue–Band A | **Green–Band B** | **Orange–Band C** | **Red–Band D**

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WATER TESTING

There are 2 individual farms completing water testing and only one NIWA water testing site in the catchment on the Makara Stream at Cheviot St Lawrence Road.

Current Water Testing Site – Makara Stream Cheviot St Lawrence Road.

Table 1: Summary ecological monitoring data for Makara Catchment ordered upstream to downstream.

	Taxa Richness	***Percentage EPT Taxa***	***MCI***
Makara Stream at St Lawrence Road	18	NA	56.6

Table 2: Summary physiochemical monitoring data for Makara Catchment 5-year median

	E.coli	***Suspended Fine Sediment (visual Clarity)***	***Nitrate-nitrogen***	***Dissolved Inorganic Nitrogen (DIN)***	***Dissolved Reactive Phosphorus***
Makara Stream at St Lawrence Road	150n/100ml	1.02 m	0.029mg/L	0.036 mg/L	0.025mg/L

Blue–Band A | **Green–Band B** | **Orange–Band C** | **Red–Band D**

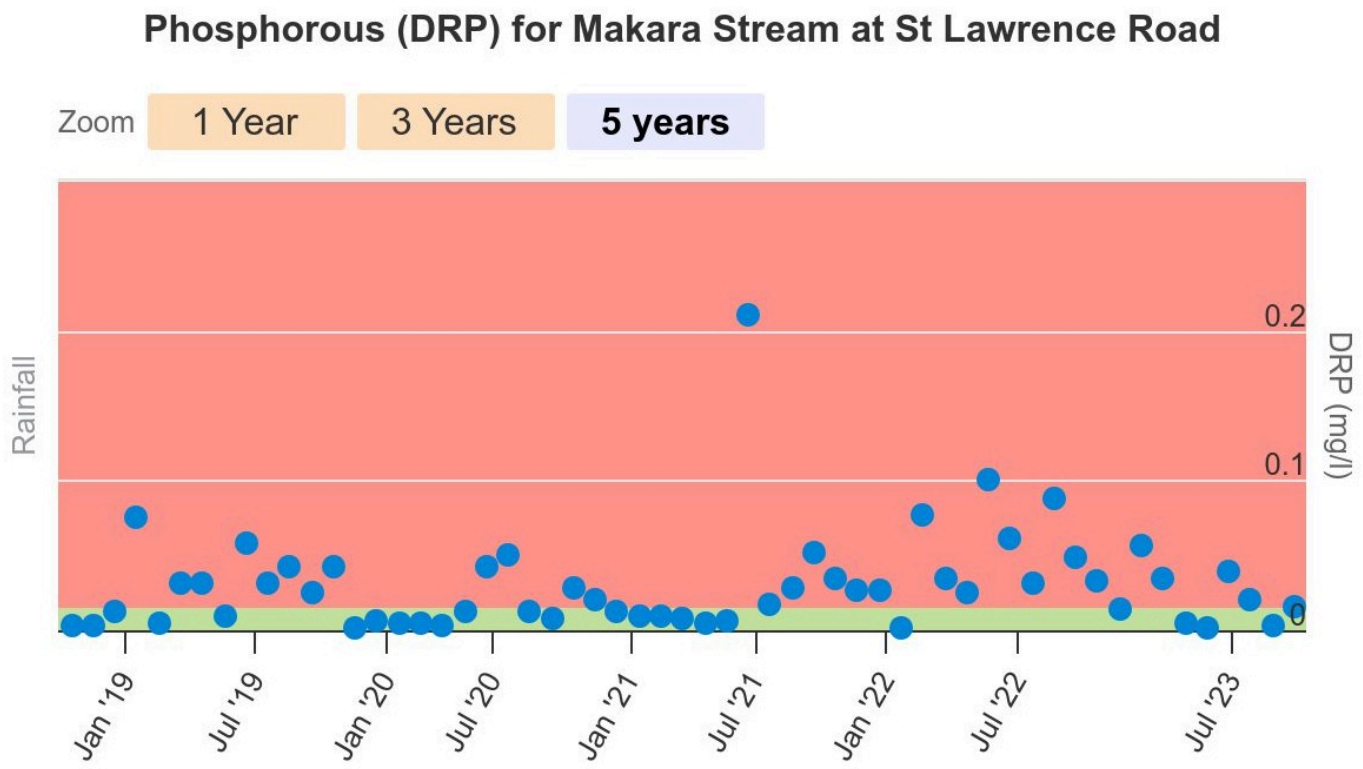

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Diagram 1: Dissolved Reactive Phosphorus (DRP) Water Testing Results for the last 5 years (Source https://www.hbrc.govt.nz/environment/farmers-hub/in-the-tukituki-catchment/tukituki-dashboard/makara-dashboard/)

The catchment considers anything over 0.015mg/L to be in the red zone.

Dissolved Reactive phosphorus (DRP) is the only form of phosphorus (P) available for aquatic plant and algae growth. Elevated levels of P can lead to excessive plant or algal growth deteriorating water quality. Over time, P bound to sediment (soil runoff) dissolves and becomes DRP. The 5-year median for the Makara catchment is 0.032mg/L which is double the recommended levels. This is the major contributing factor in the catchment affecting water quality.

DRP	Algal growth - recreation <30% algae cover	Matheson *et al.* (2016)	Very low risk	<0.003 mg/L	long-term mean, all flows
			Low risk	0.003 to <0.006 mg/L	
			Moderate risk	0.006 to < 0.015 mg/L	
			High risk	>0.015 mg/L	

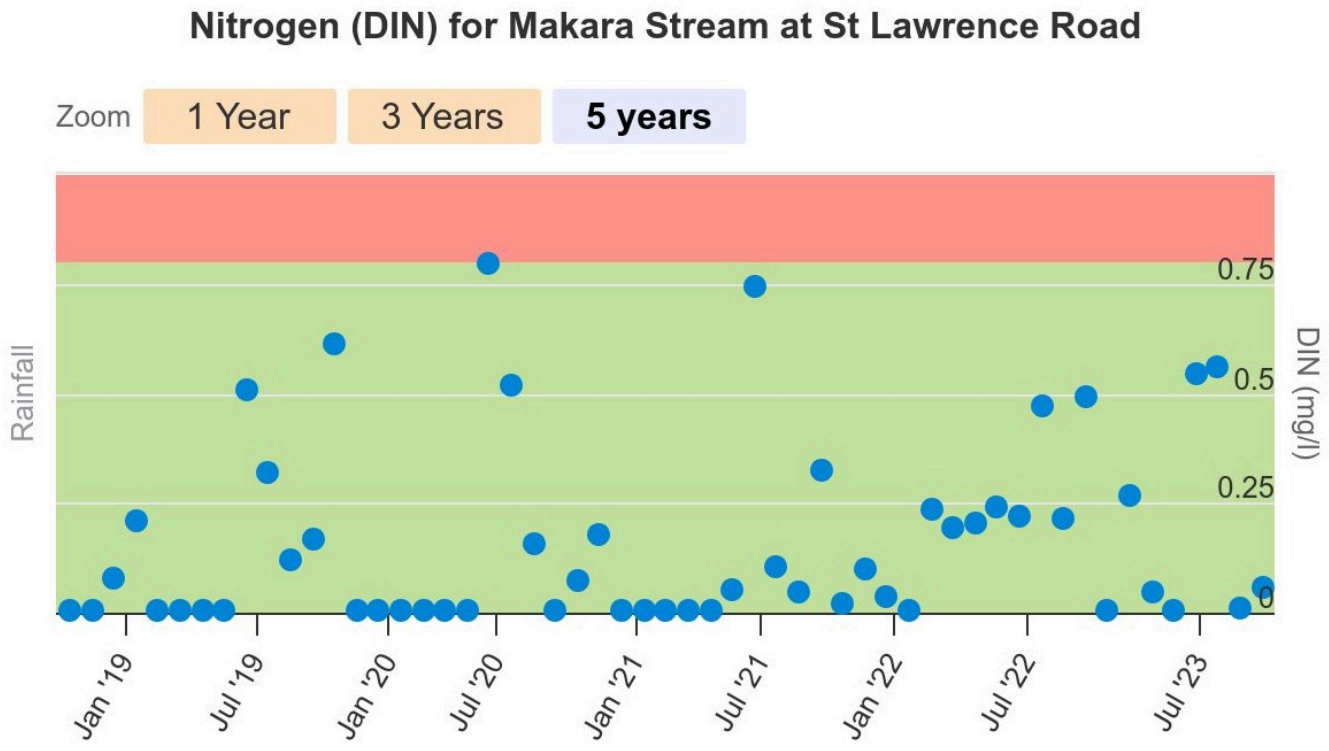

Diagram 2: Dissolved Inorganic Nitrogen Makara Stream Water Testing Results for the last 5 years (Source https://www.hbrc.govt.nz/environment/farmers-hub/in-the-tukituki-catchment/tukituki-dashboard/makara-dashboard/)

Nitrogen is an essential element for plant growth. Elevated levels can lead to excessive plant and algal growth. Dissolved Inorganic Nitrogen (DIN) is the form of nitrogen available for aquatic plant and algae growth.

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The Tukituki Catchment Plan has set a limit of 0.8 mg/L for DIN in the Makara Catchment. Water testing has shown that the Makara Catchment remains compliant and under the 0.8mg/L level with a 5-year median of 0.036mg/L (source: https://www.lawa.org.nz/explore-data/hawkes-bay-region/river-quality/tukituki-river/makara-stream-at-st-lawrence-road/)

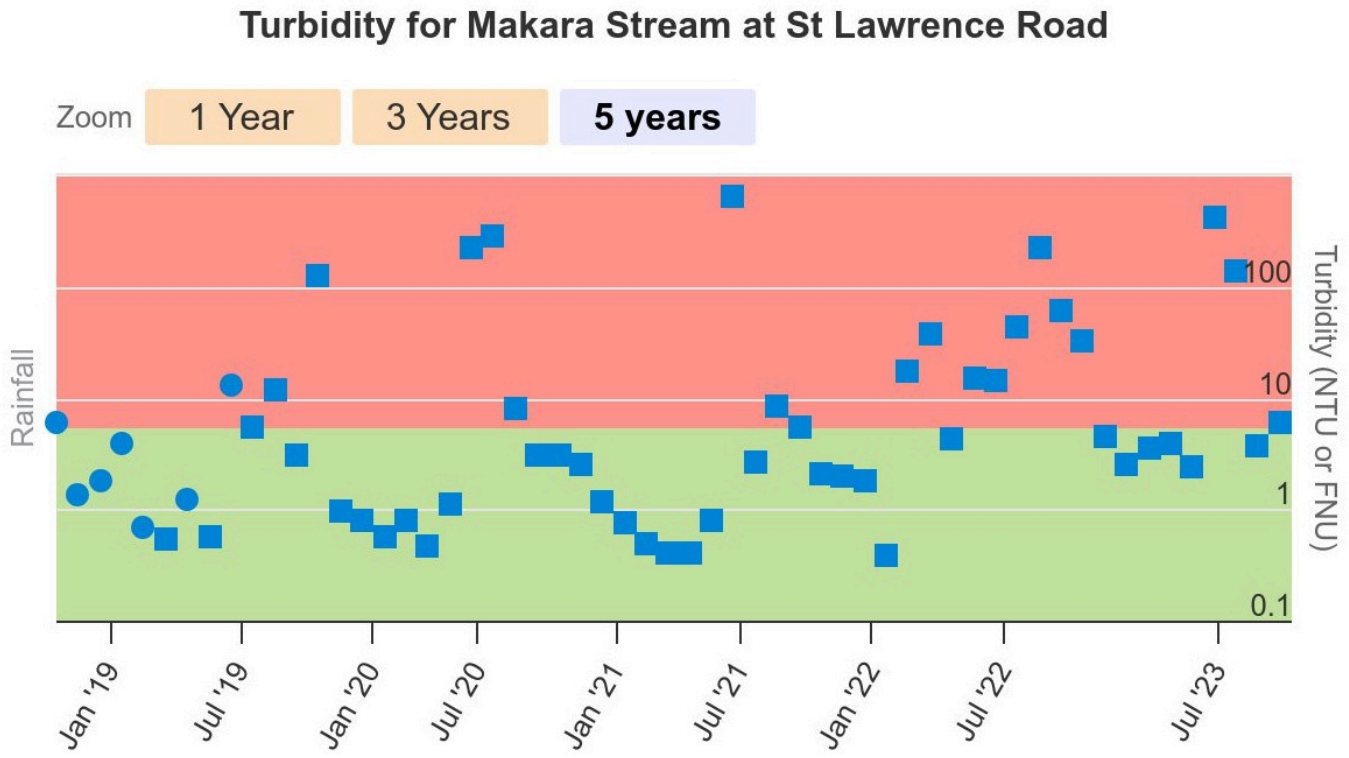

Diagram 3: Turbidity For Makara Stream Water Testing Results for the last 5 years (Source https://www.hbrc.govt.nz/environment/farmers-hub/in-the-tukituki-catchment/tukituki-dashboard/makara-dashboard/)

Increases in turbidity are associated with elevated sediment loading which is often caused by erosion. Sedimentation reduces habitat quality and limits the type of animals that can live in the waterways.

The Rolling median for the catchment is 4.42mg/L and anything over 5.6mg/L is in the red zone.

SOIL TYPES

The Makara catchment has a large percentage of Pallic soils as shown in the soil map below. Pallic soils are often dry in summer and moist in winter, which as a result lend themselves to have soil properties which present a weak soil structure and imperfect or poor drainage of water through this soil profile. The subsequent expansion of the subsoil clays in winter causes compression, making the subsoil compact and restricting drainage, impeding root development, and impacting on porosity and drainage channels.

For further information on the soil types in the catchment use S-Map online which can be found here: https://smap.landcareresearch.co.nz/maps-and-tools/app/

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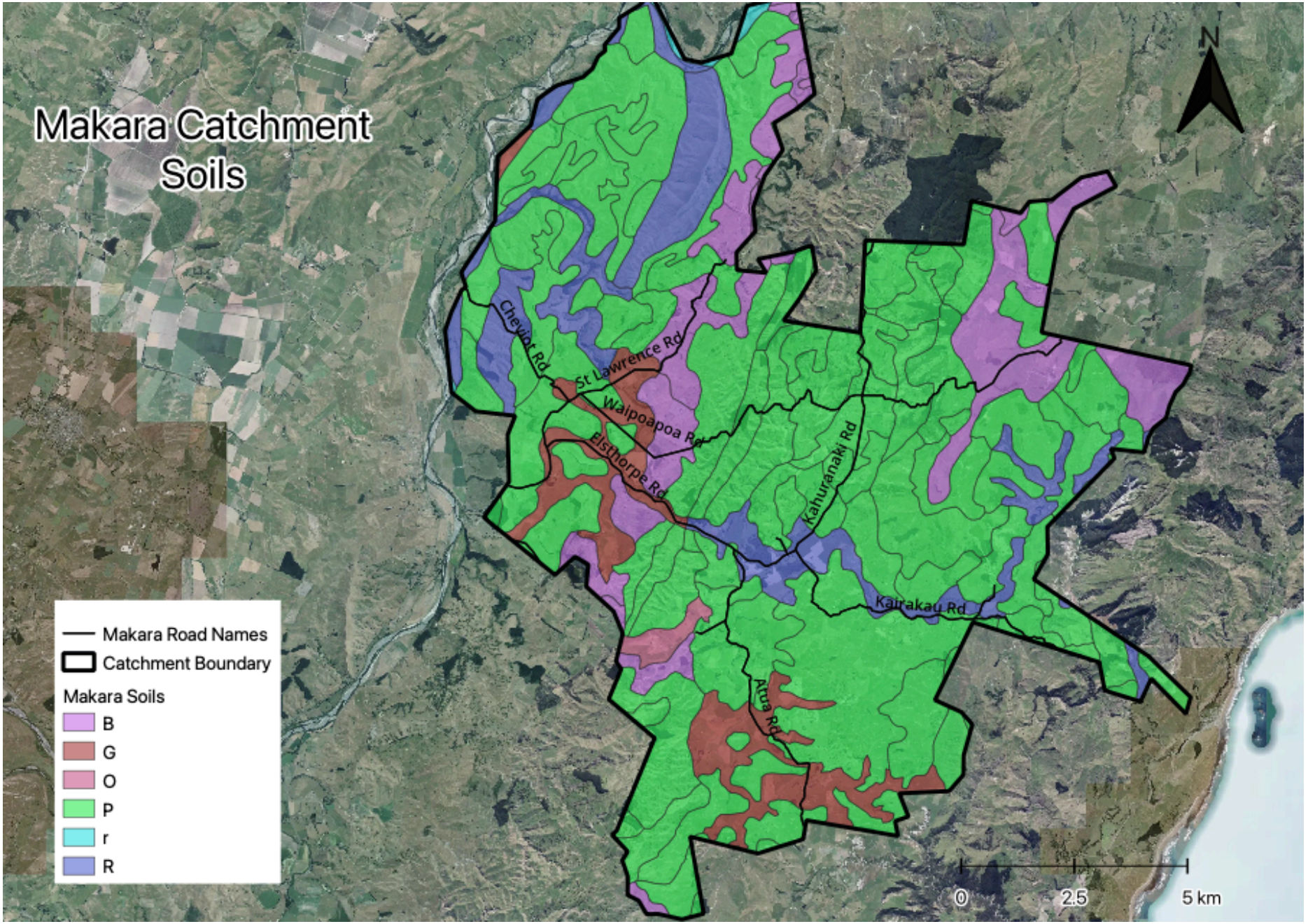
Makara Catchment Soils
N
Cheyiot Rd
St Lawrence Rd
Walpoapoa Rd
Elsthorpe Rd
Kahuranaki Rd
Kairakau Rd
Atua Rd
Makara Road Names
Catchment Boundary
Makara Soils
B
G
O
P
r
R
0
2.5
5 km

Key Contaminant Pathways for Soils in Your Catchment				
Soil Type	**Overland Flow**	**Artificial Drainage**	**Lateral Flow**	**Deep Drainage**
Pallic	✓	✓		✓
Brown (R)	✓		✓	✓
Gley	✓	✓		
Recent			✓	✓
Organic		✓	✓	
Raw (r)	✓		✓	

KEY RECOMMENDATIONS

- Water Testing
- Erosion Control
- Dung Beetles

WATER TESTING

Water testing in the catchment. As there is only one water testing site in the lower catchment it only provides some broad-scale information. By increasing the number of testing sites in the catchment, more accurate insights can be gained, and areas identified where more action is required to improve the overall water testing results in the catchment.

Site 1: Kokatawai Road Bridge Makara Stream

Site2: Kairakau Road Bridge Makara Stream

Site 3: Tucker access bridge Hawea Stream

Site 4: Duncan Bridge Wharemate Stream

Site 5: Existing Council site

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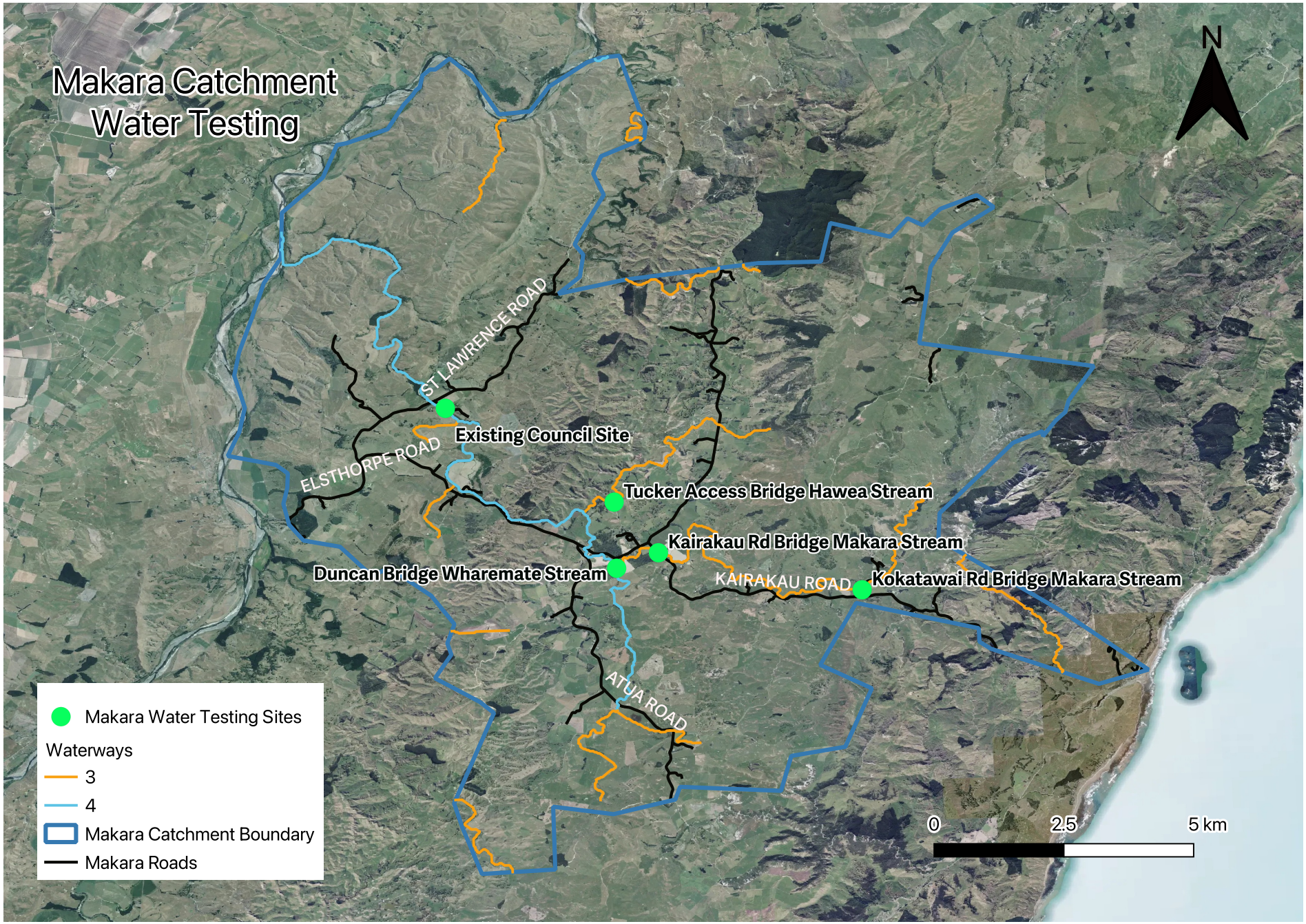

Makara Catchment
Water Testing
N
ST LAWRENCE ROAD
Existing Council Site
ELSTHORPE ROAD
Tucker Access Bridge Hawea Stream
Kairakau Rd Bridge Makara Stream
Duncan Bridge Wharemate Stream
KAIRAKAU ROAD
Kokatawai Rd Bridge Makara Stream
ATUA ROAD
Makara Water Testing Sites
Waterways
3
4
Makara Catchment Boundary
Makara Roads
0
2.5
5 km

ACTION PLAN

- The catchment needs to determine the best sites to represent activities within the catchment.
- To employ a contractor to carry out monthly water testing.
- Apply for the PanPac community sustainability grants.
- Develop a monthly sampling and contingency plan, place of storage for data and interpretation and collation of results.
- Decide on the time frame for start dates for water sampling.

EROSION CONTROL SCHEME

Slumping and creeping on hillsides is one of the problematic areas of the catchment, specifically LUC 6 to 8 land. One way to combat this is erosion control plating to ensure hill stabilisation. Areas that are considered highly erodible are shown in the map below. The red areas are where the priority should be as they are the steepest and have the most erodible potential.

Currently, only 5 farms, 13% of owners, in the catchment have used Hawke's Bay Regional Council (HBRC) funding in the last 5 years for erosion control.

More uptake of the available funding for erosion control in the catchment would help protect erosion-prone land and keep productive soils on farms and out of waterways.

Currently, the Hawke's Bay Regional Council has funding available in the Erosion Control Fund. The key contact for this is:

Catchment advisor, Upper Tukituki: Emma Redward, 0273068215

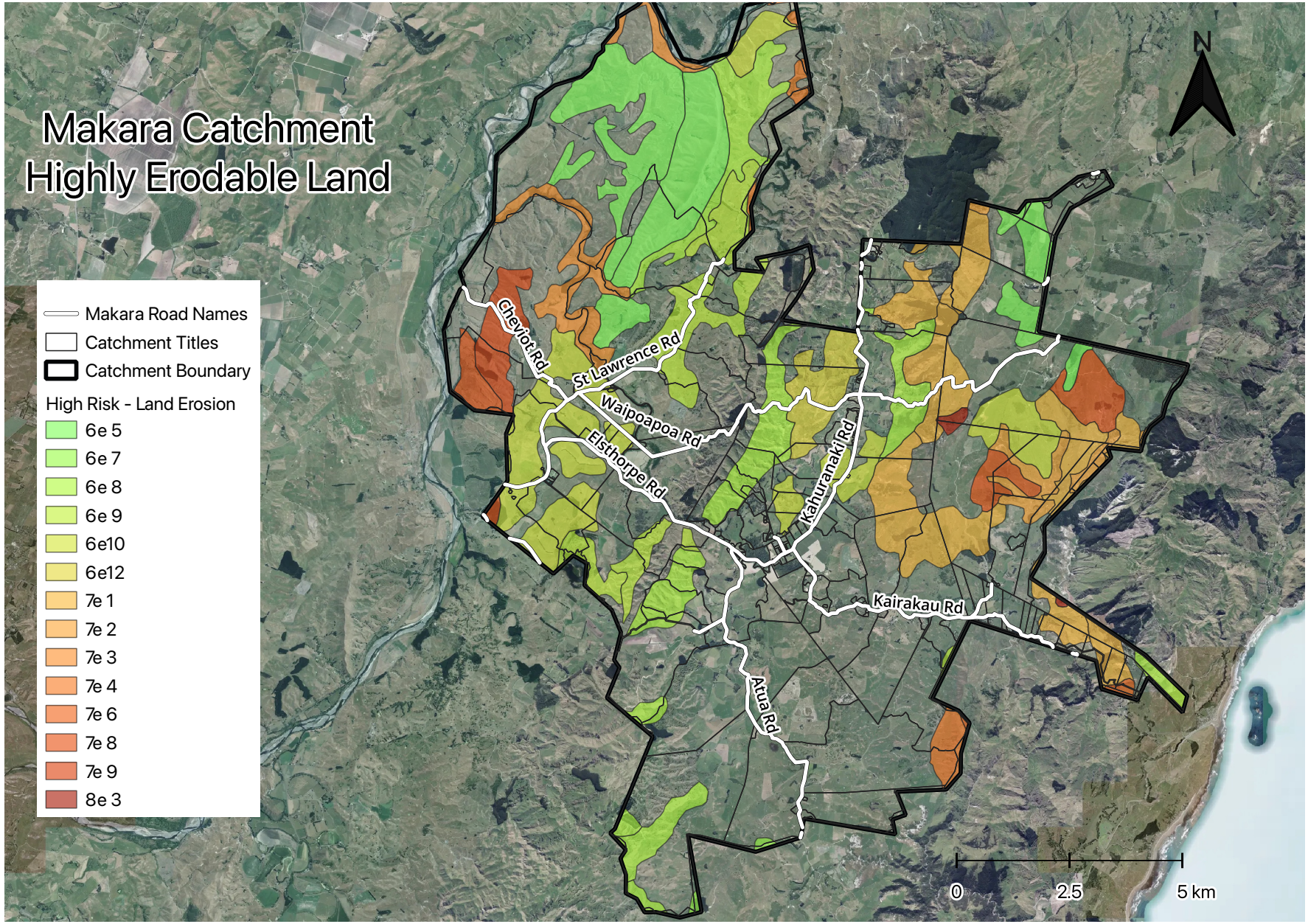
Central Office – Napier

159 Dalton Street, Napier 4110 +64 6 835 9200

Southern Office – Waipawa

26 Ruataniwha Street, Waipawa 4210 +64 6 835 9200

https://www.hbrc.govt.nz/environment/farmers-hub/managing-erosion


Makara Catchment
Highly Erodable Land
Makara Road Names
Catchment Titles
Catchment Boundary
High Risk - Land Erosion
6e 5
6e 7
6e 8
6e 9
6e10
6e12
7e 1
7e 2
7e 3
7e 4
7e 6
7e 8
7e 9
8e 3
Cheviot Rd
St Lawrence Rd
Waipoapoa Rd
Elsthorpe Rd
Kahuranaki Rd
Kairakau Rd
Attua Rd
N
0
2.5
5 km

ACTION PLAN

- Analyse each landowner and their suitability for funding for their erosion-prone areas.
- Engage with an HBRC land management advisor who can relate the erosion control fund specifically to the Makara Catchment.
- Consider having a nursery farmer field day, utilising catchment members.
- Consideration for the establishment of a catchment nursery, or better utilisation of local nurseries

DUNG BEETLES

Another option to minimise sediment and P loss in the catchment is the introduction of dung beetles.

Dung beetle activity in grazing paddocks can reduce the number of contaminants that enter waterways. It can reduce surface runoff and improve soil fertility and health. They can also improve soil drainage as the dung beetles are capable of burrowing through compacted soils which will help plant root systems to go deeper. This also provides better rain penetration into the soil reducing runoff and the phosphate that is tied up in the sediment lost.

More information about dung beetles can be found here: https://dungbeetles.co.nz
And pricing information and available packs see here: https://dungbeetles.co.nz/orders/

Action plan

- Engaging with Dung Beetle Innovations to look at a potential field day.
- Catchment swap and visit to catchments that have implemented Dung Beetles in their farm systems/local areas.

ADDITIONAL RECOMMENDATIONS:

- Undertake a follow-up State of The Nation report of the catchment in 5 years, in line with their completion and certification of their FWFP.
- Undertake a pulse check of the catchment members in 18 months to investigate direction, results being measured within the catchment but also for further community projects.
- Improve information sharing of environmental works already completed by farmers throughout the community. (i.e. posters at the pub, flyers in letterboxes etc.)
- Investigate the role of green finance from a farm-based project perspective for land use or farm system changes on the horizon.

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