

A Community-Led Deer, Goat and Pig Control Programme in Outer Queen Charlotte Sound



Report for:



Report prepared by

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Introduction

There is a long history of deer, goat and pig presence in the Marlborough Sounds. Deer and pigs, in particular, form a valued part of the landscape, providing a rich resource for recreational hunting - a reason to get into the outdoors, an ability to recover meat for family and the community, and to experience these animals first-hand.

However, it is possible to have too much of a good thing.

Over the past decade, deer and goat populations have exploded in the Sounds. A 2021 report noted that: "Damage to the understorey is now very obvious and is found in many more areas than it has been in the recent past." (Stein, 2021). Similarly, a recent goat control operation noted "some of the worst cases of regenerating forest damage we have seen" (Munn, 2021). A 2012 survey of the Momorangi Bay Scenic Reserve by the Department of Conservation (DOC) found that "natural recruitment is either very slow or not evident... due to the paucity of seed sources and by suppression of forest succession due to browsing impacts by ungulates and possums." (Macalister & Butler, 2015).

In response to these growing pressures, the Marlborough Sounds Restoration Trust (MSRT) resolved, in 2019, to take the initiative in responding to the increasing feral ungulate¹ numbers, modelling its response on the large and successful wilding pine control programme it has run in the Sounds since 2008.

The objective for MSRT is not to eradicate or eliminate feral ungulates from the Sounds, but to reduce feral ungulates from their very high and damaging levels to more manageable levels that are not causing extensive damage to the Sounds environment. The Trust is effectively promoting a 'population re-set' to restore the balance between the interests of the hunting community and protecting the native forest environment of the Sounds.

Background

In order to determine the best means to manage Sounds ungulates, in May 2021, R&D Environmental Ltd engaged hunting contractor Trap & Trigger Ltd to undertake a pilot trial of the use of a thermal camera for augmented aerial hunting in the Sounds. This trial demonstrated that aerial thermal hunting was highly effective in the regenerating native habitats of the Sounds, and could be delivered safely and cost-effectively at landscape scale (see Munn, Macdonald & Macalister, 2021).

On the back of the trial, the Sounds community from Whatamonga Bay to Hitaua Bay, on the south side of Queen Charlotte Sound, mobilised themselves to undertake feral ungulate control using the same approach, supplemented by ground hunting. This resulted in 487 goats being removed from

¹ 'Ungulates' is the collective term applied to hoofed mammals, and includes a wide range of animals, including horses, sheep and camels. In New Zealand, 'feral ungulates' refers to that subset of ungulates that maintain populations in the wild and which are often of conservation concern. Feral ungulates in the Marlborough Sounds are primarily represented by red deer (*Cervus elaphus scoticus*), feral pigs (*Sus scrofa*) and feral goats (*Capra hircus*), all of which are widespread throughout the area. Fallow deer (*Dama dama*) are present on D'Urville Island, and feral sheep (*Ovis aries*) are also occasionally encountered throughout the Sounds.

the project area (Munn, 2021). This project was largely funded by landowners, with some funding support from Marlborough District Council (MDC) and logistical support from DOC.

Then, over the summer of 2021-22, a larger control programme was developed by communities on the north side of Inner Queen Charlotte Sound, primarily targeting red deer and goats. An MDC 'Working for Nature' grant provided seed funding to get the project off the ground. This 3,650ha operation resulted in the removal of 370 deer, 141 goats and 56 pigs. It was largely funded by landowners, with some support from DOC and MDC.

A smaller project was also initiated by the Moetapu Community Association, with funding support from Marlborough Lines and the association. This covered the 717ha Mt Cawte Scenic Reserve, with the removal of 70 deer in 2022, and a further 23 in 2023. DOC also undertook aerial thermal control over the Blumine and Arapaoa Island Scenic Reserves during this period.

The success of these projects stirred interest in a further operation, this time centred around Endeavour Inlet and driven by the Endeavour Inlet Conservation Trust (EICT). This report describes that operation.

Methods

In late 2022, EICT proposed an ungulate control operation in Endeavour Inlet, modelled on the successful Inner Queen Charlotte operation. As the scale of this proposal was reasonably modest, it was agreed that a larger operation should be attempted to achieve efficiencies at scale, incorporating the Meretoto/Ship Cove Historic Reserve and Cannibal Cove Scenic Reserve, and the private land on the eastern side of Te Anamāhanga/Port Gore and Cape Jackson.

The Meretoto/Ship Cove reserve is under active management by DOC, in recognition of its ecological, cultural and historic importance, and DOC were enthusiastic about a collaborative approach. A range of views regarding the removal of deer were encountered in Te Anamāhanga/Port Gore, but ultimately six large landowners all agreed to varying forms of control on their properties in a spirit of mutual co-operation.

Bringing all the parties together in a collaborative project was only possible through a further MDC 'Working for Nature' grant, provided to MSRT as seed funding.

With funding and land access assured, the operation was delivered as a partnership between MSRT and DOC, under the auspices of a joint Operational Brief and Site-Specific Health & Safety Plan. MSRT procured contractors, managed the field delivery of the control, undertook GIS mapping, and reporting the results. DOC led Health & Safety planning, provided their staff hunting team for four weeks, made a boat available to assist field delivery, managed the risks around the Queen Charlotte Track and undertook notification to key stakeholders, such as water taxi companies and the police, using a fact sheet. DOC also advised all its hunting permit holders of the operation.

EICT also shared the fact sheet with all landowners between Endeavour Inlet and Resolution Bay, along with some supplementary information, and posted to any relevant social media networks.

It was recognised that some people may fall outside the landowner notification process, such as yachts on moorings, guests at a rental bach, and tradespeople. Therefore, the night before, or the



day of the operation, MSRT and/or DOC visited any bay scheduled for control to advise anyone present.

DOC also posted warning signs on the Queen Charlotte Track within 48 hours of project commencement.

The 4,976ha project area was divided into six hunting blocks, based on topography and the source of funding (Map 2). A budget was allocated to each block, based on donations tagged towards that block - meaning some blocks had less budget than others and that

there was therefore variation in the hunting effort subsequently applied between blocks.



MAP 2: THE PROJECT AREA WAS DIVIDED INTO SIX HUNTING BLOCKS.

Trap & Trigger undertook initial control from 14-28 May 2023, and a follow-up operation from 11-22 September, primarily through aerial hunting but supported by ground hunting with dogs. In addition, DOC allocated its existing ungulate control budget towards the project, with four weeks of ground hunting undertaken by its hunting staff between June and September.

Thermally-assisted hunting was the primary aerial control tool.

The use of high-resolution thermal camera systems is a relatively new method of ungulate control, but provides the ability to quickly reduce moderate to high ungulate populations to a low level.²

² There is a significant difference between applying a bespoke high-resolution thermal camera system designed for ungulate detection and using thermal cameras commonly used by recreational hunters as a supplementary detection tool. The wide field of view, in conjunction with a high-powered laser aligned with the camera lens, directs the pilot and shooter to the exact location of the heat signature being viewed by the camera operator. The operator follows the target until there is an opportunity for the shooter to clearly identify and dispatch the target, using a firearm equipped with a thermal scope.

All heat signatures detected by the thermal camera were quickly identified as either a target or non-target animal. Before any lethal engagement, both the shooter and the camera operator visually then verbally confirmed to each other that the detection was a target animal. They also identified a specific part of the animal (head, neck, vital organs) as a point of impact for an ethical lethal dispatch, and would pause hunting to ensure the animal was dead before continuing hunting.

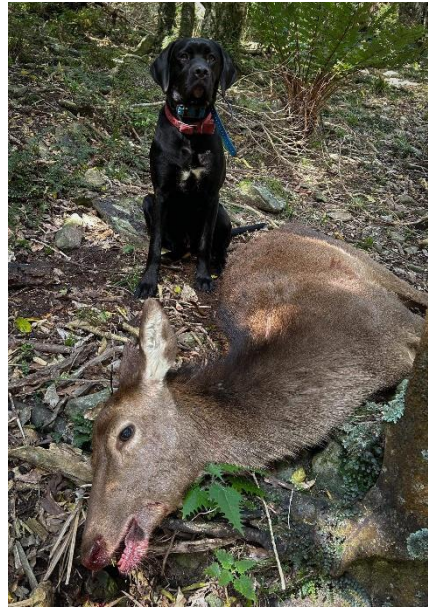


AERIAL THERMAL CONTROL: The set-up for thermally-assisted hunting is shown left, with a dedicated camera operator and shooter. On right, Kenny Barging Ltd kindly provided barge services to deliver fuel to the operational base in Endeavour Inlet.

In some areas, such as the Ship Cove Historic Reserve and Howdens Bush Scenic Reserve, remnant forest with a multi-layer canopy made it difficult for the thermal camera to detect animals. In these situations, ground hunters with dogs were deployed to cover these areas.

The effectiveness of high-resolution cameras is heavily reliant on the way it is applied. Distance above the ground, speed and angle are optimised so the camera operator has the highest detection probability based on the canopy density and slope of the terrain beneath them. The general rule being, the slower the speed and closer the distance, the higher the detection rate.

The 1290 x 980HD infrared camera is stabilised by a cinematic strong-arm camera mount which is aligned with a military-grade 2.5w laser. The thermal video feed is transferred via HDMI to a 12-inch HD screen presented with a custom-fit viewfinder in front of the operator. The camera is fitted with a 30mm Wide FOV lens. The operator sits comfortably in the helicopter's front passenger seat and holds the camera in a position where the pilot and shooter can both see the camera's position and direction.



GROUND CONTROL: *In those parts of the project area with intact indigenous forest, ground hunting was preferred, using trained bailing and indicator dogs alongside experienced hunters.*

The operational team recovered meat from shot animals, as time and resources allowed, and gifted them to a wide range of recipients, Deer were gifted to Te Rūnanga o Ngāti Kuia on two occasions, with additional animals gifted to Te Rūnanga o Rangitāne o Wairau and to Te Ātiawa o Te Waka a Māui Trust. The animals were processed by iwi and meat made available to families in need within Marlborough. Ngāti Kuia estimates that 300kg of meat was made available through their efforts alone. Animals were also provided to EICT, for distribution to its members, and to various Sounds residents.

Any animals shot near water supplies or in areas where they would create a public nuisance, such as on walking tracks, were targeted for recovery, as well as animals near the coastline.



MEAT RECOVERY: *Animals were recovered where it was safe and efficient to do so, and provided to a wide range of community recipients.*

Results

In total, EICT and 33 landowners from Resolution and Tawa Bays, Port Gore and Endeavour Inlet contributed \$81,856 (GST excl.) towards the programme.

As Ship and Cannibal Coves are all public conservation land, DOC provided \$58,000 (GST excl) for control of that area. The Marlborough District Council also provided \$28,500 (GST excl) towards the project through its Significant Natural Areas programme. MSRT provided an additional \$6,840 towards the project, primarily through a Rata Foundation grant.

In total, 1,420 feral ungulates (330 deer, 958 goats, 108 pigs and 24 cattle) were dispatched during the operation. In places, deer and goats were found at extremely high densities. Control result maps are in **Appendix 1**.

The total cost of the operation was \$175,593 (GST excl.), resulting in an average cost of \$123 per animal controlled (2022 Queen Charlotte operation: \$228 per animal). However, if the voluntary contributions to the project were valued (particularly DOC provision of their ground hunters and voluntary contributions to programme management), the 'real' cost of the project would be around \$208,500 (\$147/animal). The cost per hectare was \$35.28 (2022 Queen Charlotte operation: \$35.63 per ha) - however the hunting effort was not evenly applied throughout the project area, as noted above, but was based on the funding available.

Discussion

Based on the six control operations to date, it is now incontrovertible that ungulate numbers are at very high levels in many Sounds locations (*see Map 9, Appendix 1*). Feral animals are being removed off mainland sites at rates of between 7-10 deer and 19-20 goats per square kilometre. As not all animals are being removed, population densities are likely to be even higher than this - probably reaching carrying capacity for Sounds forests. Extrapolated over the Sounds land area as a whole, this control data indicates there could be up to around 30,000 feral ungulates in the Sounds.

At these population levels, the situation is becoming critical. There are large tracts of forest that have been stripped bare from the browse height of a deer or goat to the ground. In parts, the damage is so severe that deer had begun ring-barking all the edible trees, and transforming a standing forest into dirt clearings that will, in turn, give way to opportunistic weeds such as old man's beard, foxglove, banana passionfruit and wilding pines. As noted in Stein (2021), "this leads, eventually, to grassy tree-lands establishing where once there were forests."

Without a sustained and well-coordinated control programme, which involves Crown and community funding, and which recognises the complementary role that recreational hunting can play, the Marlborough Sounds is sleep-walking to environmental catastrophe. A healthy native forest provides multiple ecosystem services – improved habitat for native fauna, reduced damage to private gardens and infrastructure, slope stability, reduced run-off and sedimentation within the marine area, improved scenic values and carbon sequestration – and that is being put at risk through insufficient management of feral ungulates.

The six control operations have also demonstrated that solutions are available – the control tools are available to achieve cost-effective knockdown and there is a community willingness to address the problem.

The operation demonstrated once again the power of collective action towards a shared goal. It is a continuation of the approach refined by the Trust since 2008 with its wilding pine control programme. And, like that programme, it has once again demonstrated that Sounds landowners represent a progressive and well-informed community that is deeply committed to the protection and care of the Sounds environment and are prepared to do the ‘heavy lifting’ when it comes to care of the land. Their exercise of care nearly always extends over public conservation land.

Such examples of collective action do not come about without considerable effort in the background, however. The seed funding from MDC was vital to allow the bringing together of the various stakeholders and landowners. The leadership shown by the DOC Sounds District Office in embracing a collaborative model is also vital.

The thermally-assisted hunting approach continues to be transformative. The removal of 1,420 ungulates in a short timeframe could not have been achieved using the conventional ground and aerial hunting techniques³.

The reduction in population densities will have been significant across the project areas, but will be variable from block to block - primarily dictated by the amount of hunting effort applied, but also influenced by the initial population density and vegetation type in each block. It is estimated population density reductions of up to 90% would have been achieved in blocks where there was sufficient funding to undertake more than three control sweeps.

Moving forward, the recovery of ungulate numbers in each block will be variable, dependent on a range of factors including:

- Initial population reduction achieved
- The amount of uncontrolled land within each block (i.e.: landholders who didn’t authorise access)
- Migration from adjoining uncontrolled areas. Migration will be experienced most severely where operational boundaries are adjoined by uncontrolled, bush habitat.
- Species present (deer, pigs and goats all reproduce at different rates)
- The on-going effort of recreational hunters and their success at slowing recovery.

For this reason, it is hard to predict when further control will be required, as this will vary on a block-by-block basis. However, at some point all blocks will require a further population ‘reset’ if recovery isn’t managed in the interim.

³ For the last 50 years, conventional ungulate control has been delivered with ground hunters using detection dogs, or with helicopters visually searching open areas such as alpine tussock. In the Sounds, conventional aerial hunting would have had very low efficacy due to the project area being forested. If ground hunting alone had been used, it would have taken several months with a large team of hunters to thoroughly cover the landscape, and would have resulted in less deer being controlled for a higher cost.



SCENES FROM A DEVASTATED FOREST: High ungulate numbers means there is no understory present in these Sounds forests, and therefore no natural succession occurring. If ungulate numbers are not managed, such forests will eventually collapse and give way to grassy tree-lands.

Recommendations

- **The approach of staging control over two phases, about four months apart, should be maintained in future programmes.** Autumn is an ideal time to undertake initial control in the Sounds, as the weather is generally settled, temperatures are cooler, and there is low public use (outside of weekends and school holidays). Follow-up control in spring gives surviving animals time to move about and be targeted, and to target transient animals that may have been present outside of the project area at the time of initial control.
- **Meat recovery in future operations should be encouraged with meat professionally processed and donated to specified groups,** such as landowners, iwi or community groups. However, meat recovery at scale comes at a cost. Additional, separate funding for this activity would be required or an experienced volunteer workforce available.
- **Landowners should encourage recreational hunting in their areas.** Now that ungulates have been reduced to manageable levels, recreational hunters can have a more meaningful impact and will help reduce the return time for control. Recreational pig hunters, in particular, are moderately effective in the Sounds and will be most beneficial if they are prepared to hunt ungulates with the mindset of keeping numbers in check. Recreational deer and goat hunting will remain challenging without trained dogs or the ability to shoot off a vessel, and is therefore of less benefit overall.
- **Landowners in adjoining areas should be encouraged to undertake complementary control** – particularly in Endeavour Inlet, the south side of Kenepuru Sound, and further into Port Gore. Control in these areas is urgent, and will also help protect the gains made within the Queen Charlotte project area as it would effectively link up this operation with the 2022 operation in Inner Queen Charlotte Sound.
- **The Trust should advocate for a sustained and collaborative forest protection program to protect the ecological resilience of the Sounds.** The high ungulate densities and extensive forest damage encountered, and the high numbers of possums (as reported by ground hunters) strongly indicates the pressing need for a well-coordinated forest protection program. Without timely intervention and sustained maintenance, the health of these forests will deteriorate further. This degradation, if left unaddressed, will set off a chain reaction of adverse effects. A healthy native forest provides multiple ecosystem services – improved habitat for native fauna, reduced damage to private gardens and infrastructure, slope stability, reduced run-off and sedimentation within the marine area, improved scenic values and carbon sequestration – and that is being put at risk through insufficient management.

Acknowledgements

The project would not have been possible without the huge volunteer efforts of the Endeavour Inlet Conservation Trust – in particular Carey Virtue who led the fund-raising and communications in a highly professional manner. Kent Chalmers was also particularly helpful through the initial planning stages.

The project was also only possible thanks to the support of Sounds landowners. In particular, the large landowners in Te Anamāhanga/Port Gore were critical to the operation – the Marchant, Surgenor & Harvey families, Paul Eglinton, and Spear of Kupe Ltd (formerly Cape Jackson Station).

Credit is also due to the many smaller Sounds landowners between Endeavour Inlet and Resolution Bay who also granted access and made donations to the project.

Funding support was also critical. EICT made a substantial contribution and was supported by the Yealands Sustainability Initiative, Rata Foundation and the MDC Significant Natural Areas programme, while MSRT was supported by the MDC 'Working for Nature' and Significant Natural Areas programme and Rata Foundation. DOC's Te Ara ki a Mua wild animal management programme was also instrumental in realising Crown funding towards the project.

Significant in-kind support was provided by Kenny Barging Ltd, who transported helicopter fuel to the operation, and the Marlborough Tour Company, which provided on-going assistance when needed, through its staff at Punga Cove and Furneaux Lodge and the helpful team at CougarLine.

The families of the 'Glenburn syndicate' kindly hosted the operation at the Glenburn lodge, at the head of Endeavour Inlet, and the Marchant and Harvey families made accommodation available to ground hunting operations. Thanks also to Adrienne Cathie for allowing us to base the helicopter operations in her paddock.

Shannon Huntley, from Te Rūnanga o Ngāti Kuia Trust, put in a huge amount of work helping to recover deer and to process them for meat distribution, and was helped in the deer recovery by volunteer Peia Ifopo. Richard Andrell also processed meat on behalf of Te Rūnanga o Rangitāne o Wairau, and Jim Skipper organised the processing of meat at Te Ati Awa Marae.

In the background, credit is due to the trustees of the Marlborough Sounds Restoration Trust, who continue to back their vision for significant and sustainable ecological restoration in the Sounds, and to our colleagues at the Department of Conservation (Dave Hayes, Dave Carlton, Siobain Finlow-Bates and Phil Clerke) and Marlborough District Council (Mike Aviss, Jono Underwood and Zeke Hoskins).

Finally, acknowledgement is due to the contractors who did the actual work: Jordan Munn, Cole Ritchie, Tracey Johnston, Moana Robb, Geoff Stack, James Cotrill, Jacob Mckay and Jacob Hulme-Moir (Trap & Trigger Ltd), Emma McCool and Patrick Van Diepen (DOC), Cody Weller (Calibre Contracting Ltd), Alistair Twisleton (Coast to Coast Helicopters Ltd), Simon Cook (Marlborough Helicopters Ltd).

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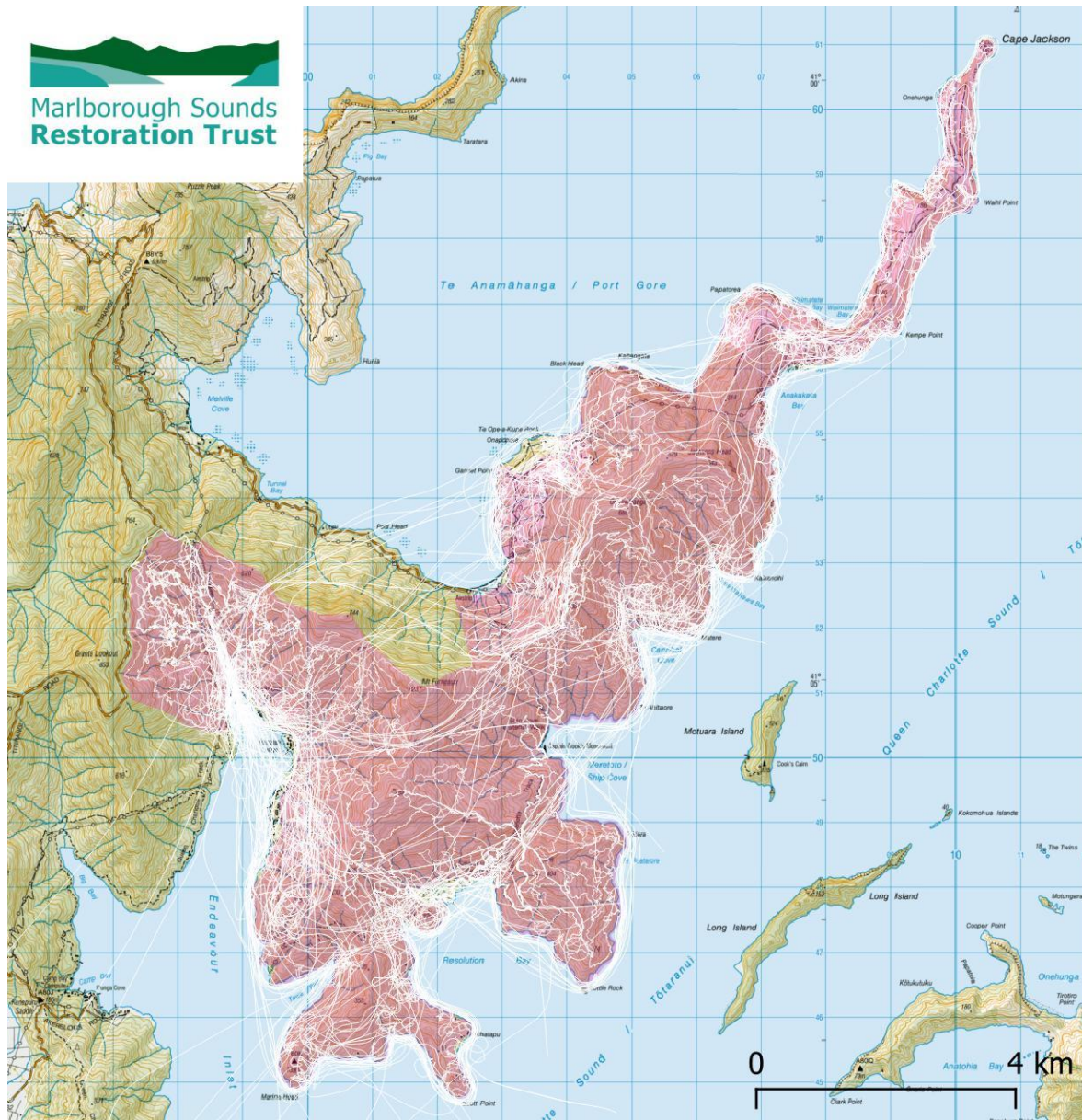
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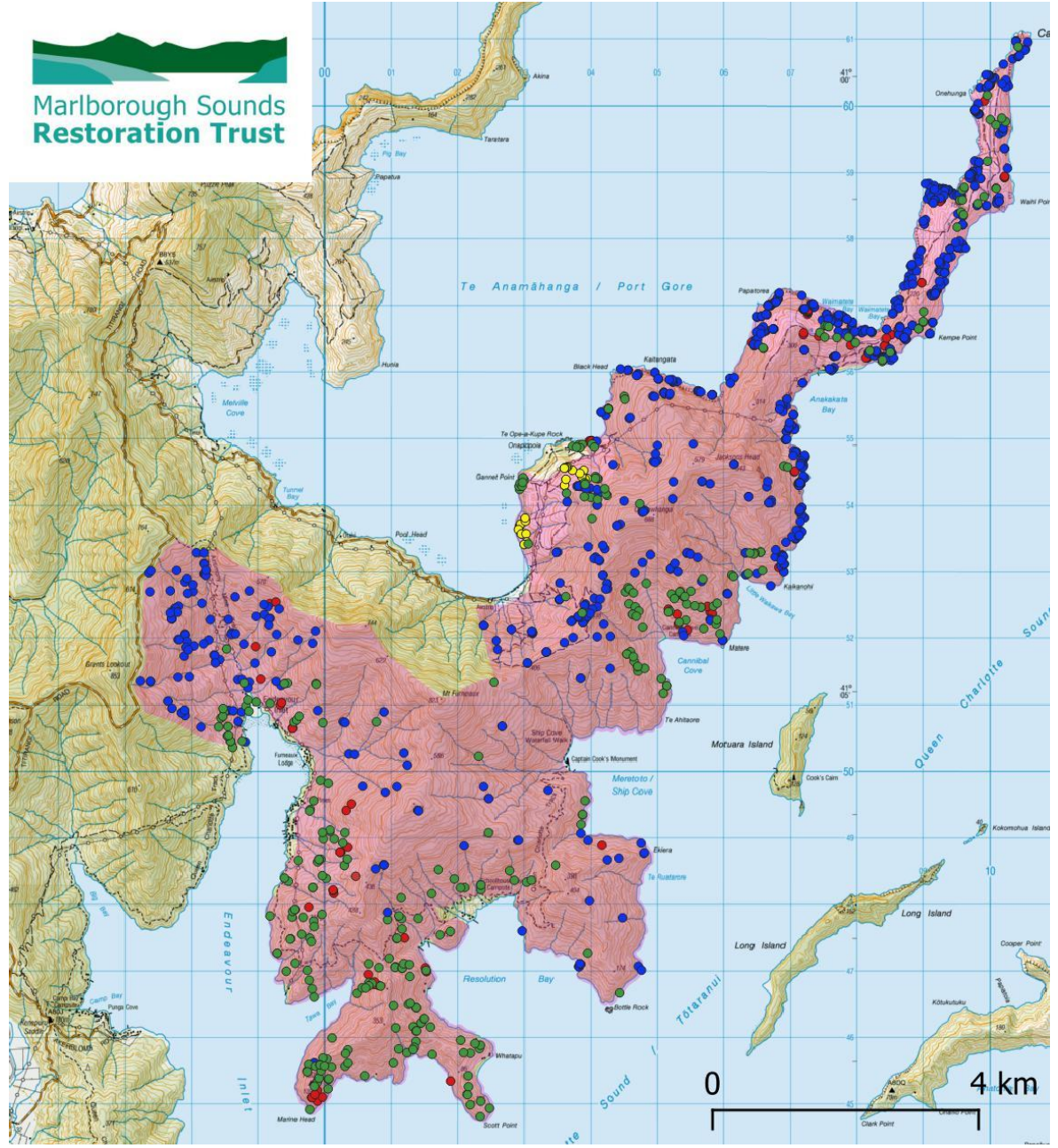
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Appendix 1: Control Maps

Map 1: SEARCH EFFORT (GROUND & AERIAL)



Map 2: OVERALL KILLS (N=1,420)



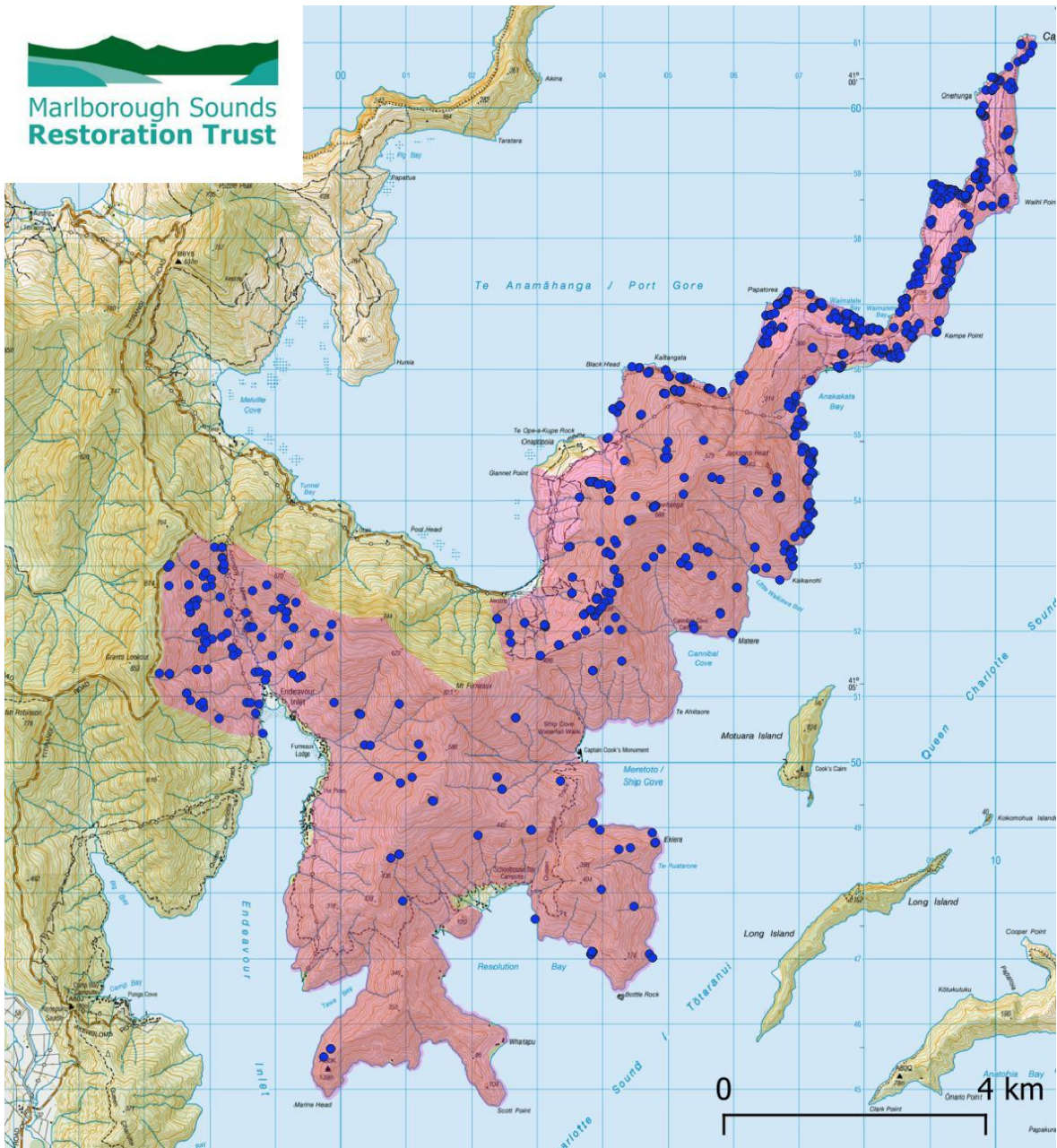
BLUE = GOATS

GREEN = DEER

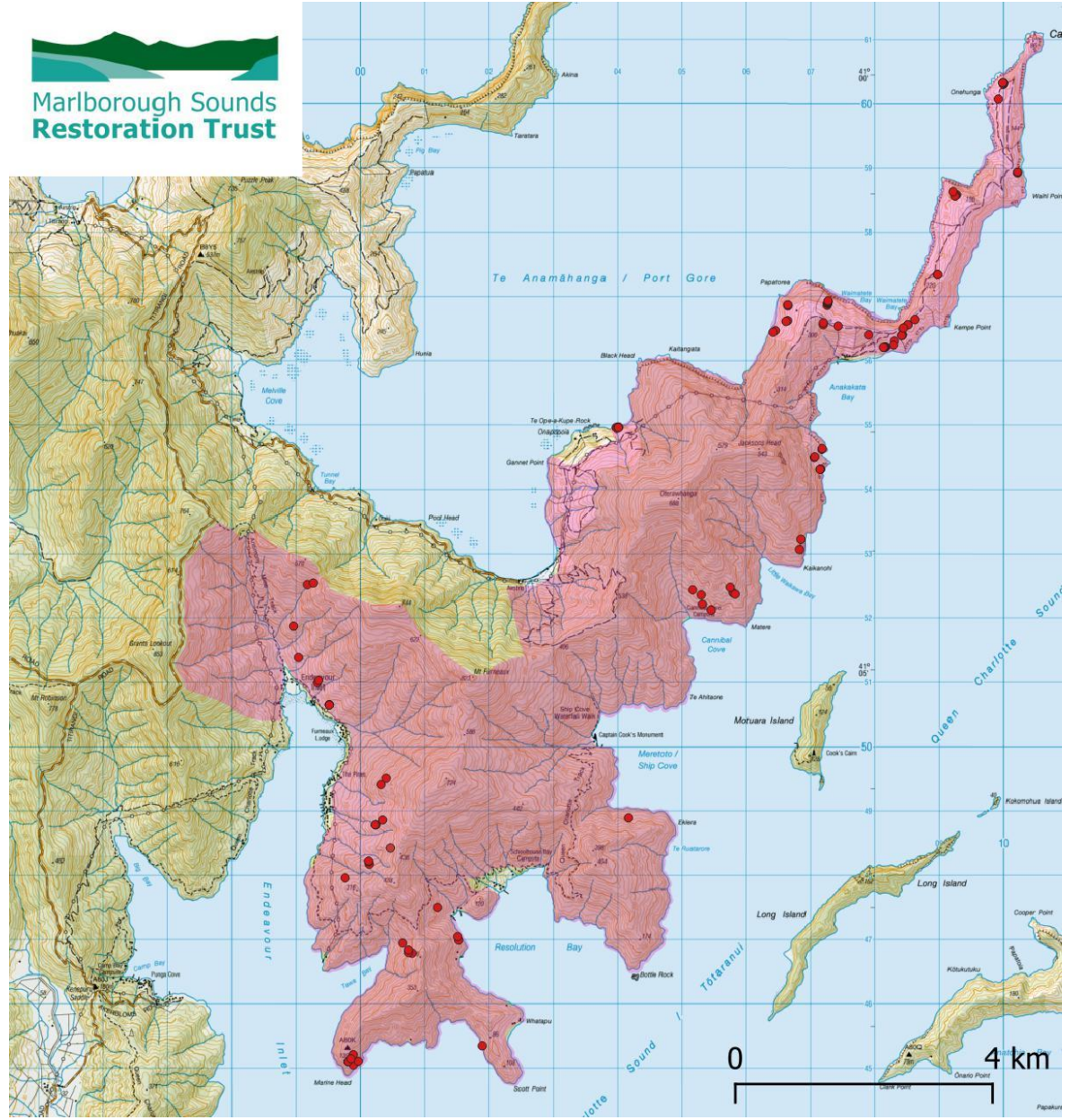
RED = PIGS

YELLOW = CATTLE

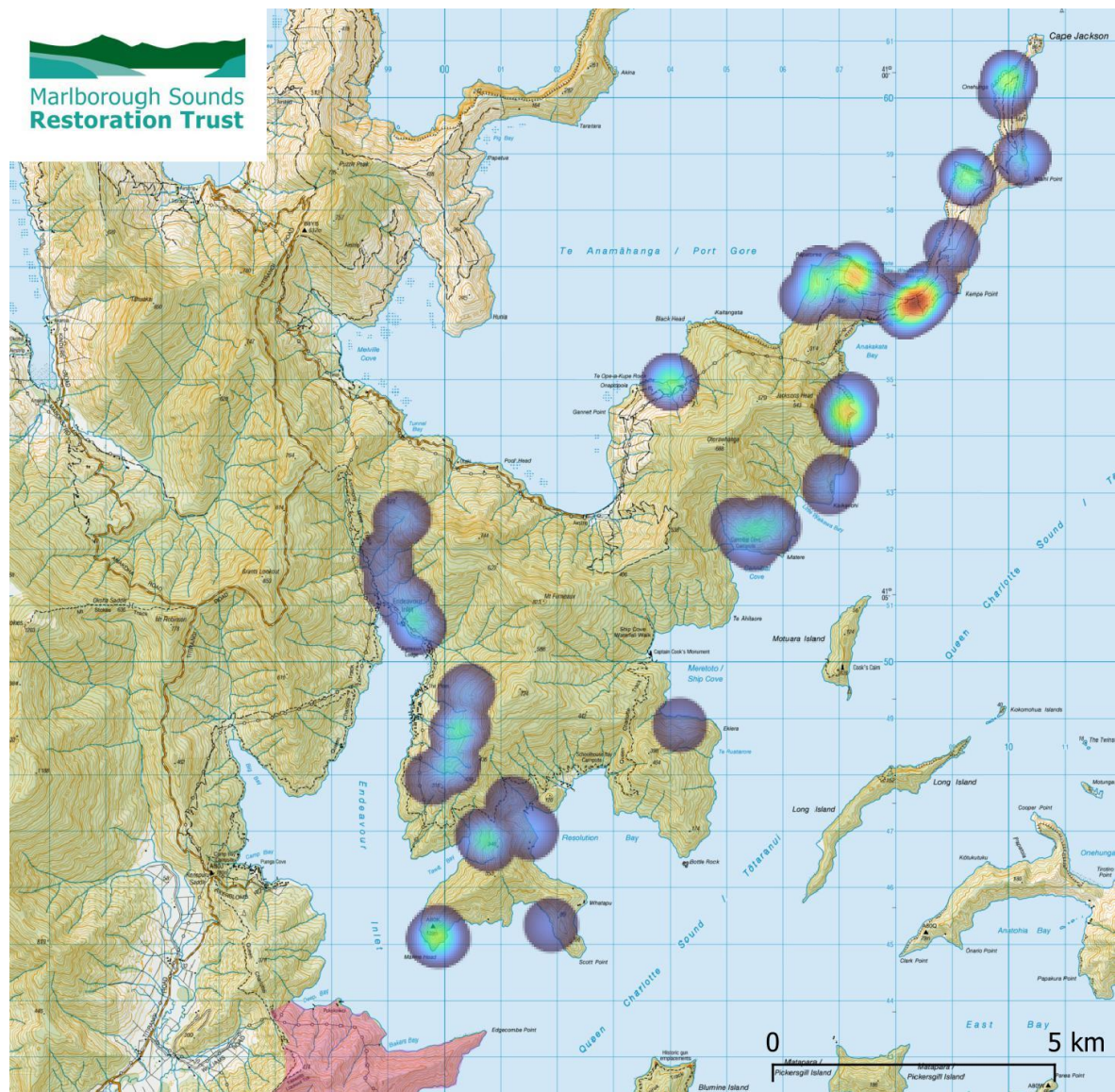
Map 3: GOAT KILLS (n=958)



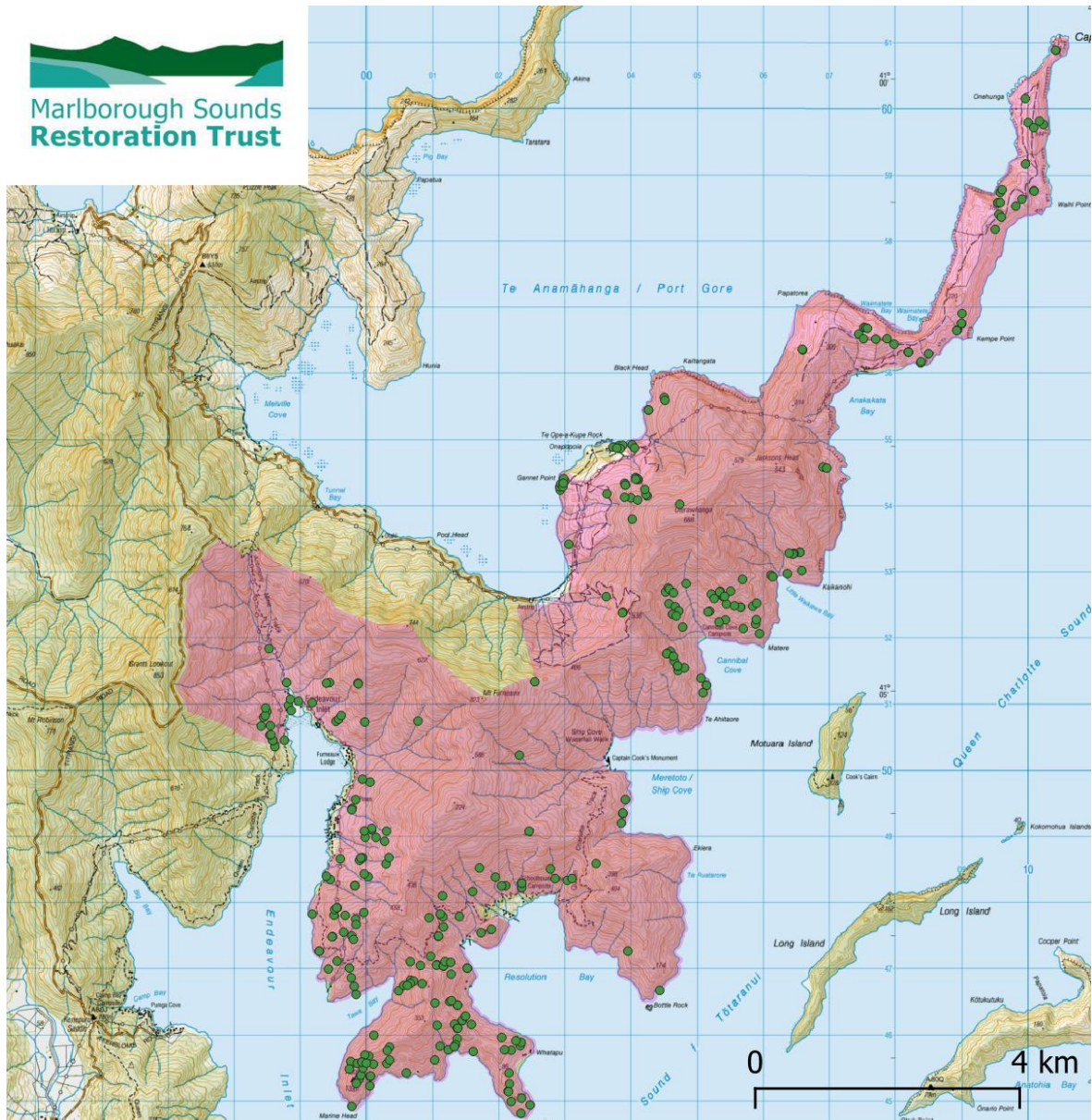
Map 5: PIG KILLS (n=108)



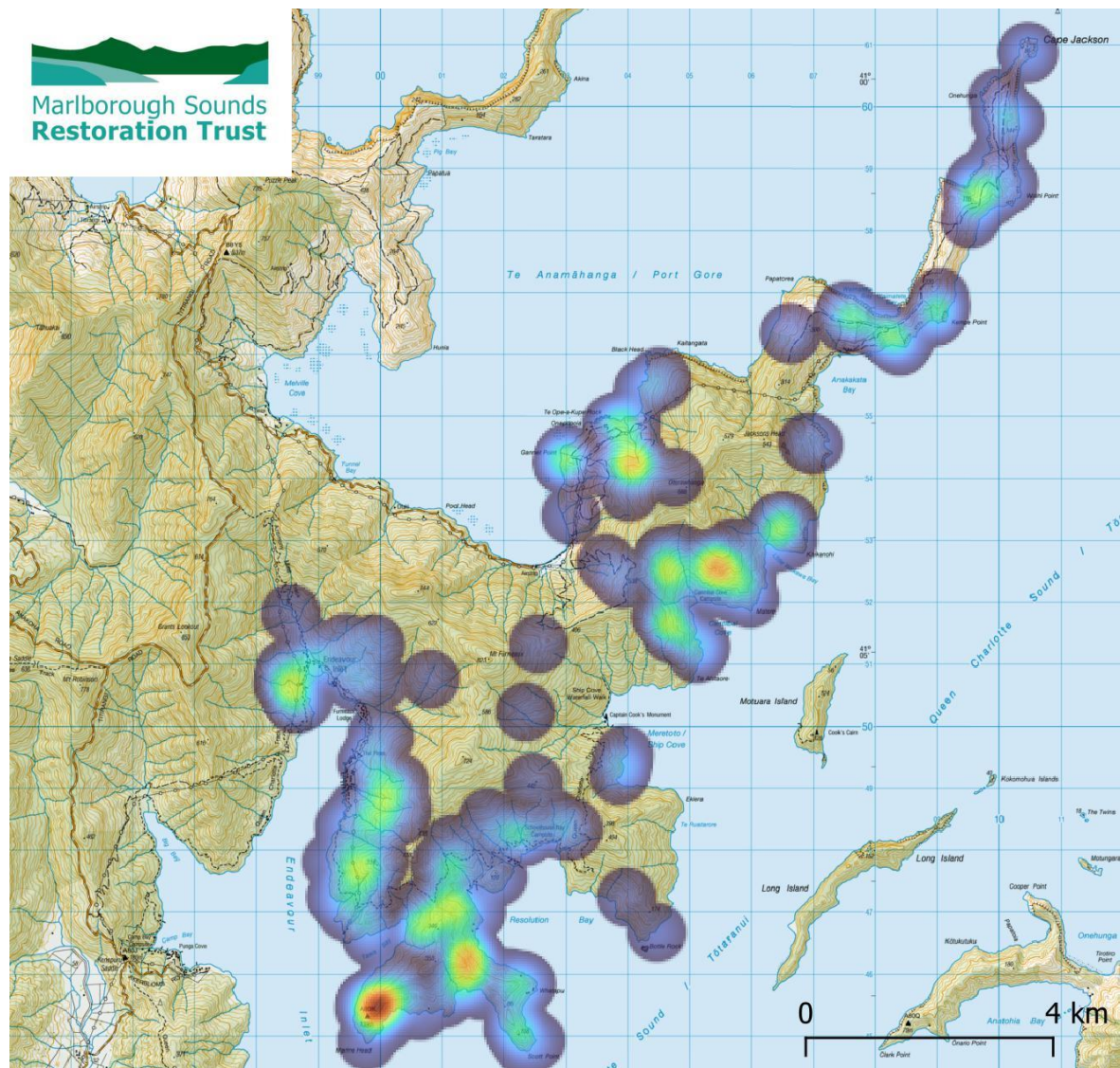
Map 6: PIG KILLS - HEATMAP



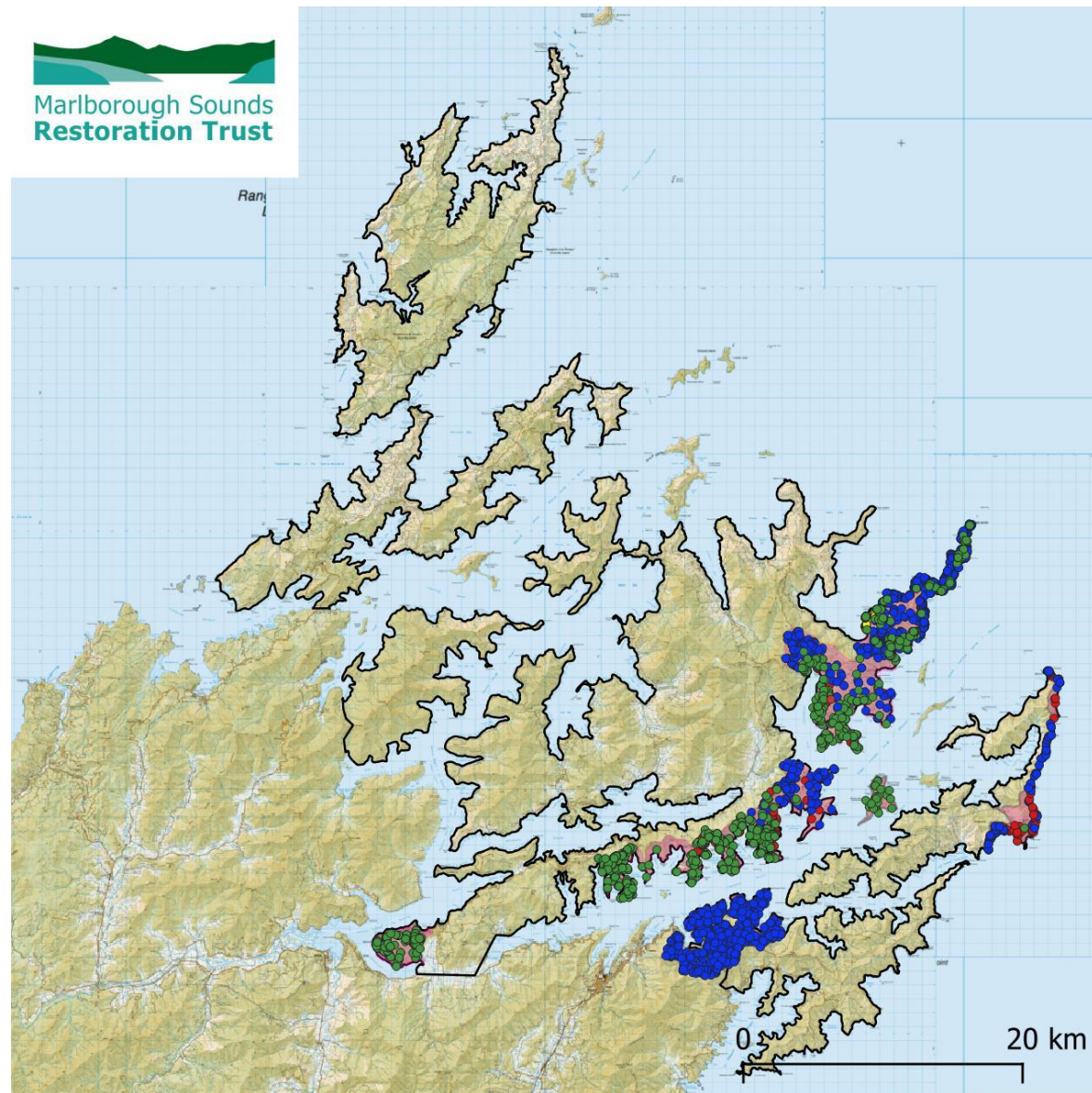
Map 7: DEER KILLS (n=330)



Map 8: DEER KILLS - HEATMAP



Map 9: OVERALL KILLS 2021-2023 (N = 2,830)



BLUE = GOATS

GREEN = DEER

RED = PIGS