Pest exclusion fencing feasibility report

Denniston and Stockton Plateaux

Buller District

[redacted]

Prepared for Alliance Ecology, Auckland

pestproof fences

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Director, Pestproof Fences Ltd, [redacted]

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Summary

The feasibility and practicality of creating fenced bio-sanctuaries on parts of the Denniston and Stockton Plateaux, Buller District, was assessed by representatives of Pestproof Fences Ltd during two site visits in late March 2025. Preliminary map studies by representatives of Alliance Ecology Ltd had identified 9 potential sites with significant ecological values, varying from 4 ha to nearly 700 ha in size. Each of these sites was inspected to determine whether they were 'fence-able' or not, and one was rejected because of its perceived difficulty.

Some of the remaining sites were then combined, resulting in four preferred enclosure locations. The purpose of this report is to identify and map the routes of the fences that will encircle them, to describe a fence design that will withstand the challenging environmental conditions on the plateaux, and to describe the factors and considerations involved in building each fence.

We recommend that fences on the plateaux be full height (1.9 - 2.0 m) with timber posts, 316 stainless steel mouse-proof mesh, and 316 steel steel fittings - appropriate for the harsh climate and acidic soils. Such fences are the most expensive pest-exclusion fences currently available, but they are also the longest lasting, with probable lifespans of 40-50 years. Regular and ongoing maintenance and water management will be essential if the fences are to remain pest-proof throughout life.

Collectively the four fences would enclose and protect approximately 910 ha of coal measure habitat, the majority on Stockton Plateau. The fences vary in length from 1.64 km to 11.93 km, and total 24 km between them. The proposed routes of those fences are currently indicative, and minor adjustments will inevitably be made during construction to avoid unforeseen obstacles, or to take advantage of options revealed by close inspection. In two of the sites, substantial culverts are required to bridge waterways. Whenever possible, the proposed fence routes utilise existing roads and tracks, to avoid otherwise inevitable substrate and vegetation disturbance during fence construction.

If built, the plateaux fences would establish new altitude records for pest-exclusion fences in New Zealand and protect an assemblage of plants and animals with no equivalents in other fenced sanctuaries.

1 Introduction

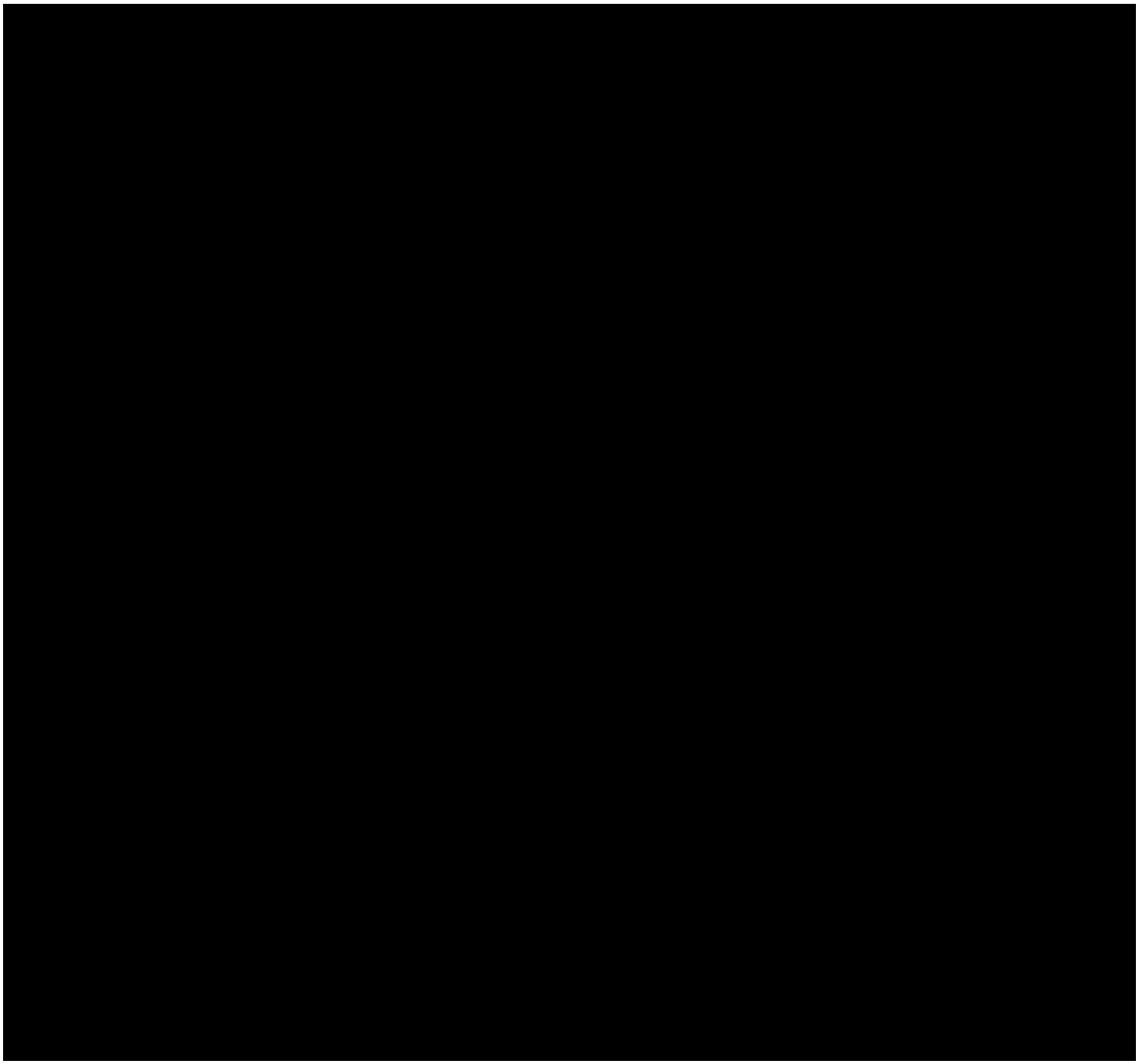
This report describes the feasibility and costs of building long-lasting pest-exclusion fences on various parts of the Denniston and Stockton Plateaux, Buller District. The feasibility assessments were undertaken by Nigel Broadbridge and John McLennan, representatives of Pestproof Fences Ltd, a company with more than 20 years experience building pest-exclusion fences in various parts of Aotearoa New Zealand.

This report focuses specifically on four sites, the distillation of 9 sites examined during detailed inspections in March 2025 (Fig.1). Following the March assessment, 3 of the original 9 sites were combined, one was rejected altogether because it was exceptionally difficult to fence, and two had boundary changes which enlarged them, improving both their 'fence-ability' and their ecological value. The four sites between them contain a range of vegetation types and landforms and many of the plateaux's faunal 'hotspots[1]'. Two are on the Denniston Plateau and two on Stockton Plateau.

This report maps the locations of the four fences and describes the various factors that were considered when selecting their routes. The same design of fence is proposed for all four sites; this too is described in the report. Finally the report provides information on probable costs, based on current exchange rates, and current international prices for materials sourced from overseas.

The report was written by John McLennan and Nigel Broadbridge and the photos in it were taken by them.

Footnote [1]: *The ecological assessments were undertaken by Dr Helen Blackie and Dr Matt Baber, Directors of Alliance Ecology. Auckland, in association with the Ecology team at Bathhurst Resources Ltd, Westport (Fig. 1).*



2 Fence design and specifications

2.1 General considerations

The Denniston and Stockton Plateaux (600 m - 880 m a.s.l.) are rocky and windswept with harsh cold climates characterised by high rainfall (6m per annum), frequent fog or mist, and winter snowfalls at higher altitude. The soils are thin, water-logged and acidic, with pH values as low as 3.5 - 4.0. In many places there are large expanses of bare eroded sandstone rock, sculptured by wind and rain, with no soil at all (Fig. 2).

In such landscapes, 2m high pest-exclusion fences have little or no protection from surrounding vegetation or hills. The primary considerations for design are therefore frequent and severe wind loadings, intermittent snow loadings, and low pH soils, potentially capable of corroding and shortening the life of metals in contact with the ground. Good drainage and the management of water are also of critical importance, to ensure both that culvert screens remain clear and permeable, and that substrates concealing buried mesh skirts are not washed away during high rainfall events.

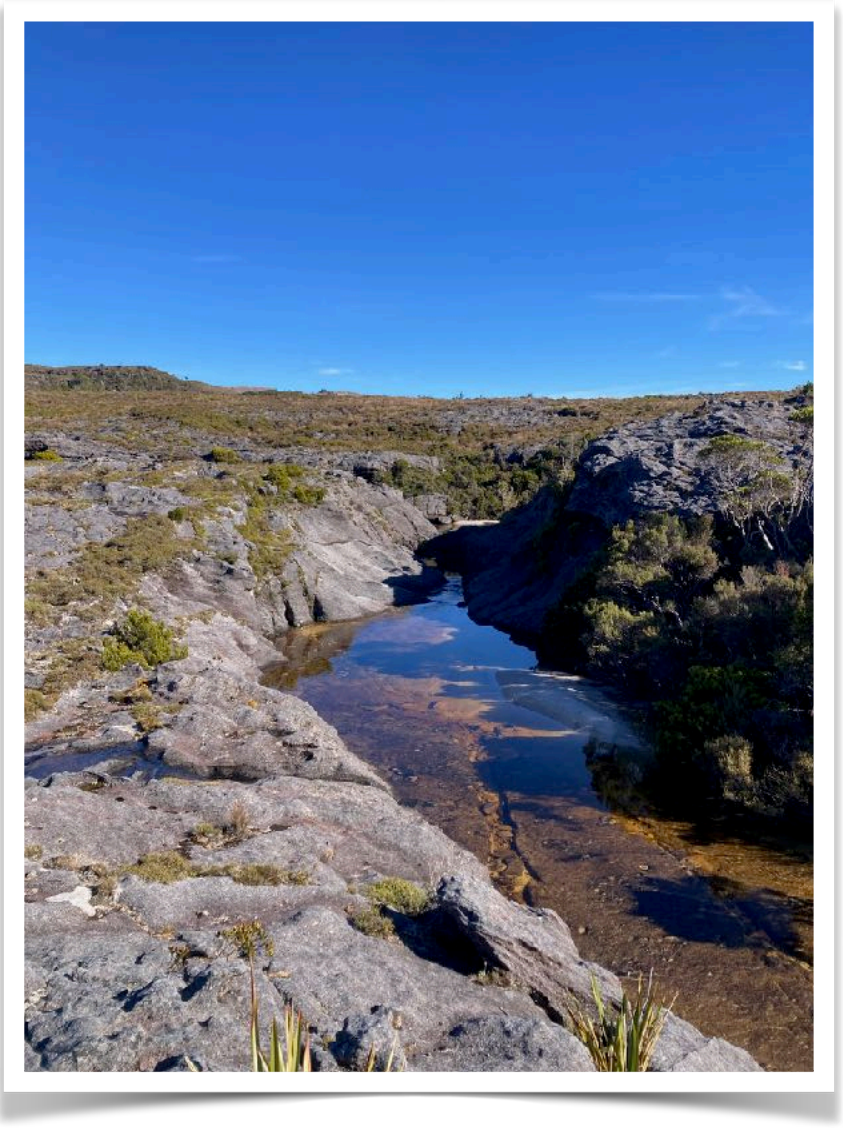


Fig. 2: *Typical geology and landform on the plateaux, with exposed sandstone, thin localised soils, stunted vegetation and perched water tables. Exclusion fences in these landscapes will experience high wind runs year round, heat in summer, and occasional loadings of snow and ice in winter.*

2.2 Fence design

The fence depicted in Fig. 3 satisfies the design requirements. The posts are treated *radiata* pine, with a minimum small end diameter of 150 mm. They provide outstanding support when driven into drilled holes at 2m spacings, eliminating vibration and wind chatter on the upper sections of the fence. All of the metal components (capping, brackets, fittings and mesh) are 316 L stainless steel to minimise corrosion. Hybrid fences, which use a mix of different metals, are prone to electrolysis and are not recommended for the plateaux. The fence has a 400 mm wide mesh skirt, buried where substrates allow, or cemented and bolted directly to exposed sections of rock[2]. The mesh is spiral woven from 1.25 mm diameter wire, with an 8 mm x 6mm aperture, small enough to exclude all pest mammals and birds, including mice. Fences with these design features have demonstrated their resilience and strength elsewhere in New Zealand - most recently during cyclone Gabrielle in Hawkes Bay (February, 2023), when four fences with the same or similar design survived three days of continuous battering during without a single component failure.

A variety of different culvert systems allow water to pass under the fence, with the size of the pipes, concrete wing-walls and screens dependent on predicted flows. The larger units incorporate hinged flap gates which open during floods then close afterwards (Fig. 4). An important feature of the proposed fenced sanctuaries on the plateaux is that none of them require flap gate culverts on inflow waterways (i.e on waterways that flow from the outside of the fence into the protected area). Such culverts are potential weak points in pest exclusion fences, because pests can raft in during floods. Flap gates on outflow culverts (which are required for the plateaux sites) do not present the same risks of pest incursion.

The gates also come in a variety of designs, depending on requirements (Fig. 5).

2.3 Fence cost

[redacted]

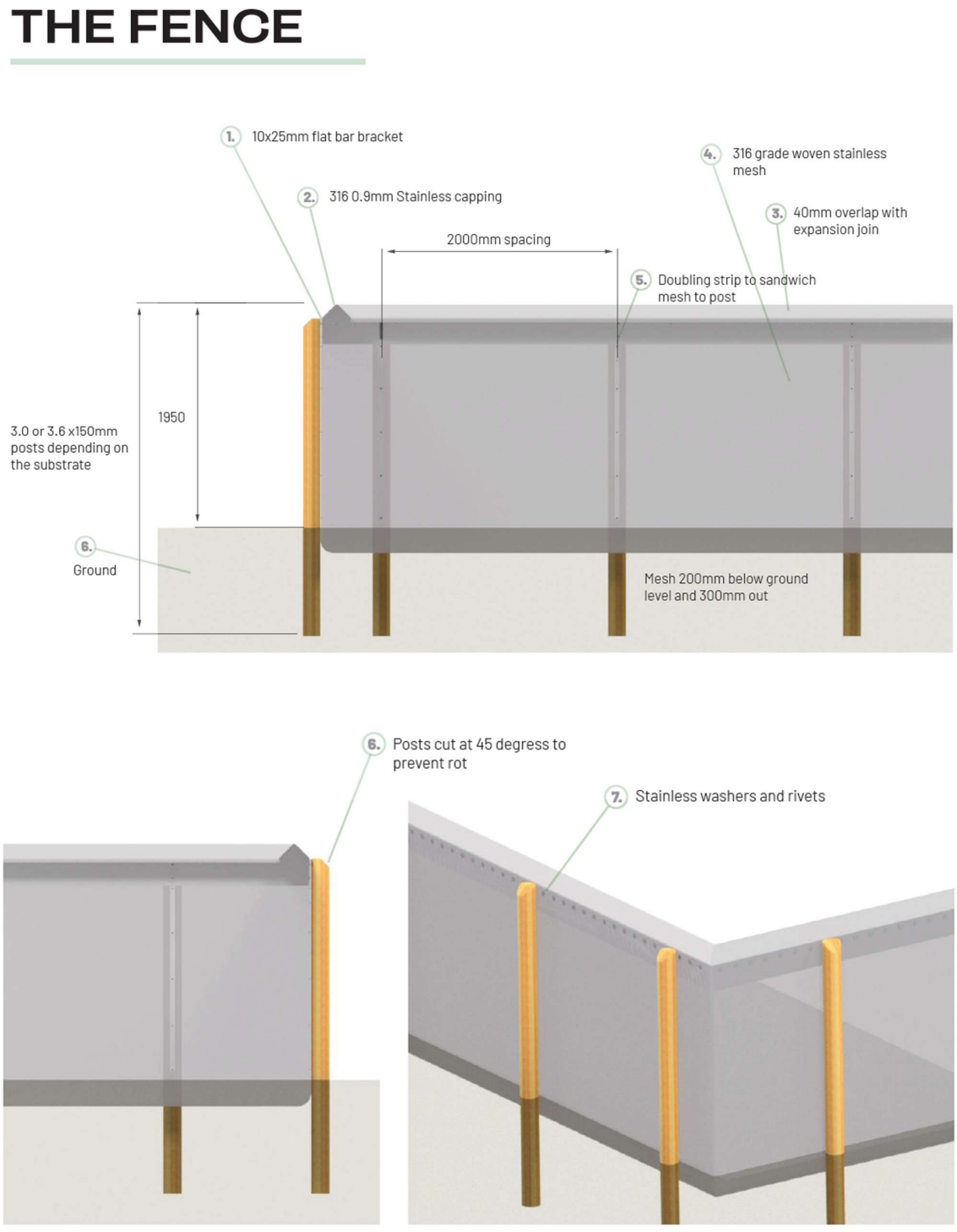


Fig. 3: *Standard design of a Pestproof Fences Ltd stainless steel pest exclusion fence. These fences are immensely strong and long-lasting.*

Fig. 4: Examples of pest-proof culvert systems applicable to the Stockton and Denniston Plateaux.

Fig. 5: Examples of pest-exclusion gates. 3.6 m wide vehicle gate (above); simple pedestrian gates (below). Double gate systems, which eliminate the risk of people accidentally leaving a gate open, are also available.

[redacted]

[redacted]

3 Location and specifications of the four sites

The location and general specifications of the four sites are shown, respectively, in Fig. 6 and Table 2.

Table 2: *General specifications of the proposed fencing sites, Stockton and Denniston Plateaux.*

Plateau	Name	Area (ha)	Fence length (metres)
Stockton	Western escarpment	14.63	1640
Stockton	Whirlwind Rise	694.54	11930
Denniston	North	47.32	3690
Denniston	Coalbrook	154.30	6930

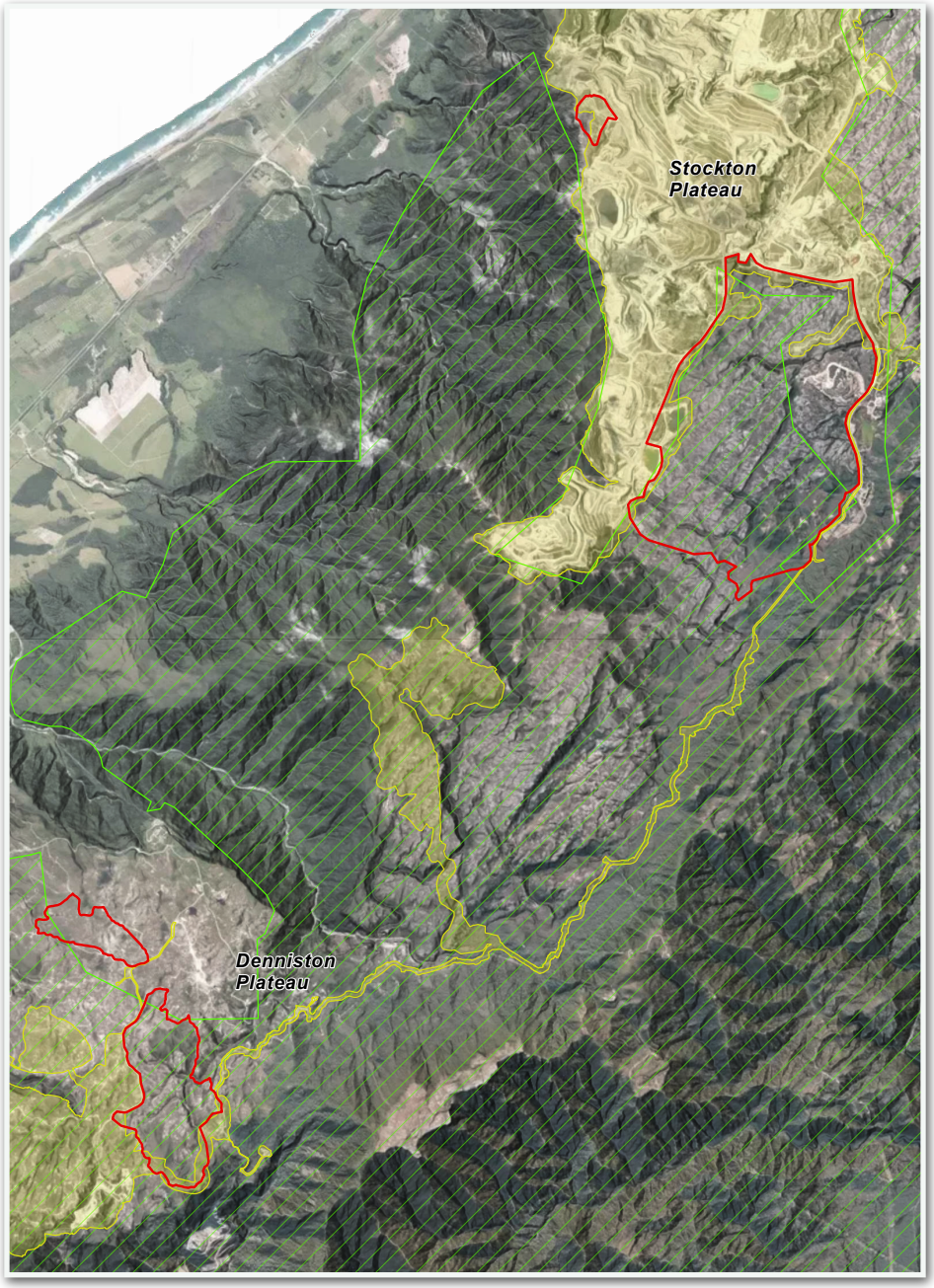


Fig. 6: *Location of the proposed fence sites (red outlines) Stockton and Denniston Plateaux. Map kindly supplied by Alliance Ecology, Auckland.*

3.1 Western escarpment, Stockton

The western escarpment site (Fig. 7& 8) comprises a mix of natural and re-habilitated vegetation on terrain that rises gently from east (803 m a.s.l.) to west (850 m). The western boundary is more-or-less flat, with prominent rock outcrops and expansive areas of exposed sandstone (Fig. 8 & 9). It essentially follows the edge of the escarpment, a few

metres back from the drop-off. Approximately 40% of the proposed fence route is on existing roads and tracks, with the remainder requiring establishment. In most places, this would be achieved by bulldozing a 3m wide bench. A 10 m long section down a cliff would have to be built by hand.

Fig. 7: *The proposed fence route for the western escarpment site, Stockton Plateau.*

Fig. 9: *The western escarpment site showing current vegetation cover and location of the main outflow culvert at the lower edge of the site.*

The catchment area within the proposed enclosure is relatively small and little or no water flows in from adjoining areas (Fig. 9). Water management is therefore comparatively straight forward, accommodated with 2-3 small inflow culverts and one medium-sized outflow culvert.

In terms of construction difficulty, the western escarpment site presents few challenges, over and above the requirement to drill all post holes. Hand-building and hand-drilling is required on less than 1% of the proposed route. The estimated build cost of this fence, with culverts, a vehicle gate and a simple pedestrian gate, [redacted]

3.2 Whirlwind Rise, Stockton Plateau

This is the longest (11,930 m) of the proposed fences on the two plateaux and (by far) the largest of the proposed enclosures (nearly 700 ha). About 75% of the proposed fence will be built on or alongside existing roads and tracks, with minimal additional earthworks required to establish a suitable building platform (Fig. 10 & 11). The build platform for the remaining 30% will, however, have to be established from scratch on what are predominately sandstone pavements to the south of Whirlwind Rise. This part of the proposed route was examined carefully over several days in March 2025, and several route options were identified. The one depicted in Fig.10 is preferred, though it crosses a deeply dissected stream which will require a large outflow culvert to bridge. There is,

however, a good location for this culvert, with workable approaches on both sides (Fig. 12). Three more large outflow culverts are required on the northern and north-eastern edge of the enclosure, and numerous smaller ones (both inflow and outflow) are required elsewhere.

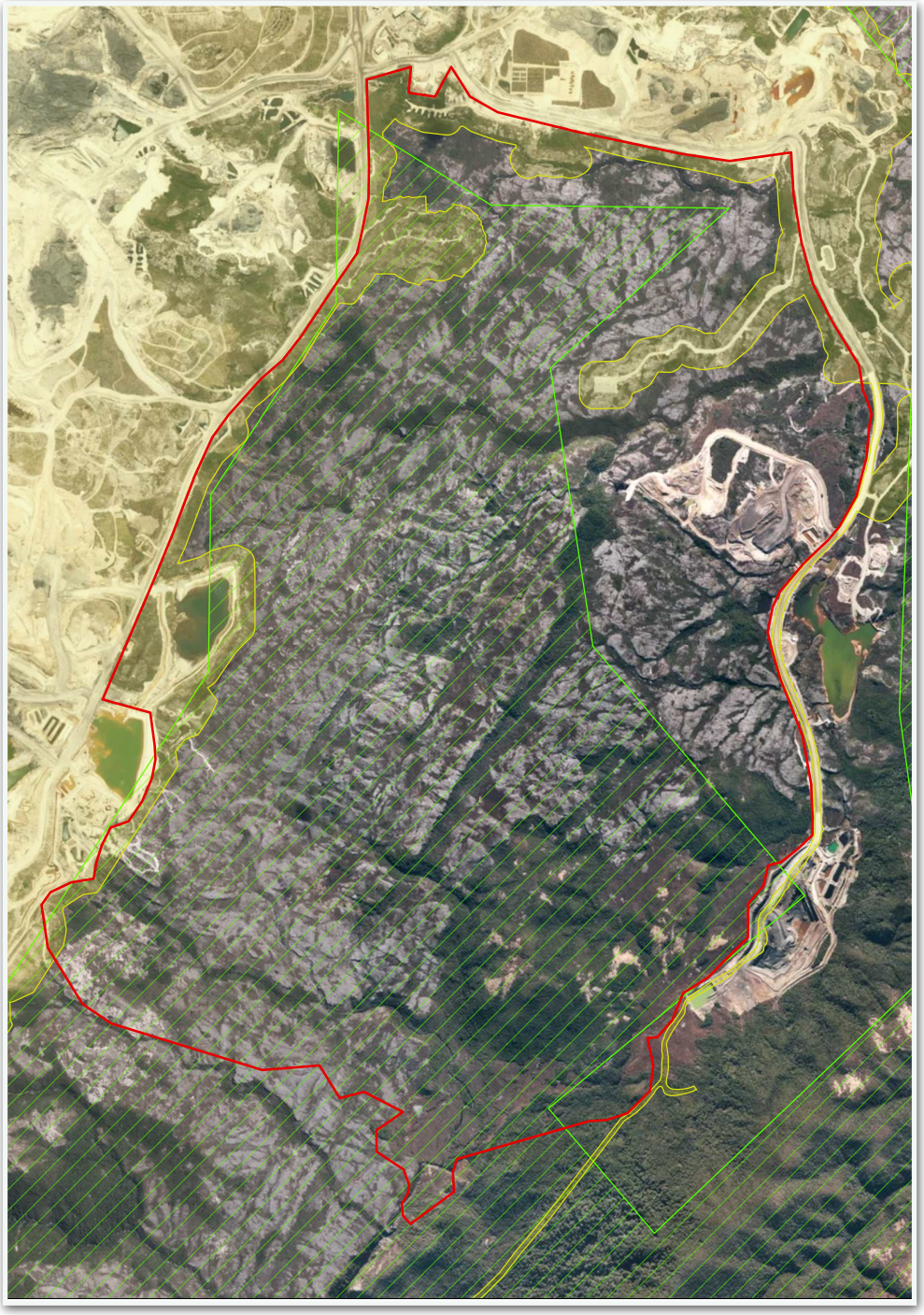


Fig. 10: *The proposed Whirlwind Rise site (red outline) on Stockton Plateau. Whirlwind Rise itself is the forested mound in the south-eastern corner of the enclosure.*

Fig. 11: *The proposed Whirlwind Rise fence would run alongside the far side of the road in the foreground and enclose most of the land and habitats beyond it.*

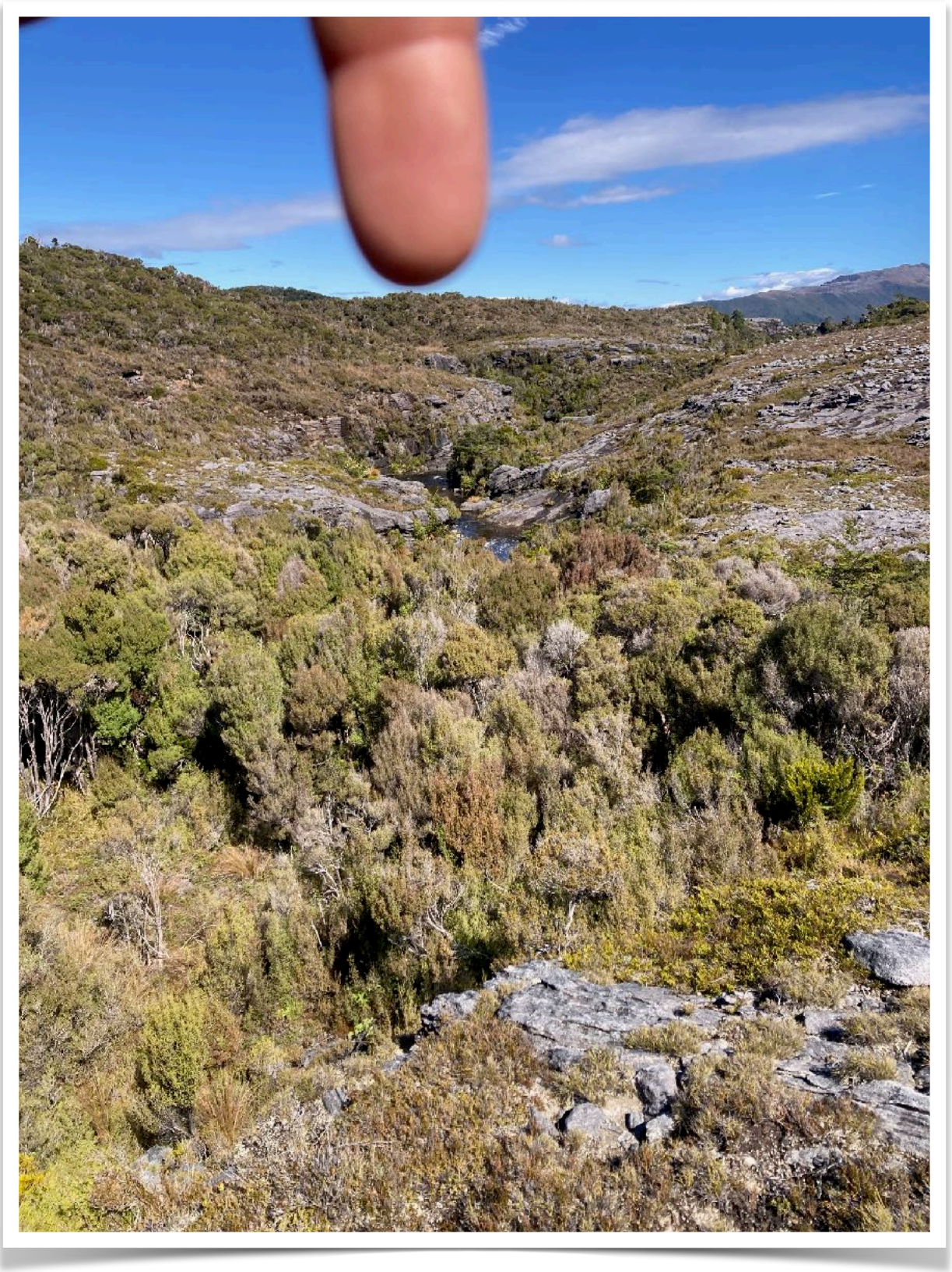


Fig. 12: *The point immediately beneath the finger is the preferred location for the stream crossing in the south-eastern corner of the Whirlwind Rise site. This is technically one of the most challenging aspects of the proposed build. The channel here is effectively a slot that would require minimal modification to accommodate a large outflow culvert.*

On an arbitrary scale of ‘building difficulty” based on previous experience, the Whirlwind Rise site scores 3 (demanding but ‘doable’) with the principal challenges being the large stream crossings, and the substantial flows that have to be accommodated during periods of high rainfall. The existing road platforms around a significant proportion of the perimeter reduce potential building costs, the chances of unexpected substrate issues being discovered during platform establishment, and the likelihood of route changes during construction.

The current estimated build cost of the Whirlwind Rise fence [redacted] which includes four pedestrian gates, one vehicle gate, 20 small and medium culverts, and four large culverts.

3.3 Denniston North, Denniston Plateau

At 47.2 ha, Denniston North is a sizeable enclosure in its own right (Fig. 13) but the smaller of the two proposed for the Denniston Plateau (Table 2). It ticks all the boxes from a building perspective: existing roads and tracks around 90%+ of the perimeter, machine access everywhere, gentle gradients, few inflow culverts, and good crossing points for the outflow streams. Furthermore, the outflow streams and their catchments are relatively small (Fig. 14.)

Fig. 13: *The proposed Denniston North site (red outline) on Denniston Plateau. The site slopes gently from 660 m a.s.l. in the west to 582 m a.s.l. in the east. The northern boundary is positioned to avoid power pylons, just visible on the skyline in Fig. 15.*

The substrates in the Denniston North site are typical of those on the wider plateaux, with exposed rock slabs, rock cobbles, and drifts of fine sediment (Fig. 15). As elsewhere, the post holes will need to be drilled. The existing roads and tracks around the site demonstrate the importance of water management and the need to inspect and clear culverts regularly. In these high rainfall areas, even gentle slopes erode when culverts block (Fig. 16).

To summarise, Denniston North is an outstanding fence site with a build difficulty score of 1 (easy). It could be made even better still with a minor route adjustment. The current estimated build cost of the fence, as depicted in Fig. 13, [redacted] This estimate includes 1 pedestrian gate, 1 vehicle gate, 6 small culverts and 5 medium culverts.

Fig. 15: *Example of the potential building platform around Denniston North. The gradient varies from flat to gentle and machine access is possible around the entire route.*

[redacted]

3.4 Coalbrook, Denniston plateau

The fence around the Coalbrook site will also be built almost entirely on or alongside roads and tracks, some yet to be established (Fig. 17). The gradient around the perimeter is, with one exception, flat to undulating, varying just 60m in altitude from the highest to

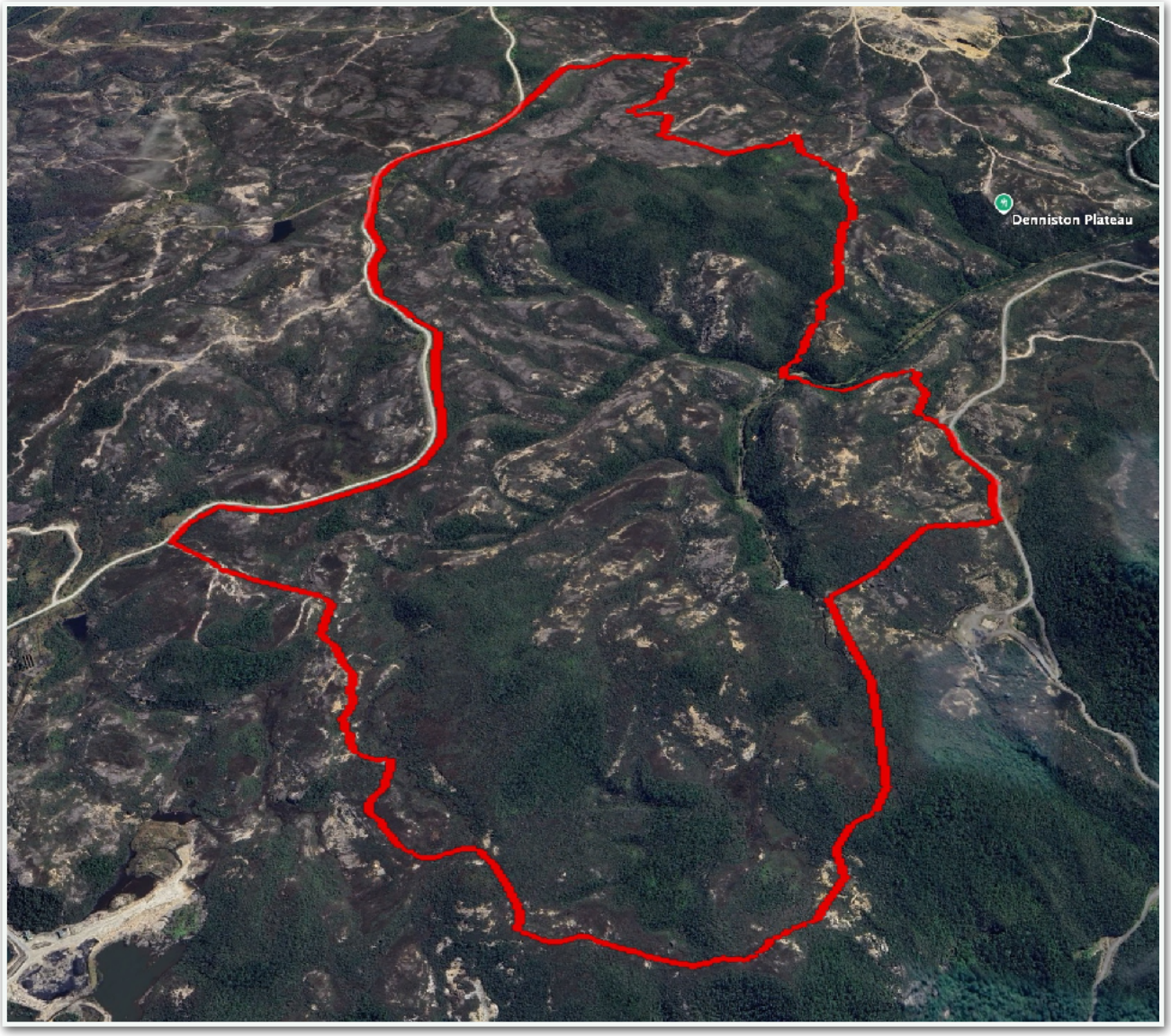


Fig. 17: *The proposed Coalbrook site on Denniston Plateau. The site drains from west to east and includes the headwater tributaries of the Waimangaroa River. The fence crosses the upper Waimangaroa River at the point of the indent, half way along the eastern boundary.*

the lowest point. It presents few if any building challenges. Some remedial earthworks will be required to upgrade some of the existing drill tracks, and numerous small inflow culverts will need to be installed along the Whareata Road.

The one challenging section is the descent down into the Waimangaroa River, the crossing itself, and the climb back out of it. This part of the route is approximately 590 m long, about 9% of the total fence length. It will require significant bench cutting and

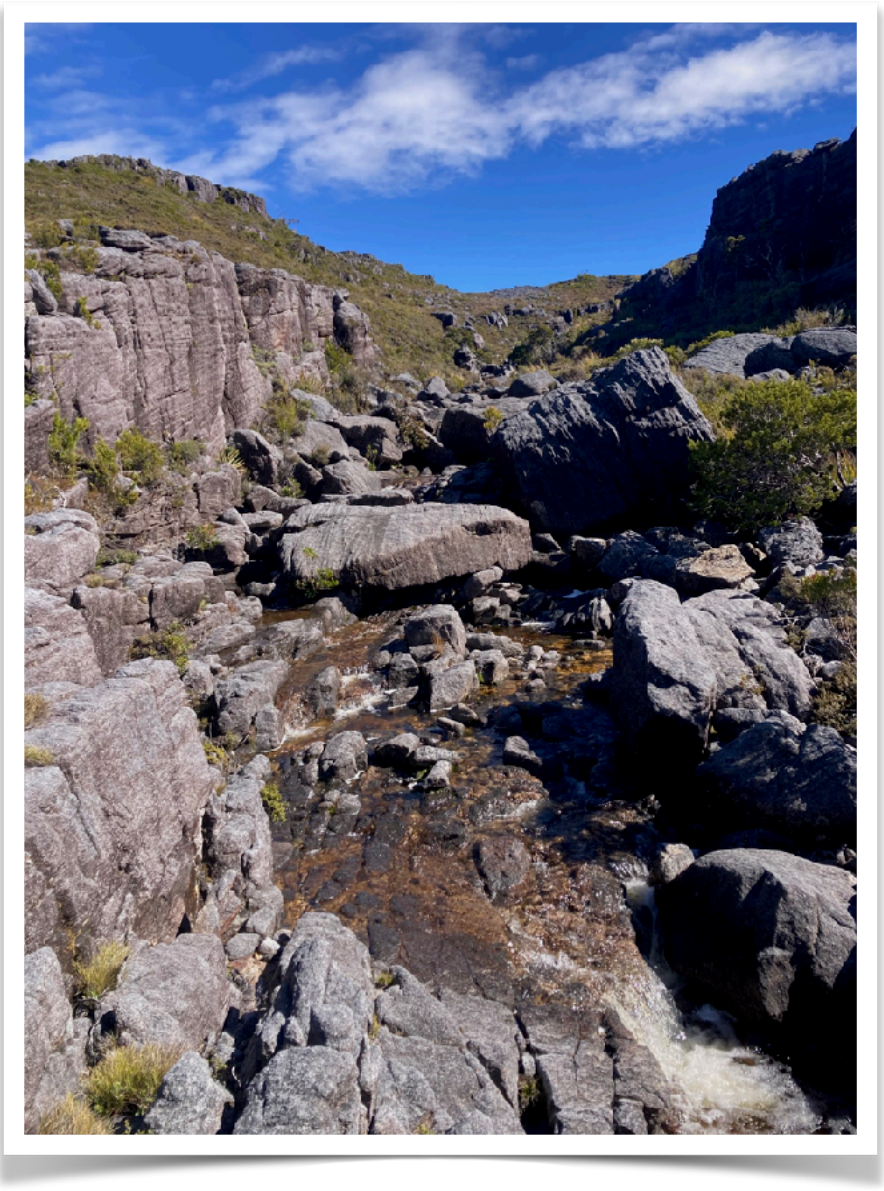


Fig. 17: *The headwater tributaries of the Waimangaroa River. The proposed fence for the Coalbrook site crosses the headwaters in a location similar to this one. A culvert will here (outflow type) will require substantial footings and the capacity to deal with large flows.*

a substantial culvert system to bridge the river itself. The crossing location is rocky and steep-sided, similar to the one shown in Fig. 18. The culvert itself will require a substantial concrete footing, a capacity to deal with substantial flows during floods, and a resource consent to install.

A great deal of additional work is required to cost the Coalbrook fence with some accuracy, but its clearly going to be [redacted] Much depends on the weir structure for the Waimangaroa River, the earthworks required for its immediate approaches, and the size and number of culverts along other sections of the fence route.

4. Conclusions and overall assessments

All of the four potential enclosures considered in this report are 'buildable' but are not equivalent in terms of their construction difficulty, their requirements for large and expensive culverts, and their probable maintenance needs following installation. The two smaller ones are considerably less challenging than the larger ones, mainly because they have fewer and smaller water crossings.

Whenever possible, the proposed fence routes for all four enclosures make use of roads and drill tracks, thereby minimising the need for additional substrate and vegetation disturbance during construction. This is of special significance in a landscape where the substrates themselves, and their associated plant communities, have high conservation values and few equivalents elsewhere. Ironically, it is the smallest of the proposed enclosures (Stockton escarpment) that has most impact (as a proportion of fence length) on virgin ground.

The fences proposed for the plateaux, if built, will be the highest (above sea level) pest-exclusion fences in the country. They will be exposed to a novel set of environmental conditions, both above and below ground, which will 'test' them repeatedly. They will need to be checked and maintained regularly if they are to retain their integrity. In our view, the paramount consideration is water management and the ongoing requirement to prevent screen blockage and erosion. The impervious rock substrate is a mixed blessing, promoting rapid runoff, but at the same time providing stable and firm footing for posts. Fence toppling (from wind, snow, or subsidence) is highly unlikely on both plateaux. All factors considered, we think the proposed fences will last 40-50 years if they are well-maintained.

Finally, it should be noted again that all of the costings here are for full-height stainless steel mouse-proof fences - the most expensive of all pest-exclusion fences. Effective pest exclusion can be achieved with fences 1.2 m high in locations where there are no cats, deer or goats - a circumstance which does not seem to exist on the plateaux. Savings are also potentially possible by substituting galvanised components for stainless ones - generally at the expense of fence longevity.

5. Acknowledgements

The site assessments were undertaken at the request of Alliance Ecology Ltd, Auckland. We thank them for the invitation, the files depicting the locations of the proposed enclosures, and for some of the figures used in this report.

Ends.