

Improving the management of woody debris

# Debris net proposal, Wakaroa Forest



**This document has been produced to discuss with affected parties the proposal to construct a debris net to capture debris that migrates from Wakaroa Forest.**

Disclaimer: The document contains sensitive data and we ask that you handle this information with the same level of confidentiality and care. The information provided should only be used for the intended purposes outlined above and not disclosed to any unauthorized third parties.

# Introducing Aratu Forests Limited

Aratu Forests Limited (Aratu) manages 35,000 hectares of forestry plantation land across Te Tairāwhiti.

Since taking over ownership in 2019, we have continued to develop low impact harvesting techniques to mitigate debris movements from the plantations to ensure our sustainable plantations deliver long term benefits for the local community. We support over 200 permanent jobs and each week our company invests more than \$1 million into the local economy through payments to our employees and suppliers.

We are committed to being a responsible custodian of the environment and lessons from the 2023 cyclone events have continued to refine our forest management practices with the aim of mitigating any negative impacts on the environment.

## Purpose of document

This document outlines a proposal, subject to approval of a resource consent from the Gisborne District Council, to install a debris net on private property that borders the Wakaroa Forest.

Debris nets will provide additional protection for the community from debris mobilised during periods of heavy rainfall and act alongside other forest management actions to reduce the risks of significant debris movement from forest catchments. Debris nets use established civil engineering technology which has been successfully used in a wide range of applications to mitigate geohazards including the migration of rock falls and woody debris.

## Location

Wakaroa Forest is located at the end of Duncan Road (25km up Waimata Valley Rd). The forest is 1700 hectares of which approximately 590 hectares is in the catchment of the proposed debris net location. This catchment is predominately second rotation plantation with majority of the harvest occurring between 2008 – 2017.

As the topography of Wakaroa Forest does not provide areas that are suited to a debris net within the Aratu forest boundary we have engaged with neighbours to identify a suitable location on the boundary of the Utting's and Hall's properties. These neighbours are facilitating access to their land to assist Aratu in further developing the proposal

# 1. Debris net

We are proposing a debris net manufactured by Geobrugg AG, Switzerland (Geobrugg). Geobrugg has pioneered the development of high-tensile steel wire nets that protect against natural hazards such as rockfalls, landslides, debris flows, avalanches and coastal erosion.

These have been used successfully across the world including in New Zealand forests, and in remediating cliff faces damaged by the Kaikoura earthquake (see examples below).

The proposed net is an engineered ring fence structure supported by high-tensile wire ropes. The net is held in place by more than a dozen anchors, each of which is drilled 6-8m into the rock and injected with cement.

The design of the nets follows stringent technical guidelines assessed by the European Organisation for Technical Approvals (EAD 340020-00-106) through a European Technical Assessment (ETA 17/0439) and have subsequently been issued a CE Certificate of Conformity: (1301 – CPR – 1289). This declaration of performance is issued in accordance with regulation (EU) No 305/2011. This certifies that nets of this type, designed within the parameters of Geobrugg's design tool are rated to operate under significant stress – dynamic pressure resistance of 160kN/m<sup>2</sup>.

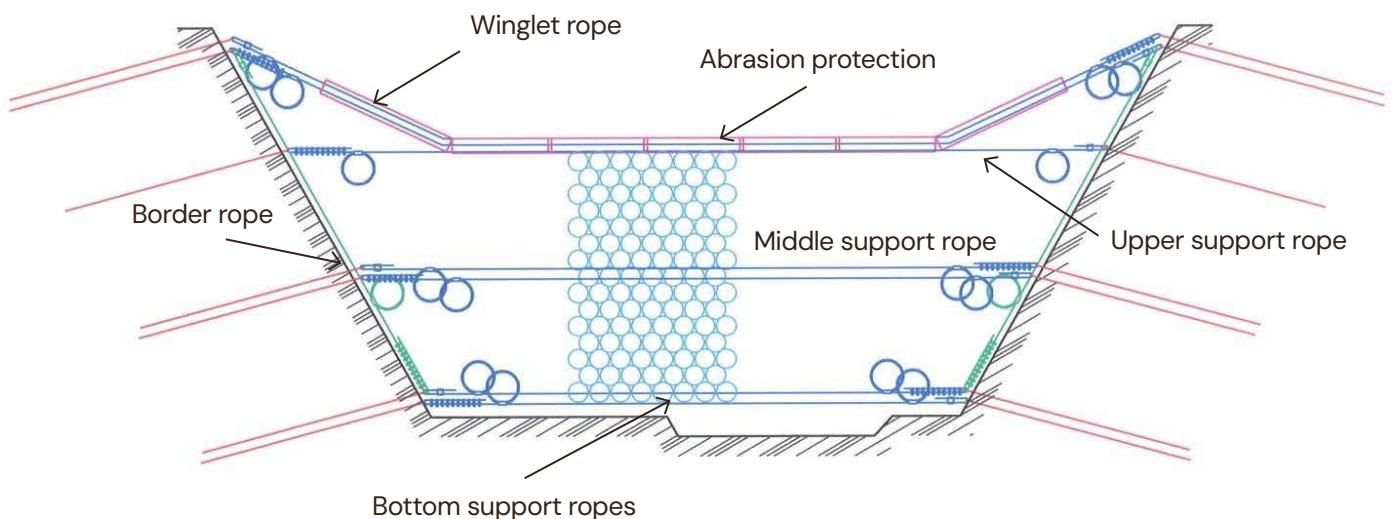


Figure 2.  
Debris net diagram



Figure 3.  
55m long debris  
net in Peru



Figure 4.  
Springs Junction  
(South Island) –  
Shallow landslide  
barrier



Figure 5.  
The world's  
largest flexible  
debris flow  
barrier, 40m  
wide, built by  
Geobrugg in  
2013 – Hupach  
Creek, Bernese  
Oberland,  
Switzerland



Figure 6.  
Kaikoura debris nets,  
installed to protect  
State Highway 1 and  
the adjacent railway  
line after the 2016  
Kaikoura earthquake



In 2021 a similar debris net as proposed by Aratu was installed downstream of an 800 ha catchment in Hampton Forest in the Matariki (Rayonier) estate in Napier. This debris net was the first net in New Zealand to be installed specifically to capture and prevent woody material migrating from the forest.

Figure 7.  
Hampton Forest  
debris net post  
installation

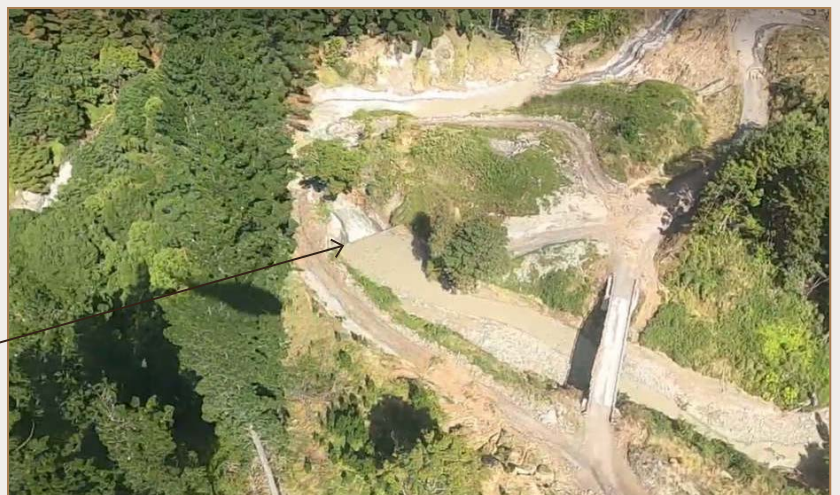


The Hampton Forest net to date has successfully caught material and been cleared after three large storm events (March 2022 event, Cyclone Hale and Cyclone Gabrielle). After each event the woody debris and sediment were removed from the site.



Figure 8.  
Hampton Forest  
debris net post  
weather event

Figure 9.  
Aerial view of  
Hampton Forest  
debris net post  
weather event



Barrier location



## 2. Aratu proposal

We are proposing the installation of a debris net at the location identified on Map 1. International engineering and technical experts, SLR Consulting (SLR), a global leader in sustainability solutions, is completing the technical elements of the consent application including:

- Assessment of rules
- Assessment of effects
- Model net heights (top and bottom)
- Model catchment hydrology
- Model the quantity of the material the net could capture
- Model what would happen in the event of failure
- Effects on damming (In the event the net could not be cleared for an extended period)
- Effects on freshwater ecology and provide mitigation recommendations

Aratu is applying to the Gisborne District Council for consent to have the maximum term for a consent – 35 years (net design life is 50 years). This period should allow us to complete a full rotation in the upper catchment and provide time to change:

- Where we replant
- Where we don't replant
- How we manage replanted and unplanted areas
- How we harvest in the future

Through our commitment to continued improvement in forestry management practices at Wakaroa, and across our plantations, our aim is to limit the risks of woody debris being mobilised. We want to build resilience to a state where the Wakaroa net will not be needed and after the 35-year term the nets can be taken down.

The height of the debris net has been designed to capture all material flowing downstream in a 1 in 100-year event (making allowances for net blockage). In events greater than 1 in 100-year events the debris net is designed to fill up and then let material pass over top.

The debris net would also be raised above the riverbed so that a 1 in 20-year event the water passes underneath the net (this level may change based on the technical advice provided by SLR). This allows the river to be largely unimpeded by the presence of the net, while still providing protection from high rainfall events.

Overall, the proposal is deemed to be a discretionary activity.



## 2.1 Monitoring

After a heavy rain event where more than 100mm falls in a 24 period the net will be inspected for woody material. If the net is free of debris Aratu will take images and hold a record of inspection.

Aratu will also use eDNA testing to monitor the impact of the net on the stream's biodiversity. Very simplistically, eDNA testing tells you what species live upstream by looking for their DNA in a water sample. We will do eDNA tests before the nets are installed to establish a baseline. We will also do eDNA tests above and below the net, 3-4 months after an event, to see if the presence of the net has impacted the streams biodiversity.

## 2.2 Clean-out process

Aratu will aim to clear any blockage from the debris nets as soon as access is available.

Aratu's proposal would see us working closely with the landowners to create an access point to the site.

During clearance, all woody material and sediment will be end-hauled away to designated storage sites. Subject to landowner approval this will either be near the net (shown in Figure 11) or into Wakaroa Forest.

To improve efficiency and minimise the space required for storage of material we plan to burn woody material using an excavator and blower.

Figure 10.  
Image of burn  
operation and  
the air blower  
designed by  
Aratu





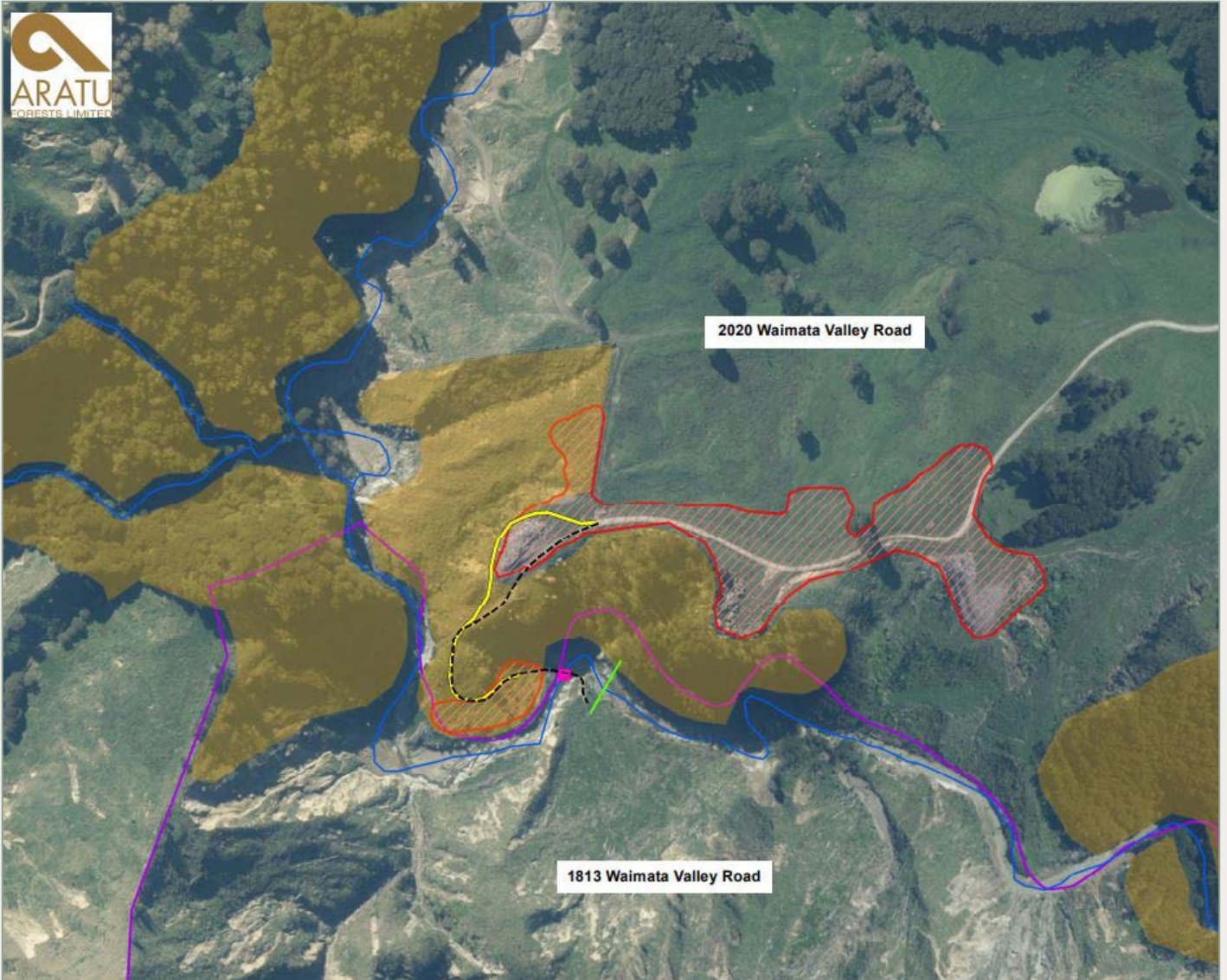


Figure 11.  
Potential storage locations  
are shown in red



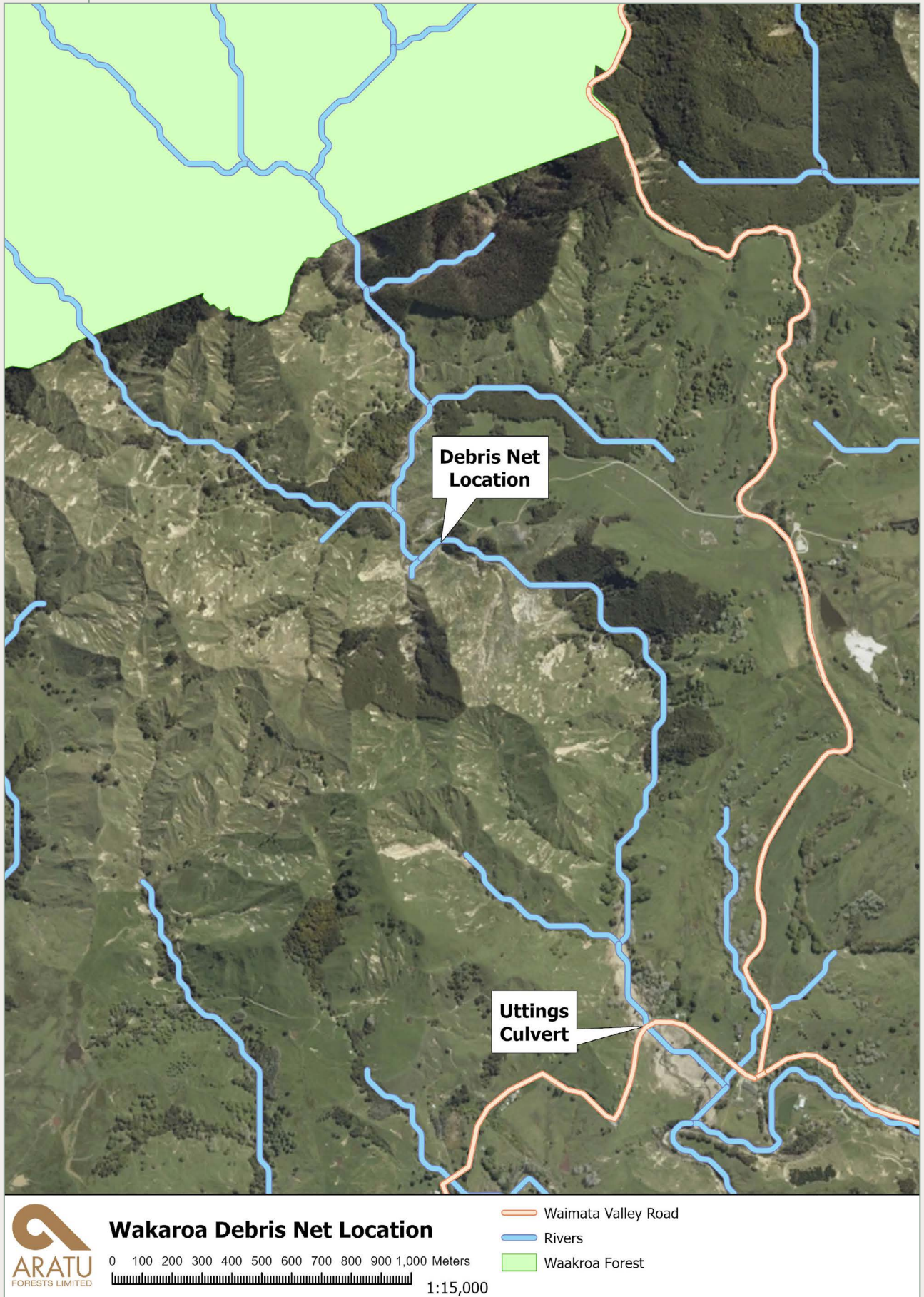


Figure 12.  
Location of the Wakaroa Debris Net



## Key debris net features

Video shows:

- Benefits of flexible barriers as opposed to rigid structures (1:15)
- A net filling to capacity before overflowing, rather than breaking, when impacted by a subsequent much bigger event (2:15)
- Product testing during which they put large woody debris in a creek below a dam and then released the dam flushing the debris into a net fitted with load cells to measure the force on the net (5:45)



Watch video:  
<https://youtu.be/ODE1OtTwCfl>

## Debris net strength test

Video shows product testing done in 2017 when Geobrugg dropped a 25 tonne concrete ball 42m into a debris net which it impacts at 103 km/hr. As designed, the net deflects by 8 meters as it soaks up the impact and stops the concrete ball.



Watch video:  
[https://youtu.be/lx\\_DGYT2M3I](https://youtu.be/lx_DGYT2M3I)

## Next steps

Aratu is now at the stage of undertaking research to support the debris net resource consent. This includes completing:

- A hydrological model
- A geomorphological investigation
- A freshwater ecological survey
- Designing the debris net structure
- An assessment of the local and national rules
- An assessment of environmental effects and mitigations





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