

## 4. Analysis of Setback Options and Harvesting Implications for Forestry in the Marlborough Sounds

(also refer separate reports available on Council's website)

(Clr Hook) (Report prepared by Dr Steve Ulrich)

E325-004-004

### Purpose

1. To provide the Committee with a report from the Crown Research Institute SCION requested by Council's Environment Committee in December 2015.
2. Separate electronic attachment: *Analysis of setback options and harvesting implications for forestry in the Marlborough Sounds* prepared by SCION. The report is available on Council's website (refer <https://www.marlborough.govt.nz/your-council/meetings?item=id:1x2b2rl2i17q9szt8jn6>)

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| 3. | <b>Dr Tim Payn Principal Scientist SCION will give a presentation outlining the report (15 minutes).</b> |
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### Background

4. Fine sediment from land can smother the seabed, and kill shellfish and affect fish health. Increased turbidity reduces light in the water column, which decreases plankton photosynthesis and ecosystem productivity. Sedimentation is one of the key causes of ongoing environmental decline in the Sounds. Satellite imagery shows the typical extent of sediment plumes (Figure 3).
5. Seabed cores from Kenepuru Sound revealed that rates of sediment deposited onto the seabed has increased from 5 to 20 times since Europeans settlement. The inflow from the Te Hoiere/Pelorus and Kaituna Rivers is the largest identifiable source of sediment, followed by pine forestry, and sub-soil from slips. Council has recently funded NIWA to take seabed cores from Havelock estuary and Mahau Sound to identify what land-uses contribute to the Te Hoiere/Pelorus and Kaituna inflow.
6. As part of its investigation into the causes and consequences of sedimentation, Council has had an inventory of slips from Sounds roads compiled. A literature review of scientific studies done in the Sounds since the 1970s on the effects of forestry was also completed by Council in 2015: *Mitigating fine sediment from forestry in coastal waters of the Marlborough Sounds* (Figure 4).
7. This report came about following the smothering of seagrass and cockles in Hitaua Bay estuary in 2015 (Figure 4), which was traced back to a harvested forest block. The report recommended an integrated suite of controls to reduce sediment inputs via a mandatory replanting management plan, such as coastal and riparian setbacks, and retirement of steep erosion-prone slopes.
8. Council's Environment Committee in receiving that report on 1 December 2015 made the following decision: *That a separate analysis on the effect and feasibility of harvesting methods on soil conservation and water quality is prepared for the Regional Planning and Development Committee.*
9. Council staff worked with the then-Environment Committee Chair to develop a research brief. This expanded to include the economic trade-offs of proposed setback options on production and environmental values.
10. SCION (NZ Forest Research Institute) is the Crown Research Institute that holds the expertise on forest resource economics and non-market valuation of ecosystem services. SCION was commissioned under the MBIE's Envirolink science transfer scheme to undertake the research.
11. To more fully understand the implications of potentially applying stricter planning controls on forestry in the Sounds, SCION were asked to use the best available spatial, economic and environmental information to report on:
  - i. The economic trade-offs of the proposed setback options on production and environmental values.

- ii. The potential effects of a selection of different harvesting approaches on sediments produced in forest areas adjacent to the marine environment, and the relative economic costs involved.



Figure 3: Satellite image from February 2016. Other imagery shows this is not unusual even after moderate rainfall. Note that the Wairau River contributes sediment to the Cook Strait side of Tory Channel/Kura Te Au and outer Queen Charlotte/Tōtaranui.



Figure 4: Council report on mitigating sediment into the Sounds (L). Smothering of Hitaua Bay estuary in 2015 (R)

## Comments

- 12. Forestry is a significant land use in the Marlborough Sounds, covering over 17,000 hectares (Figure 5). Large areas can be harvested at any one time, increasing the risk of sediment entering coastal waters. These remain exposed for a number of years before a new crop establishes.
- 13. Setbacks provide a number of environmental benefits by reducing fine sediment inputs into the Sounds and are anticipated to lead to healthier seabed environments, with benefits to biodiversity and fisheries. Setbacks also reduce the chances of damage occurring to the foreshore (Figure 6).
- 14. The SCION report evaluated the three setback options from the coast discussed in the Council review of forestry sedimentation: 30 m, which is the distance specified in the National Environmental Standard for Plantation Forestry (NES-PF); 100 m, often cited as a desirable setback as seen in Yncyca Bay in Pelorus Sound/Te Hoiere (Figure 7); and 200 m, which is the zone of most erodible soils in the Sounds. Setbacks would be applied at the time of replanting after harvest.



15. SCION analysed the relative environmental benefits of different setbacks on sediment reduction and carbon sequestration. They calculated economic costs of these in terms of employment and revenue using a Forest Investment Framework that included non-market ecosystem services.

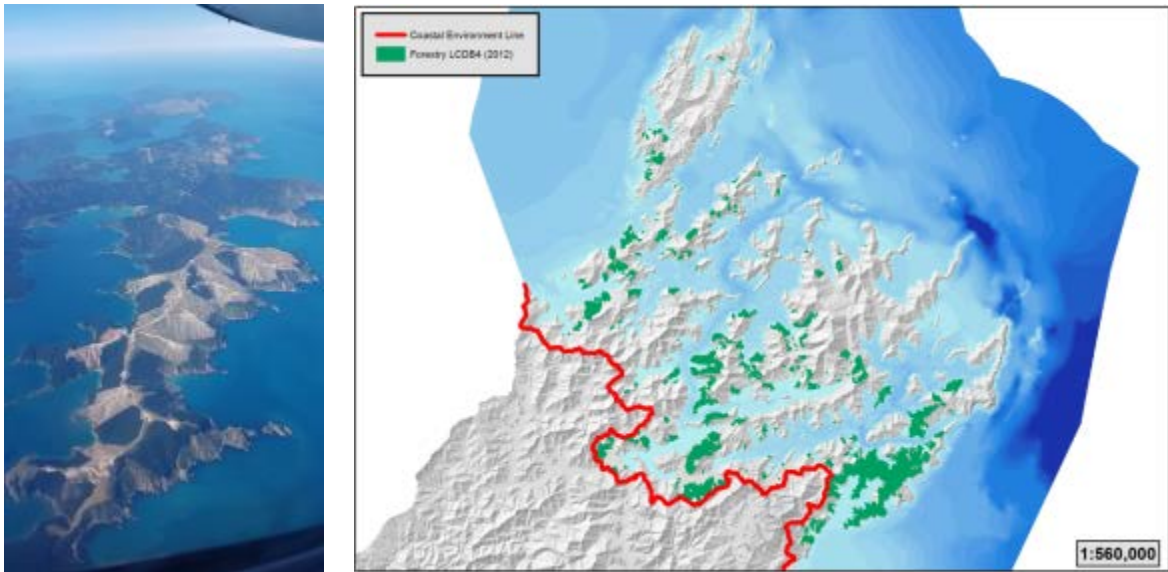


Figure 5: Port Underwood 2012 (L); Location of pine forest blocks in the Marlborough Sounds 2015 (R).

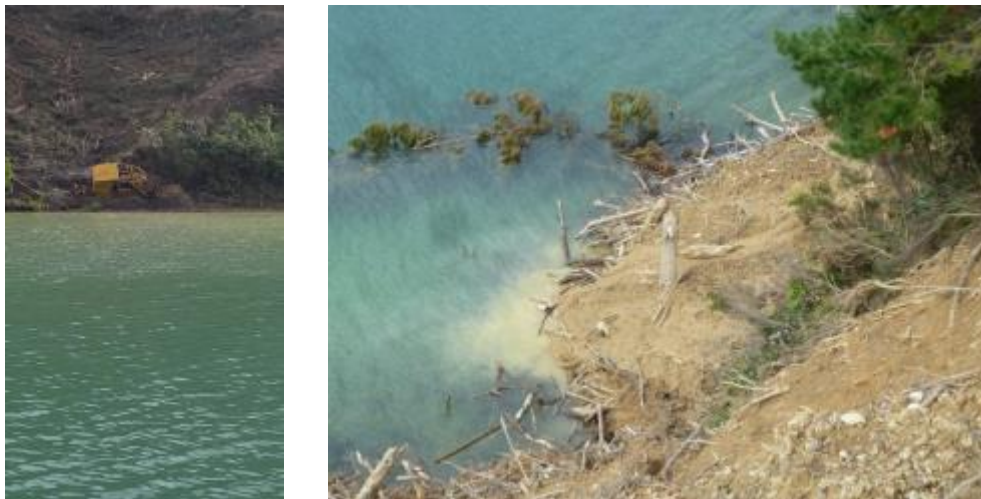


Figure 6: Some recent examples of avoidable sedimentation from forestry activities into the Sounds.

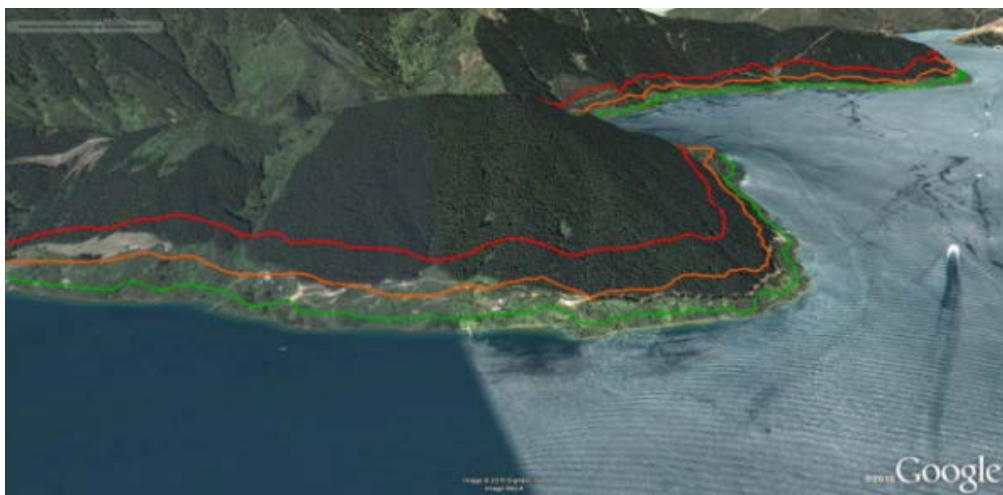


Figure 7: Setback lines projected in Yncyca Bay, Pelorus Sound/Te Hoiere: green 30 m (per the NES-PF), orange 100 m is more or less the existing setback, and red is the 200 m line corresponding with the most developed soils.

### Analysis of coastal setback benefits

16. SCION found support from the literature for Council's technical report, that an integrated suite of mitigation measures will be most effective in reducing fine sediment, via a planned approach to replanting. This includes putting in setbacks and retiring the most-erosion prone steep landforms.
17. SCION assess that 200 m coastal setbacks will theoretically be the most effective distance in reducing fine sediment into the Sounds. This is because the most highly weathered soils, and therefore most erodible and sediment-producing when deforested, are within 200 m of the coast. However, in the Sounds, no studies have been done to quantify differences in sediment trapping between setbacks.
18. Overseas studies reviewed by SCION indicate that a 30 m setback or greater is usually effective in trapping most of the sediment sources, particularly *diffuse* sediment sources after harvesting. These setbacks may not be as effective in preventing *point* source discharges from slope failures from harvested steep gullies or gully heads, or poorly designed or constructed roads and skid sites.
19. Research in the Sounds has shown that most slope failures that occur under intense rainfall are on slopes over 30° within 200 m of the coast. These slips can be transformed into debris flows as soil and logging slash are discharged into the sea. SCION suggests that 200 m setbacks can remove most of the post-harvest window of risk of landslide generation during high rainfall events.
20. SCION estimate that a 200 m setback will result in an approximate 1% increase in carbon sequestration and 6% in avoided sedimentation. These calculations are derived from models, so the accuracy of the estimations is to be viewed in that light. There are also likely to be tangible benefits to the marine ecology of the Sounds, although SCION did not attempt to model those.

### Analysis of coastal setback costs

21. SCION suggests that 200 m setbacks will result in a loss of approximately 2,850 hectares of production forestry in the Sounds (Table 1). This is an 18% decline in area with a modelled loss of 14 FTEs per year. Some small forestry blocks will become uneconomic to replant (Figure 8), given the high harvest and transport costs associated with forestry in the Sounds.
22. The NES-PF will bring in a 30 m setback for replanting and afforestation when it comes into effect on 1 May 2018. The NES-PF allows for Council to implement greater setbacks, along with other controls such as a mandatory replanting plan, in sensitive receiving environments like the Sounds.
23. Council has yet to consider whether it will apply greater stringency in the Marlborough Environment Plan (MEP). Council Environmental Policy staff will put this to the Committee in 2018. Prior to that, Policy staff will be undertaking a process of comparing the alignment of the Forestry provisions in the MEP with those that will come into force with the NES-PF.
24. Should Council apply greater stringency, it will take a generation to fully see the benefits of reduced sediment loads, as replanting controls are implemented when forests are progressively harvested. New jobs may be created in tourism and recreation as coastal water quality and ecology improve.

Coastal Setback scenario	Forestry Area (from 17,029 ha)	Proportion reduction of area	Proportion reduction in modelled forest returns	Number of estimated in Full-Time Equivalent (FTEs)
<b>30 m as per the NES-PF</b>	16,819	2%	1.3%	87.1
<b>100 m</b>	15,929	8%	5.8%	82.5
<b>200 m</b>	14,179	18%	15.9%	73.4

**Table 1: Modelled consequences of implementing coastal setbacks on forestry area in hectares (ha); proportionate reduction in area and monetary returns; and indicative number of equivalent full-time workers in Sounds forestry. NES-PF = National Environmental Standard for Plantation Forestry to come into force 1 May 2018.**

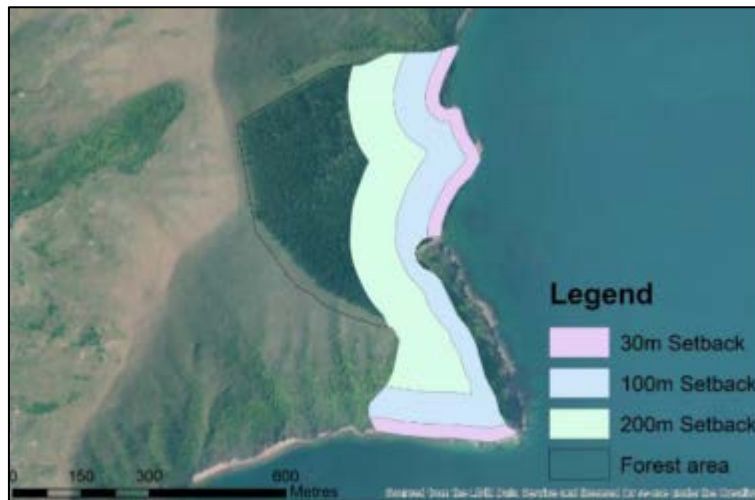


Figure 8: Estimated loss of area after implementation of different setbacks for a small Sounds forestry block.

*Harvesting techniques to reduce sedimentation*

25. The second part of the SCION report deals with different harvesting systems. They suggest that the use of cable hauler systems (Figure 9) should be the predominant form of harvesting in the Sounds. This is because of steep slopes, roading location, roading construction difficulty/costs, and poor soil bearing capacity to support a weight of large tracked excavators that harvest trees. Ground-based harvesting systems are preferred by foresters as they are cheaper than haulers, although this method can also lead to a greater level of soil disturbance on steep slopes (Figure 10).



Figure 9: (L) Large tower hauler, suitable for large settings and long haul distances on steep terrain (photo: SCION). (R) Forest harvested predominantly by hauler, Yncyca Bay, Pelorus Sound/Te Hoiere, June 2016.



Figure 10: (L) Winch assisted feller-buncher – mechanised tree felling on steep terrain (photo: SCION). (R) Forest harvested by ground-based machines, Mud Bay, Pelorus Sound/Te Hoiere, November 2016.

26. Council does not currently have planning controls specifying what harvesting techniques should be used in different situations within the Sounds. This is looked at within individual consent applications. This may be worth revisiting as part of the development of a package of more stringent controls to reduce sedimentation into the Sounds.
27. SCION has also looked at the consequences of setback implementation (Table 2). Existing roads and skid sites may need to be altered, incurring additional costs. Government has anticipated this by requiring foresters to adapt to 30 m setback once the NES comes into effect.
28. The key bone of contention for greater setback distances will be the inability to replant the large area from 30 m out to 100 m or 200 m for soil conservation and water quality purposes.

<b>Impact of 30 m setback</b>	<b>Consequences of 30 m setback</b>	<b>Impacts of 100/200 m setback</b>	<b>Consequences of 100/200 m setback</b>
Reduced haul setting area	More frequent harvesting system moves (take down/assembly), leading to higher harvesting costs	Significantly reduced haul setting area	Owner's losses – inability to replant. Remaining forest volume may be un-economic to log in some circumstances.
Reduced haul distance	Faster cycle times	May substantially affect harvesting options and plans	Existing infrastructure may no longer be optimal
Changed deflection – slope shape	Smaller average extracted loads/larger loads	Changed deflection – slope shape	Smaller average extracted loads/larger loads
Changed setting shape	Relocation of existing skid sites	Changed setting shape	Relocation of existing skid sites
Different harvesting system(s) required	Taller hauler towers/or shorter towers/smaller yarders	Different harvesting system(s) required	Taller hauler towers/or shorter towers/smaller yarders
Less area harvested per unit of roading & skid construction	Higher roading component	Less area harvested per unit of roading & skid construction	Higher roading component

**Table 2: Potential primary effects of setbacks on forestry operations (reproduced from Table 6 of the SCION report).**

## Summary

29. Council's Environment Committee requested further analysis of the effects of setbacks and harvesting methods in 2015, following a technical review of the causes and consequences of fine sediment deposition into the Marlborough Sounds. SCION has prepared a report which confirms Council's technical advice that a 200 m coastal setback will bring the greatest environment benefit in terms of coastal water quality. SCION have attempted to quantify this through calculating the increase in carbon sequestration and avoided sedimentation. The report also examines the economic costs of 30 m, 100 m, and 200 m setbacks in terms of reduced returns and employment, as well as the effects on existing infrastructure from implementation of setbacks following harvest.

## RECOMMENDED

1. **That the report be received.**
2. **That the report informs the Marlborough Environment Plan.**