BEFORE THE CENTRAL HAWKE'S BAY DISTRICT COUNCIL

220003

IN THE MATTER OF	the Resource Management Act 1991
AND	An application by James Bridge for a resource consent to subdivide land at Pourerere (being Part of Lot 1 DP 27067 and contained in Record of Title HBW3/400)

STATEMENT OF EVIDENCE OF ANDREW STEVEN HICKS

28 JUNE 2023

MAY IT PLEASE THE COUNCIL

1 My name is Andrew Steven Hicks.

Qualification

2 I hold the qualifications of BSc/BA (Hons) from the University of Melbourne and a PhD in Ecology from the University of Otago.

3 I am an ecologist with specialisation in freshwater (especially rivers and lakes) along with broader expertise in general ecology including riparian, wetland, estuarine and coastal habitats. I have over 12 years' experience providing technical advice to the Department of Conservation (2010-2012), Environment Southland (2012-2014) and Hawke's Bay Regional Council (2014-2022). This has included overseeing various monitoring programmes that span rivers, lakes, wetlands and the coastal environment and has covered various components of ecology (fish, macroinvertebrates, birds, water quality, habitat structure etc.). I have supported plan changes and their implementation, along with consents and compliance investigations. I have led various mitigation projects aimed at improving ecological values including constructed wetlands, river and riparian enhancement and fish barrier remediation. I was Team Leader / Principal Scientist for the Water Quality and Ecology Team at Hawke's Bay Regional Council until 2022.

4 I have been contracted by Paoanui Point Limited to provide ecological advice regarding the subdivision of 25 Punawaitai Road via "Science that Helps", which is a small consulting business run by my wife and I as a secondary source of income.

5 My current full-time employment is as a Senior Analyst at the Ministry for the Environment where I provide science and other technical advice for policy implementation and development of both the Resource Management Act and the Natural Built and Environment Bill. Ministry areas I have supported include Allocation, Limits and Targets, the development and implementation of freshwater plans under the National Policy Statement for Freshwater Management 2020 and support for the Ministry response to Cyclone Gabrielle and other severe weather events. But to be clear, I am not representing the Ministry for the Environment in any capacity whilst providing this evidence.

6 I have been a member of the New Zealand Freshwater Sciences Society since 2006 and currently sit on the Expert Fish Panel for the Department of

Conservation's New Zealand Threat Classification System. I was a member of the riparian and wetland practitioner technical group involved with planning and reviewing NIWA's constructed wetland guidance.

Code of Conduct and Conflict of Interest Declaration

7 I have read the Environment Court's Code of Conduct for Expert Witnesses 2023, and I agree to comply with it. I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

8 I have no commercial relationship with the applicant, save in my role as an expert in relation to this application.

Introduction

9 I provide evidence on the potential positive and negative ecological effects from the proposed subdivision, and ways to avoid, minimise or mitigate any potential negative effects where relevant. I focus on wastewater, stormwater and provide suggestions for riparian enhancement. I include evidence on whether negative effects to Northern New Zealand dotterel breeding are likely and describe measures that could be implemented to improve water quality and ecology values in the area. I explain why, in my opinion, the overall ecological effects from this proposal are likely to be positive, if design criteria are adhered to and the recommendations for enhancement work are followed.

10 In preparing this evidence, I have reviewed the following documents:

(a) Cultural Impact Assessment from Kairakau Lands Trust Dated 10 December 2022

(b) Onsite Wastewater Treatment and Disposal Report 25 Punawaitai Road, Pourerere (Stage 3) by Son Nguyen, Fraser Thomas

(c) Proposed subdivision at 25 Punawaitai Rd, Pourerere, Central Hawke's Bay Infrastructure Report by Son Nguyen, Fraser Thomas.

(d) Section 42A report of Ryan O'Leary, Planning

(e) Technical memorandum from Wayne Hudson, Senior Principal Civil Engineer (Three Waters), Stantec

(f) Technical memorandum from Iain Lachlan Grant, Director, Landvision Limited

(g) Submission from Pourerere Community and Character Preservation Society

(h) Submission from Garreth Charles Harris and Melaney Lisa Harris as trustees of the Havelock Bluff Trust

Wastewater

11 Protecting waterways from the negative effects of on-site wastewater application depends on adequate system design and maintenance. The water table in this area may be quite shallow during wetter periods, and the topsoil depth averages 0.25m to 0.3m, which means careful design principles need to be followed for adequate on-site wastewater treatment.

12 Fraser Thomas appear to have provided an appropriate assessment and have provided the necessary disposal area sizing and design approach for adequate on-site treatment to be undertaken. I note that Fraser Thomas estimate nitrogen loadings of 56 and 42 kg/N/Ha/year for Stages 1 and 3, respectively, which is approximately one third of the controlled permitted activity rule of 150 kg/N/Ha/year. I also note that urine patches from grazing animals are concentrated in small areas, rather than being spread out evenly across the area they use for grazing. The bulk of nitrogen loading from pastoral systems is linked with these urine patches. In contrast to urine patches, the nutrient loading from on-site wastewater systems is evenly spread out over their disposal fields. The even spread of nutrient means that assimilation by plants of all applied nutrients is more likely to occur. I therefore agree with Fraser Thomas that the relatively low nutrient loading from wastewater, along with a deliberate and controlled rate of effluent application, will mean the risk of eutrophication effects from the on-site wastewater treatment will be substantially less than from the current land use.

13 While at HBRC, I was involved in an investigation into suspected contamination from on-site wastewater treatment systems at Haumoana. Inadequate space for disposal fields, the lack of buffer widths to waterways, and suspected lack of appropriate septic tank management and maintenance, were considered the most probable reasons for inadequacies of on-site wastewater management in this area. These deficiencies reflected many septic tanks in the area being installed prior to consents for on-site wastewater being required,

and prior to any other regulations being in place for on-site wastewater management. This problem with old septic systems is recurrent in settlements throughout New Zealand.

14 I note the policy environment and stipulations around on-site wastewater management have changed considerably in the last 30-40 years in Hawke's Bay and throughout New Zealand. The proposed lot sizes for 25 Punawaitai Road have been sufficiently sized to allow on site wastewater treatment for at least 3 bedroom dwellings. Most lot sizes in this proposed subdivision are near to or more than 2000 square metres. Most lots in the aforementioned Haumoana area were less than 1000 square metres.

15 In my experience, water quality problems associated with on-site wastewater disposal have occurred in settlements with older septic tank designs and are a product of systems being installed in areas and at a time when on site wastewater disposal was less, or not at all, regulated.

16 If on-site wastewater systems are designed and managed according to the accepted design principles, I have no reason to expect water quality effects from the subdivision to be any worse than the current land use. On the contrary, in the case of the 25 Punawaitai Road subdivision, I expect the risk to water quality from suitably designed and maintained on-site wastewater systems to be substantially less than from the current land use.

Stormwater

17 An increase in impervious surfaces associated with housing developments, and contaminants that may be associated with those developments, may mean more rapid transport of contaminants to waterways occurs. As with wastewater, careful design and maintenance principles therefore need to be adhered to if the potential negative effects are to be avoided.

18 Fraser Thomas have provided a thorough site assessment and appear to have provided a suitable stormwater design system to mitigate risks from the subdivision.

19 A number of investigations have concluded that grass provides a superior buffer strip for water quality improvements (e.g. Mckergow et. al. 2020[1]). Although native plantings that provide a more complex structure and diversity

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[1] McKergow, L., Goeller, B., Woodward, B., Matheson, F., and Tanner, C., 2022. Attenuation of diffuse-source agricultural sediment and nutrients by riparian buffer zones. Prepared for DairyNZ. NIWA client report No 2020037HN. Hamilton, New Zealand.

of niches have superior biodiversity benefits, I think the narrow nature of roadside swales have less potential for biodiversity benefits. As such, focus should be on maximising water quality benefits and I recommend that swales in the subdivision are managed as grass buffer strips, or similar, so as to optimise filtering benefits.

20 A detention pond has been incorporated into the overall stormwater design to attenuate flows and provide a longer retention time and greater level of water quality treatment. The wider dimensions of this detention pond present a greater opportunity for biodiversity benefits as compared with swales. If investment in native plantings is to occur, I would recommend focusing native planting efforts on the detention pond.

21 As with wastewater, and if the provided designs are implemented appropriately, I expect any negative effects from stormwater off the subdivision to be less than stormwater effects from the current land use.

Dotterels

22 Concern was expressed in submissions from the Pourerere Community and Character Preservation Society, and Garreth Charles Harris and Melaney Lisa Harris, that increased use of the track between the settlement and the beach will have a negative impact on breeding dotterels. These concerns are reflected in the S42A report, with Mr O'Leary recommending further input from an ecologist.

23 The species in question is the Tūturiwhatu/ Northern New Zealand dotterel, *Charadrius obscurus aquilonius*. This is a bird most commonly found on sandy East Coast beaches in northern New Zealand. It has a conservation status of Threatened: Nationally Increasing under the New Zealand Threat Classification System. Their population has shown an increase of 50% between 1989 and 2011, with this increasing trend continuing as of 2020 (NZTCS). This recovery has seen their range expand south of East Cape and recolonise Southern Hawke's Bay since 1990.

24 A survey by McArthur et. al. (2021)[2] observed 34 birds from the Aramoana and Pourerere beach area, which was 15% of the regional total 222 observed. Most

[2] McArthur, N., Thomas, D., and Lees, D. 2021. A baseline survey of the indigenous bird values of the Hawke's Bay coastline. Hawke's Bay Regional Council Publication No. 5560.

of these birds were observed in the Aramoana rather than Pourerere beach area. Breeding behaviour was noted in both areas. See Figure 1.

25 The main conservation tool for Tūturiwhatu has been the protection of breeding sites via pest control, fencing and education. There is a breeding site at Pourerere Beach that is fenced off with signage provided to minimise disturbance, but as far as I am aware, no pest control is occurring. Continued protection of the breeding habitat at Pourerere would be highly desirable, and there are management opportunities available that would be an improvement on the status quo.

26 The potential disturbance from track users depends on how close to the breeding birds they are. A study by Lord et. al. (2001)[3] experimentally observed disturbance to nesting dotterels from people walking, running or being accompanied by a leashed dog. The strongest effect was from walkers with a dog, which was associated with a flushing distance of close to 100m and birds spending about 6 minutes away from the nest. The flushing distance from walkers alone was about 50m, with birds only spending 3-4 minutes away from the nest. A comparison of bird behaviour on busy versus more secluded beaches showed a habituation effect was apparent, with birds in the busy beaches only being flushed at a distance of around 20m. Nevertheless, the authors recommended a buffer distance of 50m be established against foot traffic around breeding areas in busy beaches. With a recommendation to ban dogs from within 100m of breeding areas.

27 If an adequate buffer distance (at least 50m and ideally 100m) between the nesting area and foot traffic has been established, I see no reason to expect an increase in foot traffic to be of concern. A buffer fence has been erected by Mr Bridge around the designated nesting area, with this fence approximately 50m from where the access path traverses the dunes. I understand most nesting occurs closer to the river mouth, which is further again than the 50m between the buffer fence and the path.

28 Dotterels breed on sand spits, sandy beaches, shell banks, dunes as well as tidal estuaries and river mouths, so there will be other areas in the immediate vicinity that also provide suitable habitat for breeding, which is noted by the Pourerere Community and Character Preservation Society.

[3] Lord, A., Waas, J.R., Innes, J. and Whittingham, M.J., 2001. Effects of human approaches to nests of northern New Zealand dotterels. Biological Conservation 98:233-240.

29 A major threat to dotterels is predation of nesting birds or their chicks. One of the main reasons why the dotterel population is recovering is due to concerted predator control efforts at key breeding sites. I understand there is no such predator control work being undertaken at Pourerere Beach.

30 Although I do not expect any increased disturbance on birds from path users, there would be a clear benefit and a net-positive outcome on bird populations if a suitably designed predator control programme was implemented that protected the dotterel nesting area. Discussions with Mr Bridge has indicated he would be willing to fund and drive a suitable predator control programme to protect the dotterels, in addition with a broader pest control footprint to protect the existing and proposed riparian plantings, and any constructed wetlands (riparian areas and wetlands are discussed later).

31 Predator control around the designated dotterel nesting area, and broader area, would benefit any dotterels that attempt to breed outside of the fenced off area. This equates to an improvement beyond the immediate vicinity of the path and I think the inclusion of a predator control programme as part of this proposal provides a clear net positive effect for dotterels and broader biodiversity.

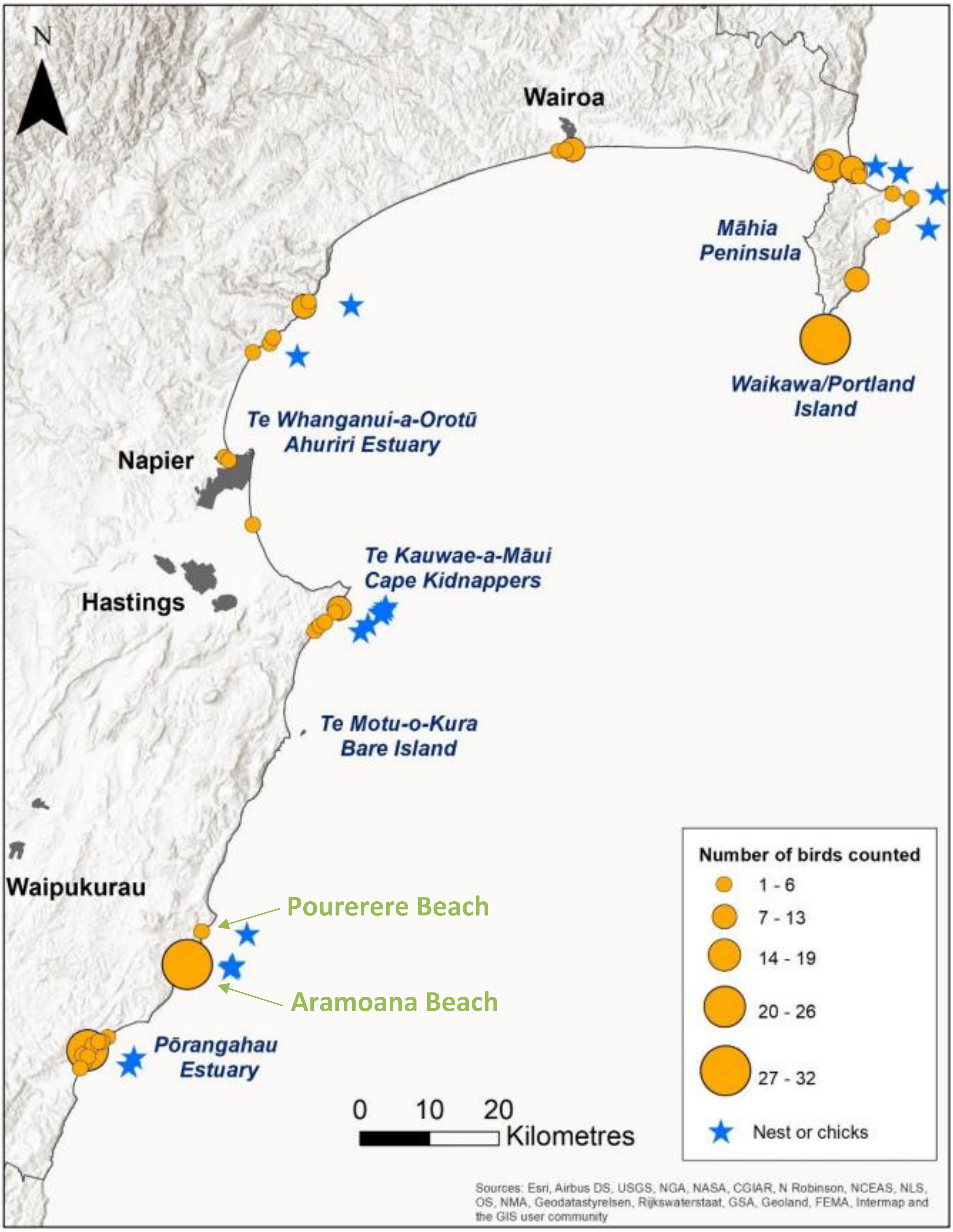


Figure 1 Counts of New Zealand dotterels around the Hawke's Bay coastline. Adapted from Figure 3.11 in *McArthur, N.; Thomas, D. and Lees, D. 2021. A baseline survey of the indigenous bird values of the Hawke's Bay coastline. Client report prepared for Hawke's Bay Regional Council, Napier.*

Modified tributary

32 The waterways in the vicinity of this proposal have been heavily modified. I include here some of that context, in reference to the names included in the Cultural Impact Assessment provided by the Kairakau Lands Trust, to clarify the naming convention used for the 'modified tributary'. See Figure 2.

33 The Mahakainga Stream is the main water course flowing from the catchment. Historically, this followed the base of the hills to the west of the flats. The Makurapara Stream is a smaller tributary that flows from the hills to the east of the flats. Water from both streams would have followed a more meandering path through the flats prior to drainage.

34 To facilitate drainage of the flats and wetland areas, a channel was dug through the centre of the flats. Most of the water from both the Mahakainga and Makurapara Streams now follows this manmade course, until it connects with the historic channel of the Makurapara Stream along the southern boundary of the proposed subdivision.

35 The waterway along the northeastern boundary of the subdivision is therefore a manmade channel with water from both the Mahakainga and Makurapara. The waterway along the southeastern boundary of the subdivision is the channel of the historic Makurapara Stream, but it now conveys water from both the Mahakainga and Makurapara Streams.

36 There is still residual flow in the remnant channel from the lower catchment of the Mahakainga Stream catchment that flows to the west of the subdivision area.

37 Until such time as an appropriate name for this waterway is confirmed, I suggest referring to this waterway as a 'Modified Tributary' of the Pourerere Stream. Noting that stream names and their history was helpfully provided by the Kairakau Lands Trust in their cultural impact assessment.

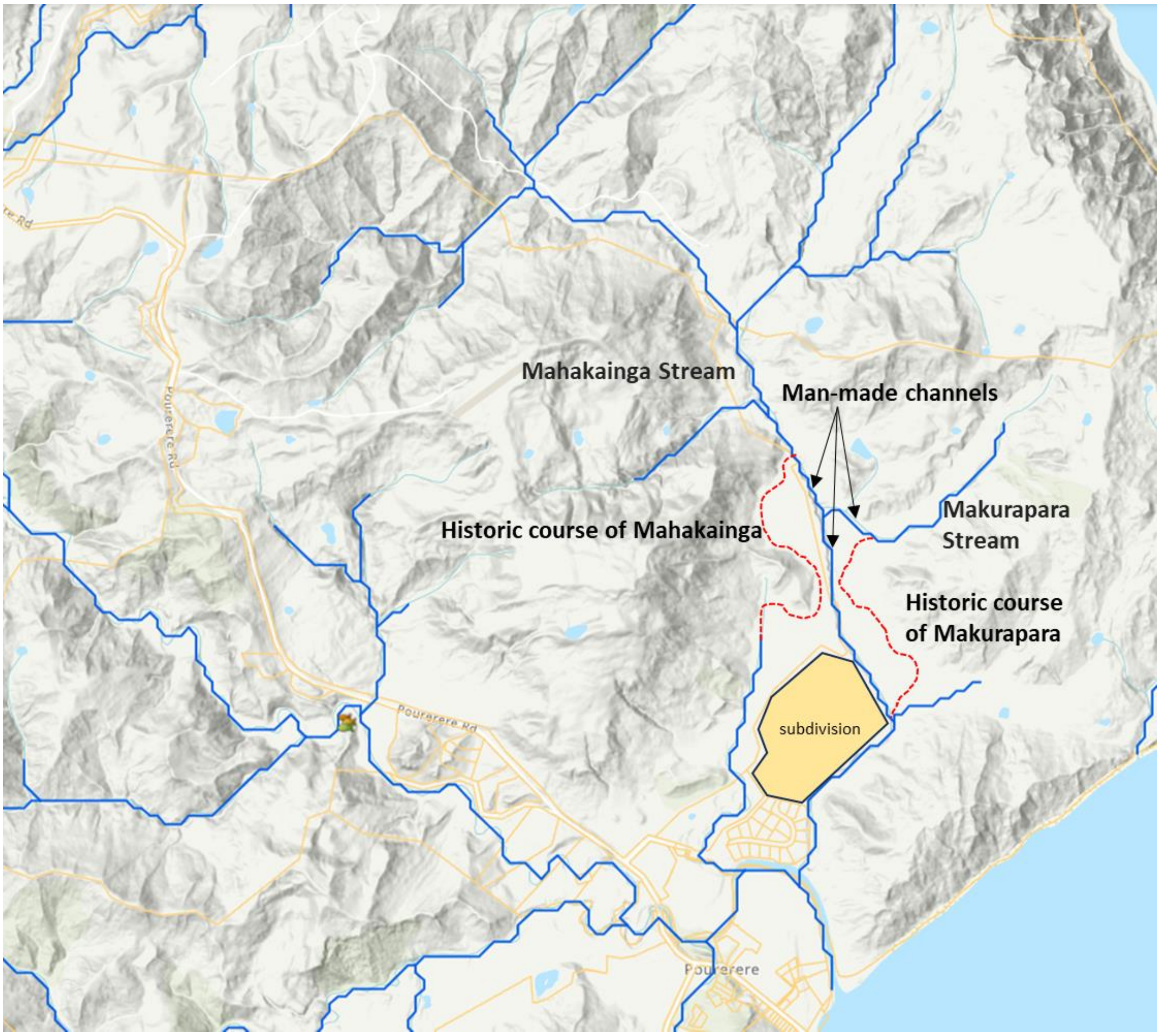


Figure 2 History of waterways in the vicinity of the proposed subdivision area. Lines delineating stream flow paths are indicative only.

Riparian planting

38 The Modified Tributary flows along the eastern boundary of the proposed subdivision site. It joins the Pourerere Stream immediately upstream of the river mouth, with the lowest 250m of the Modified Tributary being tidal. It is a small coastal creek with hydraulic variability and a ‘hard bottom’ (i.e. cobbles/gravels or bedrock) that should provide excellent habitat opportunities for native fish. See Figure 3 for photographs of representative reaches.

39 There are no fish records from the Modified Tributary in the New Zealand Freshwater Fish Database, but there is 1 record from about 3km inland on the Pourerere Stream, which noted 4 species of native fish: Crans bullies, redfin bullies, longfin eel and shortfin eel. I would expect these species to occur in the Modified Tributary too, and I saw a school of īnanga in the lower reaches during a site visit. I would also expect species such as banded kokopu, smelt and giant bully to be present where habitat conditions are suitable.

40 All of these native fish species, as well as a diverse range of birds, insects and other fauna, would greatly benefit from an improvement in riparian habitat structure.

Figure 3 Modified Tributary. Top left, gravel bar and channel constriction. Top right, riffle with gravel and cobble substrate. Bottom left, poplars lining a slight meander, with variability in flow conditions evident. Bottom right, downstream tidal reach immediately upstream of junction with Pourerere Stream.

41 I recommend riparian planting is undertaken along the entire length of the boundary of the subdivision area, which equates to about 1km of stream length. See Figure 4. Most planting effort (e.g. 80% of the plants) should be on the true right bank (western bank) to provide dense vegetation and deeper root systems to help polish water flowing through from the subdivision area. The polishing effect from established riparian plantings would constitute an over-and-above benefit from the project. In other words, the subdivision itself should contribute a lesser contaminant risk than existing land use. Additional riparian planting will provide even greater benefits to water quality.

42 The stream is deeply incised in some areas, and there are areas of unstable banks. There are existing trees in some areas that will be providing a stabilisation effect, such as poplars that are preventing channel migration. A tailored planting plan will need to factor in the site characteristics, bank stability, existing vegetation and the likely flow environment that plants will be exposed to. Some general tips to maximise water quality and stream health benefits are:

(a) Provide as much shade to the stream as possible, with the final architecture of banks plus plants intercepting at least 70% of solar radiation. This can be achieved by planting species on both sides of the stream whose final height above the water line is at least as tall as the stream is wide. The wetted width of the stream is mostly less than 2m, which means grasses and smaller shrubs can provide effective shading. For example, in reaches where the stream is 1m wide, *Carex secta* (1 m diameter) planted right on the water line on both sides will achieve effective shading. Similar, in reaches where the stream is 2m wide, flax (3 m height) planted 1 m from the water line on both sides will achieve effective shading.

(b) Use mostly grasses in areas where flow velocity may be high, because grasses will bend over in the flow rather than being ripped out.

(c) Use mainly hardy, fast growing and deeper-rooting species for the initial planting. Some species that meet these requirements include *Carex secta* (Pukio/swamp sedge), *Austroderia fulvida* (toetoe) and *Cordyline australis* (tī kōuka/cabbage tree). Enrichment plantings of a greater diversity of species that are less hardy can occur later when the site is well established and pressure from weeds is lessened.

(d) *Phormium tenax* (harakeke/flax) have good root systems but can become quite heavy for unstable banks. So these should be setback at least 1m from the edges of taller or unstable banks.

43 A more formal planting plan should be prepared for the site, but some example layouts that would meet the recommended requirements for maximising stream health are provided in Figure 5, Figure 6, Figure 7 and Figure 8.

44 I note that the riparian planting undertaken as part of the first stage of the subdivision appears to have been successful and looks to be thriving. Any additional riparian planting can follow the approach taken for this earlier work, and the additional planting will complement this earlier work. In general, the potential biodiversity benefits will increase with the size of the area that habitat enhancement occurs. Adding to existing riparian habitat enhancement therefore provides additive benefits to this area. And combining this habitat enhancement with predator control should contribute substantial, additional biodiversity benefits to this area.

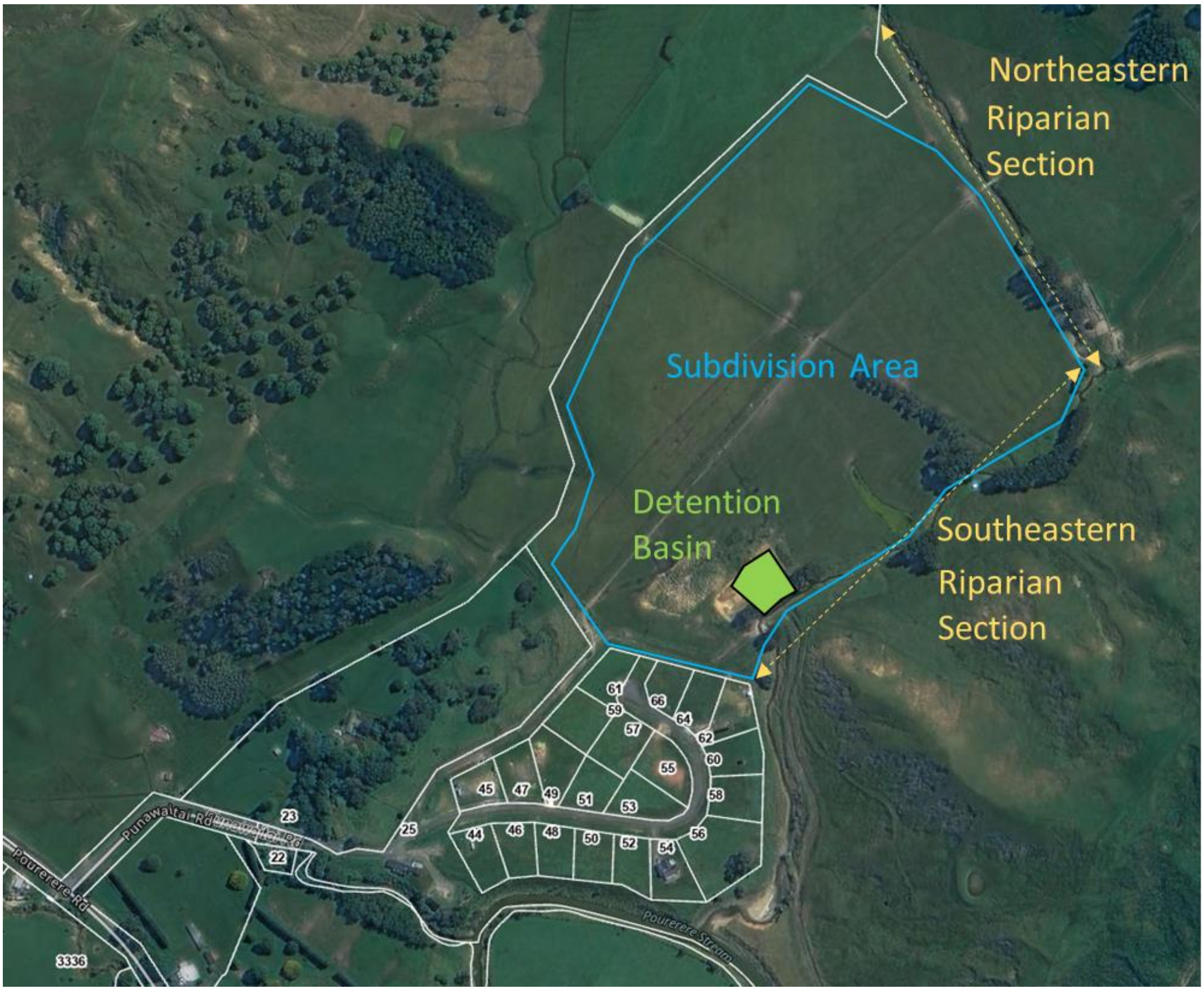


Figure 4 Indicative location of riparian plantings around the proposed subdivision at 25 Pourerere Road.

Figure 5 Riparian concept, along north-eastern boundary. Subdivision is to the left of the image.

Figure 6 Riparian concept design, eastern boundary. Subdivision is to the right of the image.

Figure 7 Riparin concept design southern boundary. Subdivision is to the right of the image.

Figure 8 Riparian concept design, overlooking subdivision area from the east.

Constructed wetlands

45 I understand there is an intention to avoid any potential loss in overall farm productive capacity from the subdivision by improving the productivity capacity of the remaining farming area. This is to be achieved by installing sub-surface drainage and enhancing production, thereby allowing an increase in the stocking rate, in the remaining flatter areas of the property.

46 Nutrient losses from these areas of enhanced productivity may increase due to the more intensive stocking operations.

47 As I explained in the wastewater section, urine patches tend to be a focal source of nitrogen loss. This is because the highly concentrated nutrient loading in a small patch overwhelms the ability of the soil and vegetation to assimilate nutrients before they are leached beyond the root zone. And grazing animals distribute this concentration of nutrient in an uneven and uncontrolled manner (i.e. urine patches).

48 One water quality management benefit from artificial subsurface drainage is that it acts as a collector of drainage water that gets funnelled through a network of pipes in a controlled manner. The branches of the subsurface drainage network act as 'collectors', with the downstream arterial lines acting as a 'trunk' where all of the collected water and associated nutrient passes. The downstream trunks provide a logical and practical point to intercept any nutrients that have been transported via this drainage network.

49 The National Institute of Water and Atmosphere (NIWA) have provided guidelines for constructing wetlands in this type of situation. In general, they recommend that a wetland is sized so that it is at least 1% of the catchment area (i.e. in this case, the wetland is at least 1% of the paddocks drained by the subsurface drainage). The flow path through the wetland should be elongated in shape, with an ideal length:width ratio between 5:1 to 10:1. Approximately 70% of the wetland area should be shallow water (average of 30cm depth) that is densely vegetated. The remaining 30% of the area should be deeper water areas (>0.5m) that ensure the water flowing through is evenly dispersed when it passes through the vegetated areas where most of the nutrient stripping occurs. See Figure 9 and Figure 10 for schematic examples of suitably designed constructed wetlands.

A well-functioning wetland should have:

- Low sediment accumulation rates in the main vegetated wetland zone.
- Well-established, flourishing and evenly distributed wetland plants.
- Uniform flow, with no signs of channelisation or short-circuiting.
- Outflow water which is generally clear, with low odour.
- Appropriate water levels for plant survival and treatment function.
- Minimal cover of invasive weedy plants in the vegetated treatment cell.
- Well-maintained embankments and margins – fenced to exclude livestock, without erosion or dominance by weeds.

Figure 8. Features of a surface flow constructed wetland in the landscape: (1) A deep sedimentation pond (more than 1.5m deep), size will depend on rainfall intensity and topography but generally up to 20% of wetland size, (2) Deep (over 0.5m) open water zones at the inlet of each cell to help dispersion and mixing, and even out the flow, (3) shallow (average 0.3m deep), densely vegetated zones (at least 70% of the total area). The shallow zone is where most of the nitrogen removal happens via microbial denitrification, fuelled by decaying plant leaf litter. Sunlight penetration in deep open-water areas can promote die-off of faecal microbes in inflowing waters, but shallow water with dense plantings is recommended in the final 20% of the wetland to limit faecal contamination and sediment disturbance in the final outflow by waterfowl.

Figure 9 Conceptual design of a constructed wetland. From Tanner, C.C.; Depree, C.V.; Sukias, J.P.S.; Wright-Stow, A. E.; Burger, D.F.; Goeller, B.C. (2022). Constructed Wetland Practitioners Guide: Design and Performance Estimates. DairyNZ/NIWA, Hamilton, New Zealand.

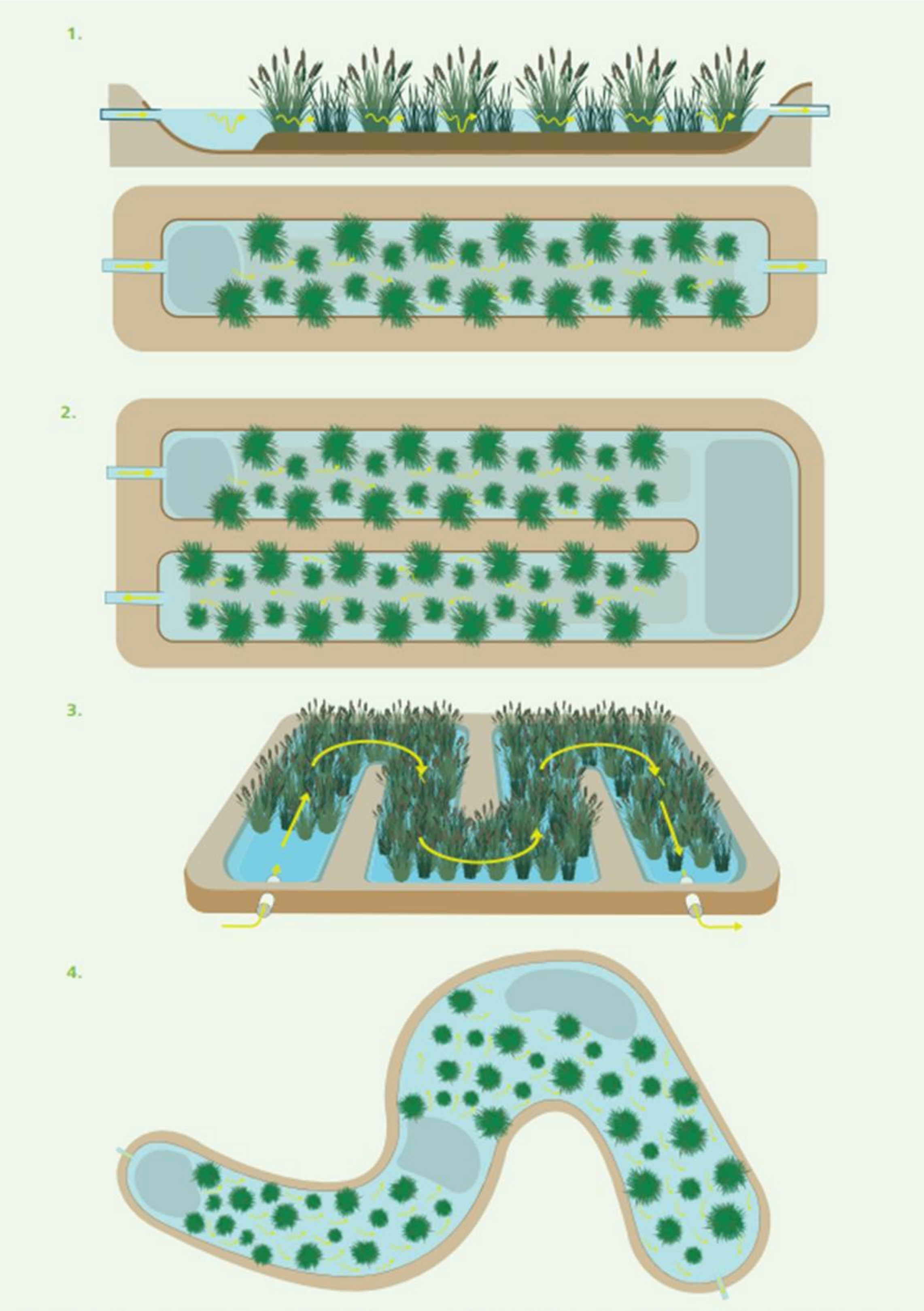


Figure 9A. Different design configurations of surface-flow constructed wetlands for flat land. Wetland length:width ratios can be increased by having multiple cells in series or using bunds to create a serpentine flow path.

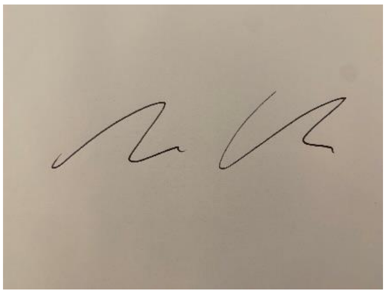
Figure 10 Different configurations of constructed wetlands suited for intercepting subsurface drainage. From Tanner, C.C.; Depree, C.V.; Sukias, J.P.S.; Wright-Stow, A. E.; Burger, D.F.; Goeller, B.C. (2022). Constructed Wetland Practitioners Guide: Design and Performance Estimates. DairyNZ/NIWA, Hamilton, New Zealand.

50 If wetlands are designed according to the NIWA criteria, then approximately 25% of the nitrogen and phosphorus load, and 50% of the sediment load, are expected to be removed when the wetland is 1% of the receiving catchment area.

51 To ensure the water quality benefits from the overall project remain as a net positive despite an increase in stocking rate on some parts of the farm, I recommend that suitably designed wetlands are placed at the downstream end of new sub-surface drainage networks in accordance with NIWA constructed wetland design guidelines. I recommend constructed wetlands, rather than some other edge-of-field mitigation options, because wetlands have the additional advantage of providing more habitat for native fauna including fish (e.g. tuna/eels and īnanga/whitebait) and birds (e.g. matuku/Australasian bittern).

52 If the above recommendations are followed as part of the overall project, I am confident that the net effects of the subdivision on ecology will be a substantial net improvement. The benefits will extend to water quality, biodiversity and overall ecosystem health.

Dated this 28th day of June 2023



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Andrew Steven Hicks