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Wood Availability Forecast – Nelson and Marlborough 2021

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PREFACE

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We trust our report proves useful to you and we would be pleased to provide assistance to you again on future assignments.

ashell

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- Appendix 2 Nelson Wood Availability Forecasts from 2021 to 2060

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1 INTRODUCTION

This report presents the findings of a wood availability study for the Nelson and Marlborough planted exotic forest estate. This is based on the Ministry for Primary Industries (MPI) National Exotic Forest Description (NEFD) as at 1 April 2020 which was rolled forward to January 2021. The forecasts then project annualised woodflows for 40 years thereafter. The study was commissioned by MPI with support from the major plantation forest owners in the region. The modelling, analysis, and report preparation for the study was undertaken by Margules Groome Consulting Ltd (Margules Groome).

Margules Groome prepared four scenarios for radiata pine wood availability and one for Douglas-fir availability. The scenarios indicate how the forest resource in each of the Nelson and Marlborough regions could be harvested from 2021 to 2060. The scenarios are based on the NEFD data which shows the available standing resource and potential yield for each stand. This was modelled to forecast regional log yield subject to a series of forecasting assumptions. Only radiata pine and Douglas-fir were included in the scenarios and wood availability forecasts. The forecasts for other exotic tree species are not included in the regional availability forecasts but are included in the New Zealand national forecast.

The forecasts incorporate the harvesting intentions of the region's large-scale forest owners. Large-scale owners are defined as exotic plantation owners:

- with 3 000 ha or more of forest in the region of interest; and
- with more than three age classes; and
- not a part of a syndicate.

In some regions, particularly those with only a few large-scale owners, some forest owners with just under 3 000 ha were also included.

In addition, discussions with forest managers and consultants were held to ensure the scenarios represented a realistic range of future wood availability.

The scenarios clearly show there are different ways for the regional resource to be harvested. The timing of each forest harvest is driven by a range of factors, including individual forest owner's objectives, forest age, log prices, demand by local wood processing plants, and perceptions about future log prices and future wood supply. A model can only predict how woodflows may occur subject to assumptions that drive individual forest harvest.

In examining the scenarios, it is important to recognise that forests are normally managed in a way that maximises the benefits to the owners, and such benefits are not easily modelled particularly as prevailing market conditions will change. Each owner has their own harvesting strategy based on the woodflow objectives and forest revenue. Any change in harvesting strategies by forest owners affects the age structure and maturity of the forests they own. This in turn feeds back into future wood availability.



A key issue is the timing of harvesting by small-scale forest owners. The harvest age can vary markedly, even between neighbouring properties. While the volumes forecasted by larger forest owners are subject to alteration because of changes in harvesting intentions or changes in the resource description (for example, areas and yields), a higher level of confidence can generally be assumed for these owners than for the small-scale owners. Harvest intentions are less clear for small-scale owners who are more reactive, and resource descriptions tend to be less accurate.





2 SCENARIOS

Four wood availability scenarios have been modelled for radiata pine for each region and one for Douglas-fir for the Nelson and Marlborough region. These scenarios show the range of potential ways the forests in each region could be harvested in the future.

The scenarios were developed by the NEFD Steering Committee. Margules Groome undertook initial modelling of the scenarios, and these were presented to the major forest owners and consultants in the Nelson and Marlborough wood supply region. Their feedback was considered in the final derived profiles.

There are around 2 914 ha of species other than radiata pine and Douglas-fir in the Nelson and Marlborough region. The volumes from these species are not included in the regional wood availability forecasts but are included in a national forecast.

2.1 Scenario 1: Large-scale Owners Harvest at Stated Intentions, Small-scale Owners Harvest at Age 27

Large-scale owners' wood availability is based on stated harvest intentions for the period 2021 to 2031 (calendar year estimates, 11-years only). After 2031, the modelling assumption is that the wood availability from large-scale owners will not decrease and the target rotation age is 27. Small-scale owners are assumed to harvest their forest holdings at age 27.

2.2 Scenario 2: Non-declining Yield (NDY) – Target Rotation 27 Years

Large-scale owners' wood availability is assumed to be at stated harvest intentions for the period 2021 to 2031. From 2031, the wood availability from large-scale owners is assumed not to decrease (as for Scenario 1). The total wood availability of radiata pine is also assumed to not decrease.

2.3 Scenario 3: Split NDY – Target Rotation 27 Years

This is the same as Scenario 2 except that the total wood availability of radiata pine from the region is allowed to increase and decrease by the following amounts for the given periods for each sub-region:

Table 2-1: Nelson Constraints

Year	Large-scale Owners	All
2021-2028	Harvest intentions	NDY with max 300 000 m ³ increase/decrease
2028-2030	Harvest intentions	Max 300 000 m ³ increase/decrease
>2030	NDY	NDY





Table 2-2: Marlborough Constraints

Year	Large-scale Owners	All
2021-2028	Harvest intentions	NDY with max 300 000 m ³ increase/decrease
2028-2032	Harvest intentions	300 000 m ³ increase/decrease
>2032	NDY	NDY

2.4 Scenario 4 (A & B): Target Rotation Age Variations

These are the same as Scenario 3 except in Scenario 4A the target rotation age is decreased by two years and in Scenario 4B it is increased by two years.

2.5 Scenario for Douglas-fir

The large-scale owners' resources are harvested at stated intentions up until 2031. After 2031, the wood availability from large-scale owners is modelled in a five-year period non-declining yield (NDY) block (i.e. 2031-2035, 2036-2040, etc). The total wood availability of the combined estate is also modelled to be non-declining within each of the five-year period NDY blocks. The harvest level for the first five-year NDY block is set to be the same as in 2031. The total wood availability from clearfell and production thinning operations can change by 100 000 m³ per year for the large-scale owners' estate and by 150 000 m³ per year for the combined estate. The target rotation is 35 years for the Douglas-fir stands.

2.6 Discussion of Radiata Pine Scenarios

In Scenario 1, the forests owned by small-scale owners are assumed to be harvested at age 27. The scenario shows the "potential" availability of mature forest from small-scale owners in any given year. This scenario directly reflects the area of forest in the small ownership category in each age class in the Nelson and Marlborough region. For practical reasons, it is unlikely that the future harvesting would occur this way. The intention of this scenario is to show the potential magnitude of harvesting under favourable market conditions in any given year.

Scenarios 2 and 3 are based on yield regulation and avoid the large year-to-year fluctuations in volume seen in Scenario 1. Yield regulation refers to where, when, and how these recoverable volumes should be extracted, and provides a more orderly harvesting volume profile that, to some degree, reflects logistical and market constraints. Under Scenario 2, the future harvesting is constrained to be non-declining (where possible): that is, each year the volume must either be the same or higher than in the previous year. However, this can lead to large fluctuations in the average rotation ages and is unlikely to be a realistic outcome.

The constraints placed on Scenario 3 are designed to keep the average rotation age close to the target rotation age while maintaining a more realistic flow of wood.

A fundamental property of the forests in Nelson and Marlborough (like many regions in New Zealand) is the large area of forests established during the early 1990s, followed by very little new planting after that period. The remaining forest



area planted during the 1990s has now either been harvested or will be harvested in the next five to seven years. This is leading to record harvest levels in most regions. Once this harvesting has been completed, Scenario 3 lets the volume decline again.

The main limitation of all scenarios is that log prices and other market factors are a significant determinant of harvesting in any given year. When log prices go up, harvesting will generally increase. When log prices fall, the level of harvesting will generally decrease. It is beyond the scope of this analysis to predict future log prices, yet it is important to note how prevailing market conditions will be a significant determinant in how the actual woodflows occur.





3 DATA AND METHODOLOGY

3.1 Development of Forest Areas

The forest areas were primarily sourced from the NEFD as at 1 April 2020.

A mapping study carried out by the University of Canterbury in 2019 for Nelson and Marlborough¹ showed that the small-scale owners' resource NEFD area was overstated for Marlborough and understated for Nelson(specifically those with less than 1 000 ha). Of the small-scale owners with less than 1 000 ha, the study showed the mapped area for the Nelson was 106% of the area reported in the NEFD, and the mapped area for the Marlborough was 94% indicating only a slight anomaly.

The likely error in the NEFD comes from data on forest owners with less than 40 ha. These owners were not surveyed in the NEFD process; instead, data for these forests is collected from three sources:

- 1. New planting imputations from 1992 to 2006.
- 2. A survey of small forest growers from 2004.
- 3. Forests previously surveyed for the NEFD but which have dropped to below 40 hectares.

The Nelson and Marlborough region has a large portion of the area (~14%) which is assigned as either "new planting imputations" or from the "2004 Small Forest Owner Survey"; both were designed at the time to improve the accuracy of the NEFD.

The new planting imputation was estimated by subtracting the known new area planting (in the NEFD survey) from an estimate of total new planting calculated from the annual MPI nursery survey. The estimated new planting was calculated by dividing a nominal planting stocking (for radiata plantation development) into the total number of seedlings sold.

In 2004, AsureQuality ran a survey of small forest owners with less than 40 ha (2004 Small Forest Owner Survey). The survey results were subsequently included in the NEFD area statement alongside the New Planting Imputation.

It is Margules Groome's understanding that the NEFD does not currently have a process for harvesting and replanting of these areas as would typically occur in forest management. As such, these NEFD areas remain unchanged from 2004 which is highly unlikely in reality.

While much further work is required to improve the accuracy of small-scale forest ownership in New Zealand, to improve the area description for the purpose of wood availability forecasting in the Nelson and Marlborough region, Margules Groome has made the following adjustments:

1. The "New Planting Imputations" and "2004 Small Forest Owner Survey" areas have been modified slightly so that the total area of the small-scale owners'

¹ Manley, B., Morgenroth, J., Xu, C. Map of the small-scale forest estate of New Zealand. New Zealand Journal of Forestry, May 2021, Vol 66, No. 1.





resource less than 1 000 ha is 106% (Nelson) and 94% (Marlborough) of the area of the reported NEFD as at 1 April 2020.

2. All standing forests derived from "New Planting Imputations" and "2004 Small Forest Owner Survey" with an age equal to or greater than 24 years were assumed to be harvested and removed from the NEFD data. The residual area (less 3.3% (Nelson) and 2.1% (Marlborough) deforestation²) was assumed to have been replanted in equal amounts over the last five years.

The area for the small-scale owners with area between 1 000 ha and 3 000 ha, and large-scale owners was unadjusted for the purpose of modelling.

3.2 Development of Yield Tables

The 2015 NEFD yield tables were used for the wood availability forecasts. These yield tables supplied by MPI were originally developed in the following way:

- Large-scale forest owners provided yield tables for their forest estates.
- The large-scale owner yield tables were averaged on an area-weighted basis to derive regional yield tables for each crop-type.
- The area-weighted average regional yield tables for "old" radiata pine (planted before 1990), and Douglas-fir were calibrated to match the harvest intentions data provided by large-scale owners. The assumption is that the harvest intentions data is the most accurate information available, as it is based predominantly on detailed inventory.
- The area-weighted average regional yield tables for "young" radiata pine croptypes (planted in 1990 and later) were adjusted based on consultation with large-scale owners.
- The area-weighted average regional yield tables developed for the large-scale owners' estate were applied to the small-scale forest owners' estate under the assumption that large-scale owner data is regionally representative across all sizes of forest owner.

As part of these forecasts, the 2015 NEFD yield tables were calibrated against the yields (m^3/ha) calculated from the large-scale owners' harvest intentions. In the case of Nelson and Marlborough, no adjustments were made to the 2015 NEFD yield tables.

² The deforestation assumption was sourced from the 2015-2016 Ministry for the Environment deforestation mapping report (Ministry for the Environment. 2018. Deforestation Mapping 2015 & 2016 – Final Report. Submitted by Indufor Asia Pacific for the Ministry for the Environment).



3.3 Large-scale Owners' Harvest Intentions

Large-scale owners were asked to provide details of their projected harvest volumes for all species for the period 2021 to 2041. The survey specifically asked for:

- Radiata pine:
 - Domestic grades pruned, unpruned, pulp
 - Export grades A, K, KI, KIS
 - Split by pruned/unpruned area if possible
- Other Species:
 - Douglas-fir domestic and export grades
 - Other Softwoods and Hardwood: Sawlog, pulp
- Additional questions to assist with modelling

The area covered by the large-scale owners covered 60% of the total NEFD area. Inclusion of the actual levels of intended harvest by the large-scale owners is considered a critical step, as it provides the best estimate of future wood availability for the first twenty years (2021-2041) of the forecast horizon.



3.4 Modelling Assumptions

In addition to the modelling assumptions specific to each scenario, the wood availability forecast for the Nelson and Marlborough region is based on the following modelling assumptions:

- Radiata pine area in the large-scale owners' estate aged over 35 years is assumed to be non-commercial and therefore will not be harvested.
- Radiata pine area in the small-scale owners' estate aged over 40 years is assumed to be non-commercial and therefore will not be harvested.
- Douglas-fir area in all estates aged over 60 years is assumed to be noncommercial and therefore will not be harvested.
- A downwards adjustment of 5% was applied to all areas aged 1 to 4 to reflect losses in stocked area due to factors such as erosion, slips, and various setbacks.
- An area awaiting restocking of 5 284 ha (Nelson) and 1 614 ha (Marlborough) is added to the model area based on MPI data. All areas are replanted, with a regeneration lag of one year. Replanting rules are as follows:
 - Large-scale forest owners:
 - One hundred percent of all pruned areas will be replanted to an unpruned regime.
 - Ten percent of Douglas-fir areas are replanted into Douglas-fir and 90% is replanted into radiata pine.
 - Small-scale forest owners:
 - Ten percent of all pruned areas will be replanted as a pruned regime with 90% transferring to an unpruned regime.
 - Ten percent of Douglas-fir areas are replanted into Douglas-fir and 90% is replanted into radiata pine.
- The total harvest for 2021 has been constrained to be no greater than 3.31 million m³.
- The model assumes no future afforestation and deforestation.





4 WOOD AVAILABILITY FORECASTS FOR NELSON

4.1 Nelson Region Area Description

The Nelson region has a plantation resource of 90 657 ha. Of this, 83 433 ha consists of radiata pine, and 5 411 ha of Douglas-fir – as reported by the NEFD as at 1 April 2020. After adjustments are applied to the NEFD area (see Section 3.4), the modelled area reduces to 90 227 ha.

The modelled resource consists entirely of radiata pine and Douglas-fir. Figure 4-1 shows the age-class distribution for the Nelson estate by owner size. Large-scale owners held 71% of the modelled resources, and small-scale owners held 29%.



Figure 4-2 shows the age-class distribution for the Nelson region by species. Only 17% is recorded as managed under a pruned regime. No production thinning is undertaken in the Nelson region.







Figure 4-1: Nelson Modelled Age-class Distribution for All Species









4.2 Scenario 1

In Scenario 1, large-scale owners are modelled to harvest according to their stated intentions and small-scale owners are modelled to harvest their forests at age 27. Figure 4-3 shows the age-class distribution for the Nelson radiata pine estate for both large-scale and small-scale owners combined.

The wood availability from all owners in Nelson under Scenario 1 is presented in Figure 4-4. The estate has the potential to generate a substantial increase in the amount of wood available in the next years, all of which is coming from the small-scale owner resource. This volume reduces substantially as the large plantings from the 1992 to 1995 period are harvested.













4.3 Scenario 2

Figure 4-5 shows the radiata pine availability for all owners under Scenario 2. The sustainable yield under a non-declining yield constraint for the Nelson region is just over 1.75 million m³ per year for the first 19 years of the forecast increasing to just over 2 million m³ in 2040.









Figure 4-6 shows that the harvest age varies from the target rotation of 27 under the constraints of Scenario 2.





The harvest volume forecast under Scenario 2 is shown by log grade in Figure 4-7.







Figure 4-7: Nelson Radiata Pine Availability by Log Grade under Scenario 2

4.4 Scenario 3

The Scenario 3 model assumes large-scale owners' resources are harvested in-line with their harvesting intentions between 2021 and 2031, and then a non-declining yield constraint is applied after 2031. The total yield for all owners has been regulated in a manner that tries to maintain the target rotation age for both ownership types at around 27 years.

Figure 4-8 shows the radiata pine availability from all owners. The total volume increases to around 2 million m³ per year for five years, then drops to around 1.5-1.7 million m³ for a period of thirteen years. The volume then increases back up to a sustainable annual cut of just under 2 million m³.

Figure 4-9 shows the radiata pine average clearfell age by ownership. Under this scenario the average rotation age of small-scale owners' resource is maintained closer to the target rotation than in Scenario 2.











Figure 4-10 shows the radiata pine availability by log grade for all owners. The Nelson region has very little pruned area left, most of the pruned volume will be harvested by 2029.







Figure 4-10: Nelson Radiata Pine Availability by Log Grade under Scenario 3

4.5 Scenario 4

In Scenario 4, target rotation ages of 25 or 29 years are used, and the same constraints are applied as in Scenario 3. Figure 4-11 shows the woodflows for the three different target rotations ages are not significantly different. The older target rotation age results in a slight delay in volume harvested (as expected), particularly in the first five years. Likewise, a younger rotation age results in an earlier recovery from woodflow decline. The older target rotation age scenario allows the harvest to increase back to a sustainable level of around 2 million m³ approximately eight years earlier than the other rotation ages.







4.6 Douglas-fir

The area of Douglas-fir in the Nelson region is 5 411 ha. The age-class distribution of Douglas-fir in the Nelson is shown in Figure 4-12. The model requires 90% of the Douglas-fir area to be replanted into radiata pine.

The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2021 to 2031. From 2032, the wood availability is kept at a constant volume for five-year periods, between the five year periods the volume for large-scale owners' can decrease or increase by up to 100 000 m³ and total volume by 150 000 m³ (Figure 4-13).

The target rotation age is 35 years for both small-scale and large-scale owners of Douglas-fir. The average clearfell age of the Douglas-fir estate in the Nelson region is presented in Figure 4-14.





Figure 4-12:





Figure 4-13: Nelson Douglas-fir Availability





Figure 4-14: Nelson Average Douglas-fir Clearfell Age





5 WOOD AVAILABILITY FORECASTS FOR MARLBOROUGH

5.1 Marlborough Region Area Description

The Marlborough region has a plantation resource of 73 982 ha. Of this, 71 561 ha consists of radiata pine, and 1 320 ha of Douglas-fir – as reported by the NEFD as at 1 April 2020. After adjustments are applied to the NEFD area (see Section 3.4), the modelled area reduces to 72 397 ha.

The modelled resource consists entirely of radiata pine.

Figure 5-1 shows the age-class distribution for the Marlborough estate by owner size. Large-scale owners held 47% of the modelled resources, and small-scale owners held 53%.

Figure 5-2 shows the age-class distribution for the Marlborough region by species. Of the radiata pine area, 41% is recorded as managed under a pruned regime. No production thinning is undertaken in the Marlborough region.

Figure 5-1: Marlborough Modelled Age-class Distribution for All Species











Figure 5-2: Marlborough Modelled Age-class Distribution by Species

5.2 Scenario 1

In Scenario 1, large-scale owners are modelled to harvest according to their stated intentions and small-scale owners are modelled to harvest their forests at age 27. Figure 5-3 shows the age-class distribution for the Marlborough radiata pine estate for both large-scale and small-scale owners combined.

The wood availability from all owners in Marlborough under Scenario 1 is presented in Figure 5-4. The estate has the potential to generate a substantial increase in the amount of wood available next year, coming mostly from the small-scale owner resource. This volume reduces substantially as the large plantings from the 1992 to 1995 period are harvested.









Figure 5-4: Marlborough Radiata Pine Availability under Scenario 1





5.3 Scenario 2

Figure 5-5 shows the radiata pine availability for all owners under Scenario 2. The sustainable yield under a non-declining yield constraint for the Marlborough region is just under 1.5 million m³ from 2021.

Figure 5-5: Marlborough Radiata Pine Availability under Scenario 2



Figure 5-6 shows that the harvest age varies from the target rotation of 27 under the constraints of Scenario 2. The small-scale owners' average rotation age has to increase to around 35 years between 2032 and 2037 to maintain the non-declining yield.







Figure 5-6: Marlborough Average Radiata Pine Clearfell Age under Scenario 2

The harvest volume forecast under Scenario 2 is shown by log grade in Figure 5-7. **Figure 5-7**:

Marlborough Radiata Pine Availability by Log Grade under Scenario 2





5.4 Scenario 3

The Scenario 3 model assumes large-scale owners' resources are harvested in-line with their harvesting intentions between 2021 and 2031, and then a non-declining yield constraint is applied after 2031. The total yield for all owners has been regulated in a manner that tries to maintain the target rotation age for both ownership types at around 27 years.

Figure 5-8 shows the radiata pine availability from all owners. The total volume increases to over 2 million m³ per year for five years, then drops to below 1.0 million m³ for a period of eight years. The volume then increases back up to a sustainable annual cut of 1.5 million m³.

Figure 5-9 shows the radiata pine average clearfell age by ownership. Under this scenario the average rotation age of small-scale owners' resource is maintained closer to the target rotation than in Scenario 2 after 2030.

Figure 5-10 shows the radiata pine availability by log grade for all owners. The Marlborough region has very little pruned area left, most of the pruned volume will be harvested by 2029.

Figure 5-8:

Marlborough Radiata Pine Availability under Scenario 3

















5.5 Scenario 4

In Scenario 4, target rotation ages of 25 or 29 years are used (rather than 27 years) and the same constraints are applied as in Scenario 3. Figure 5-11 shows the woodflows for the three different target rotations ages are similar. The older target rotation age of 29 results in a slight delay in volume harvested (as expected), particularly in the first five years.





5.6 Douglas-fir

The area of Douglas-fir in Marlborough is 1 320 ha. The age-class distribution of Douglas-fir in Marlborough is uneven, as shown in Figure 5-12. The model requires 90% of the Douglas-fir area to be replanted into radiata pine.

The Douglas-fir harvest for the large-scale owners' estate is based on intentions for 2021 to 2031. From 2032, the wood availability is kept at a constant volume for five-year periods, between the five-year periods the volume for large-scale owners' can decrease or increase by up to 100 000 m³ and total volume by 150 000 m³ (Figure 5-13).

The target rotation age is 35 years for Douglas-fir. The average clearfell age of the Douglas-fir estate in the Marlborough region is presented in Figure 5-14.







Figure 5-12: Marlborough Age-class Distribution of Douglas-fir



Figure 5-13: Marlborough Douglas-fir Availability











6

WOOD AVAILABILITY FORECASTS FOR THE COMBINED NELSON AND MARLBOROUGH REGIONS

The combined radiata pine forecasts for Nelson and Marlborough are presented for Scenario 2 (Figure 6-1 and Figure 6-2), Scenario 3 (Figure 6-3 and Figure 6-4) and Scenario 4 (Figure 6-5). The combined scenarios are additive, meaning the results of the Nelson and Marlborough regions are added together to derive the combined results.

6.1 Scenario 2

Scenario 2 is based on a non-declining yield, and a target rotation of 27 years. Figure 6-1 indicates that wood availability in the Nelson and Marlborough region will stay at current levels until 2040, after which it will increase to just under 3.5 million m³.

Figure 6-2 indicates the pruned log type in the Nelson and Marlborough region will almost disappear by 2045.

Figure 6-1:











6.2 Scenario 3

Scenario 3 is based on a range of the constraints placed on the Nelson and Marlborough region separately to try to maintain an average rotation age of 27 years (Figure 6-3 and Figure 6-4). The combined Nelson and Marlborough region can achieve harvest levels of just over 4 million m³ from 2023 to 2027, the harvest level drops to 2.5 million m³ for a period of eight years before increasing up to 3.6 million m³/a.







Figure 6-3: Combined Nelson and Marlborough Radiata Pine Availability under Scenario 3







6.3 Scenario 4

Different wood availability profiles are generated if the target rotation age is altered from 27 years to either 25 or 29 years (Figure 6-5) for the combined Nelson and Marlborough region.

Figure 6-5:

Combined Nelson and Marlborough Radiata Pine Availability by Target Rotation Age under Scenario 4



6.4 Douglas-fir

Figure 6-6 shows the combined Nelson and Marlborough Douglas-fir wood availability. Supply gradually dissipates due to the age-class distribution of the existing resource, and replanting most of Douglas-fir areas into radiata pine.







Figure 6-6: Combined Nelson and Marlborough Douglas-fir Availability





7 COMPARISON TO PREVIOUS FORECAST

The results of the 2021 wood availability forecasts were compared with the previous forecasts (undertaken in 2014) for each region based on Scenario 2 (Figure 7-1 and Figure 7-2) and Scenario 3 (Figure 7-3 and Figure 7-4).

The long-term sustainable cuts under the previous and current forecasts for the Nelson and Marlborough regions under Scenario 2 are very similar. There is a small difference in the Nelson region (Figure 7-1) which could be caused by any number of reasons.



Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 2 – Nelson







Figure 7-2: Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 2 – Marlborough

FINAL

The differences in the Scenario 3 forecasts (Figure 7-3 and Figure 7-4) are most likely caused by the different modelling approaches. The previous forecasts used the same constraints across the whole country regardless of the region's age-class distribution. In the current forecasts the constraints placed on the woodflows varied regionally and were designed to maintain the average rotation age around 27 years.



Figure 7-3:

Wood Availability Forecasts (All Radiata Pine): 2014 vs 2021 under Scenario 3 – Nelson









Table 7-1 and The "Productivity" is the area weight average yield from the yield tables at a reference age. The "Annual Sustainable Harvest" is the annual harvest as determined in Scenario 2. "N/A" indicates where the previous wood availability report does not provide that parameter.

Table 7-2 show variations between the current and previous forecasts for Nelson and Marlborough respectively. The variations include the following:

- In both Nelson and Marlborough there has been an increase in the stocked area. This is due to the adoption of the new percentage adjustments to the forest owners' resource of less than 1 000 ha. In the previous forecast a 15% reduction was applied, this time the Nelson area was increased by 6% and the Marlborough area was decreased by 6% based on the mapping work carried out by the University of Canterbury (refer to Section 3.1).
- There are now greater proportions of the estate described by the higher yielding yield tables derived from stands planted in 1990 and thereafter. Just under 3 464 ha of forest planted before 1990 is now remaining in the Nelson and Marlborough region.
- The radiata pine's target rotation age for the 2014 forecast was 28 years, whereas the target rotation for the 2021 forecast is 27 years. The decrease in rotation age was based on results obtained from the large forest owners harvest intention survey.

Item	2014 WAF	2021 WAF	Change (%)
Stocked Area (ha)	81 647	84 439	3.4
Average Age (years)	N/A	13.9	N/A
Productivity (m ³ /ha at age 28)	620	631	2
Clearfell Age Target (years)	28	27	-3.6
Annual Sustainable Harvest (million m ³)	1.8 to 2	1.7 to 2	0

Table 7-1: Key Differences between 2014 and 2021 WAF – Nelson (Radiata Pine)

The "Productivity" is the area weight average yield from the yield tables at a reference age. The "Annual Sustainable Harvest" is the annual harvest as determined in Scenario 2. "N/A" indicates where the previous wood availability report does not provide that parameter.

Table 7-2: Key Differences between 2014 and 2021 WAF – Marlborough (Radiata Pine)

Item	2014 WAF	2021 WAF	Change (%)
Stocked Area (ha)	63 682	67 443	6
Average Age (years)	N/A	14.9	N/A
Productivity (m ³ /ha at age 28)	591	599	1
Clearfell Age Target (years)	28	27	-3.6
Annual Sustainable Harvest (million m ³)	1.5	1.5	0

The "Productivity" is the area weight average yield from the yield tables at a reference age. The "Annual Sustainable Harvest" is the annual harvest as determined in Scenario 2. "N/A" indicates where the previous wood availability report does not provide that parameter.



8 CONCLUSION

Wood availability under Scenario 3 from the Nelson and Marlborough wood supply region is expected to continue to increase in the next couple of years to a maximum of 4 million m^3/a . This increase is required to complete the harvesting at an average rotation age of around 27 years for the areas planted during the record afforestation years of 1992 to 1995. Once the peak of harvesting has been completed, the volume will likely decrease to a low of around 2.5 million m^3/a then rebound to a sustainable cut of 3.6 million m^3/a . The Nelson wood availability is relatively stable, ranging from 1.6 million m^3/a to 2 million m^3/a . The Marlborough harvest peaks early at 2 million m^3/a , then drops to below 1 million m^3/a before recovering to 1.5 million m^3/a .

Market conditions (e.g. demand from China) and logistical constraints (e.g. trucking and port constraints) will determine the actual rate of harvest increase, and the peak that is reached.

The increase in wood availability in the next couple of years is largely driven by the small-scale owner resource (especially in Marlborough), however, the confidence around the NEFD age-class distribution and area for these owners is low. Margules Groome has made some adjustment to areas of the owners with less than 1 000 ha – this is to account for a recent mapping study showing a likely over-prediction for Marlborough and a likely under-prediction for Nelson of NEFD area for this group of forest owners in the region. This uncertainty will impact the wood availability from the Nelson and Marlborough region, particularly in the short term.



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Appendix 1 - Nelson & Marlborough Wood Availability Forecasts for the Period 2021-2060

Table 1: Nelson & Marlborough Wood Avaliability under Scenario 1

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and target harvest age of 27 years)

Year Ending	Large-Scale	Small-Scale	All
December	Owners	Owners	Owners
	(000 m ³)	(000 m ³)	(000 m ³)
2021	1 131	2 157	3 288
2022	1 324	7 697	9 021
2023	1 315	1 911	3 226
2024	1 480	1 379	2 860
2025	1 500	1 169	2 669
2026	1 860	979	2 839
2027	2 042	1 443	3 485
2028	2 078	759	2 837
2029	2 055	619	2 673
2030	2 014	818	2 831
2031	2 014	749	2 763
2032	2 006	486	2 493
2033	2 061	724	2 784
2034	2 088	433	2 520
2035	2 190	403	2 593
2036	2 190	0	2 190
2037	2 190	301	2 491
2038	2 190	516	2 705
2039	2 190	421	2 611
2040	2 190	359	2 549
2041	2 190	359	2 549
2042	2 190	2 826	5 016
2043	2 190	2 150	4 340
2044	2 190	2 081	4 271
2045	2 190	2 391	4 581
2046	2 190	2 025	4 215
2047	2 190	876	3 066
2048	2 190	586	2 776
2049	2 190	2 053	4 243
2050	2 190	7 154	9 343
2051	2 190	1 997	4 187
2052	2 190	1 467	3 657
2053	2 190	1 238	3 428
2054	2 190	1 014	3 204
2055	2 190	1 511	3 701
2056	2 190	830	3 020
2057	2 190	717	2 907
2058	2 190	873	3 062
2059	2 190	871	3 061
2060	2 190	563	2 753

Notes:

Table 2: Nelson & Marlborough Wood Avaliability under Scenario 2

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and total wood availability is modelled at a non-declining yield)

Year Ending	Large-Scale	Small-Scale	All
December	Owners	Owners	Owners
	(000 m ³)	(000 m ³)	(000 m ³)
2021	1 131	2 110	3 241
2022	1 324	1 917	3 241
2023	1 315	1 926	3 241
2024	1 480	1 761	3 241
2025	1 500	1 742	3 241
2026	1 860	1 381	3 241
2027	2 042	1 199	3 241
2028	2 078	1 164	3 241
2029	2 055	1 187	3 241
2030	2 014	1 228	3 241
2031	2 014	1 228	3 241
2032	1 938	1 303	3 241
2033	2 125	1 117	3 241
2034	2 125	1 117	3 241
2035	2 125	1 117	3 241
2036	2 125	1 117	3 241
2037	2 125	1 117	3 241
2038	2 125	1 117	3 241
2039	2 125	1 117	3 241
2040	2 125	1 355	3 480
2041	2 125	1 355	3 480
2042	2 125	1 355	3 480
2043	2 125	1 355	3 480
2044	2 125	1 355	3 480
2045	2 125	1 355	3 480
2046	2 125	1 355	3 480
2047	2 125	1 355	3 480
2048	2 125	1 355	3 480
2049	2 125	1 355	3 480
2050	2 125	1 355	3 480
2051	2 125	1 355	3 480
2052	2 125	1 355	3 480
2053	2 125	1 355	3 480
2054	2 125	1 355	3 480
2055	2 125	1 355	3 480
2056	2 125	1 355	3 480
2057	2 125	1 355	3 480
2058	2 125	1 355	3 480
2059	2 125	1 355	3 480
2060	2 125	1 355	3 480

Notes:

Table 3: Nelson & Marlborough Wood Avaliability under Scenario 3

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield)

Year Ending	Large-Scale	Small-Scale	All	Pruned	Unpruned	Pulp Logs
December	Owners	Owners	Owners			
	(000 m ³)					
2021	1 131	1 769	2 900	220	1 995	685
2022	1 324	2 175	3 500	476	2 281	742
2023	1 315	2 772	4 087	430	2 739	919
2024	1 480	2 607	4 087	374	2 771	942
2025	1 500	2 587	4 087	500	2 728	859
2026	1 860	2 227	4 087	451	2 737	899
2027	2 042	2 045	4 087	377	2 795	915
2028	2 078	1 409	3 487	241	2 434	812
2029	2 055	1 042	3 096	180	2 186	730
2030	2 014	850	2 864	89	2 066	709
2031	2 014	550	2 564	77	1 861	625
2032	2 054	509	2 564	54	1 883	627
2033	2 195	369	2 564	42	1 879	642
2034	2 195	391	2 585	48	1 899	638
2035	2 195	391	2 585	31	1 919	635
2036	2 195	391	2 585	10	1 915	660
2037	2 195	391	2 585	33	1 891	662
2038	2 195	469	2 664	53	1 937	673
2039	2 195	983	3 178	67	2 309	801
2040	2 195	1 441	3 636	82	2 613	941
2041	2 195	1 441	3 636	176	2 576	884
2042	2 195	1 441	3 636	112	2 621	902
2043	2 195	1 441	3 636	186	2 608	842
2044	2 195	1 441	3 636	152	2 632	853
2045	2 195	1 441	3 636	21	2 697	917
2046	2 195	1 441	3 636	90	2 625	921
2047	2 195	1 441	3 636	1	2 695	940
2048	2 195	1 441	3 636	12	2 707	916
2049	2 195	1 441	3 636	10	2 723	902
2050	2 195	1 441	3 636	18	2 674	944
2051	2 195	1 441	3 636	23	2 703	909
2052	2 195	1 441	3 636	15	2 700	921
2053	2 195	1 441	3 636	16	2 699	921
2054	2 195	1 441	3 636	20	2 680	935
2055	2 195	1 441	3 636	20	2 704	911
2056	2 195	1 441	3 636	10	2 682	944
2057	2 195	1 441	3 636	8	2 681	947
2058	2 195	1 441	3 636	37	2 677	922
2059	2 195	1 441	3 636	68	2 682	886
2060	2 195	1 441	3 636	5	2 725	906

Notes:

Table 4: Nelson & Marlborough Wood Avaliability under Scenario 4

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield with target rotation ages of 25, 27 and 29 years)

Year Ending	Recoverable	Average	Recoverable	Average	Recoverable	Average
December	Volume Target	Age	Volume Target	Age	Volume Target	Age
	Age 25 (000 m ³)	(Years)	Age 27 (000 m ³)	(Years)	Age 29 (000 m ³)	(Years)
2021	2 892	28	2 900	28	2 900	30
2022	3 492	28	3 500	28	3 283	29
2023	4 092	27	4 087	28	3 583	29
2024	4 212	27	4 087	28	3 713	29
2025	4 212	28	4 087	30	3 713	29
2026	4 212	28	4 087	29	3 713	29
2027	4 212	29	4 087	29	3 713	29
2028	3 612	27	3 487	29	3 296	29
2029	3 035	27	3 096	28	3 344	29
2030	2 735	27	2 864	27	3 044	29
2031	2 435	27	2 564	27	2 788	29
2032	2 435	25	2 564	27	2 971	29
2033	2 435	25	2 564	27	2 971	29
2034	2 435	26	2 585	28	2 975	29
2035	2 435	26	2 585	28	3 143	29
2036	2 435	25	2 585	27	3 351	29
2037	2 435	25	2 585	27	3 351	28
2038	2 435	26	2 664	27	3 351	28
2039	2 435	26	3 178	27	3 351	29
2040	3 416	28	3 636	26	3 351	28
2041	3 416	26	3 636	28	3 486	28
2042	3 416	26	3 636	28	3 486	29
2043	3 416	26	3 636	29	3 560	28
2044	3 416	26	3 636	29	3 560	28
2045	3 416	26	3 636	28	3 560	28
2046	3 416	26	3 636	27	3 567	29
2047	3 416	27	3 636	27	3 610	29
2048	3 416	26	3 636	28	3 610	29
2049	3 416	26	3 636	29	3 610	29
2050	3 416	26	3 636	27	3 610	29
2051	3 416	26	3 636	28	3 610	29
2052	3 416	25	3 636	28	3 610	29
2053	3 416	25	3 636	28	3 610	29
2054	3 416	25	3 636	28	3 610	29
2055	3 416	28	3 636	29	3 610	29
2056	3 416	27	3 636	27	3 610	29
2057	3 416	29	3 636	27	3 610	29
2058	3 416	27	3 636	28	3 610	29
2059	3 416	27	3 636	29	3 610	29
2060	3 416	27	3 636	28	3 610	29

Notes:

Table 5: Nelson & Marlborough Wood Avaliability for Douglas-fir

(Assumes that large-scale owners harvest at stated intentions with yield regulated and a target rotation age of 35 years)

Year Ending	Large-Scale	Small-Scale	All	Average
December	Owners	Owners	Owners	Age
	(000 m ³)	(000 m ³)	(000 m ³)	(Years)
2021	180	77	257	45
2022	256	43	299	40
2023	266	0	266	40
2024	246	0	246	39
2025	202	0	202	40
2026	193	0	193	39
2027	189	5	194	38
2028	198	50	248	38
2029	185	48	233	37
2030	157	68	225	37
2031	157	68	225	36
2032	157	68	225	37
2033	157	68	225	37
2034	157	68	225	36
2035	61	32	92	36
2036	61	32	92	37
2037	61	32	92	37
2038	61	32	92	38
2039	61	32	92	37
2040	0	10	10	37
2041	0	10	10	35
2042	0	10	10	35
2043	0	10	10	36
2044	0	10	10	38
2045	6	4	11	35
2046	6	4	11	36
2047	6	4	11	37
2048	6	4	11	38
2049	6	4	11	40
2050	14	27	41	40
2051	14	27	41	36
2052	14	27	41	37
2053	14	27	41	38
2054	14	27	41	38
2055	1	3	4	41
2056	1	3	4	37
2057	1	3	4	35
2058	1	3	4	35
2059	1	3	4	36
2060	71	0	71	36

Appendix 2 - Nelson Wood Availability Forecasts for the Period 2021-2060

Table 1: Nelson Wood Avaliability under Scenario 1

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and target harvest age of 27 years)

Year Ending	Large-Scale	Small-Scale	All
December	Owners	Owners	Owners
	(000 m ³)	(000 m ³)	(000 m ³)
2021	782	548	1 330
2022	842	3 179	4 021
2023	782	878	1 660
2024	923	339	1 262
2025	983	630	1 614
2026	1 074	556	1 630
2027	1 138	558	1 696
2028	1 228	274	1 501
2029	1 263	282	1 545
2030	1 344	400	1 743
2031	1 439	404	1 843
2032	1 483	197	1 680
2033	1 483	347	1 830
2034	1 483	182	1 665
2035	1 483	251	1 734
2036	1 483	0	1 483
2037	1 483	168	1 651
2038	1 483	268	1 752
2039	1 483	151	1 634
2040	1 483	158	1 641
2041	1 483	136	1 619
2042	1 483	1 248	2 731
2043	1 483	719	2 202
2044	1 483	951	2 434
2045	1 483	1 170	2 653
2046	1 483	1 084	2 567
2047	1 483	537	2 021
2048	1 483	34	1 518
2049	1 483	544	2 027
2050	1 483	3 122	4 605
2051	1 483	927	2 410
2052	1 483	380	1 864
2053	1 483	665	2 148
2054	1 483	575	2 058
2055	1 483	586	2 069
2056	1 483	331	1 814
2057	1 483	359	1 842
2058	1 483	438	1 922
2059	1 483	508	1 992
2060	1 483	243	1 726

Notes:

Table 2: Nelson Wood Avaliability under Scenario 2

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and total wood availability is modelled at a non-declining yield)

Year Ending	Large-Scale	Small-Scale	All
December	Owners	Owners	Owners
	(000 m ³)	(000 m ³)	(000 m ³)
2021	782	990	1 772
2022	842	930	1 772
2023	782	990	1 772
2024	923	849	1 772
2025	983	789	1 772
2026	1 074	698	1 772
2027	1 138	634	1 772
2028	1 228	544	1 772
2029	1 263	509	1 772
2030	1 344	428	1 772
2031	1 439	333	1 772
2032	1 415	357	1 772
2033	1 415	357	1 772
2034	1 415	357	1 772
2035	1 415	357	1 772
2036	1 415	357	1 772
2037	1 415	357	1 772
2038	1 415	357	1 772
2039	1 415	357	1 772
2040	1 415	595	2 010
2041	1 415	595	2 010
2042	1 415	595	2 010
2043	1 415	595	2 010
2044	1 415	595	2 010
2045	1 415	595	2 010
2046	1 415	595	2 010
2047	1 415	595	2 010
2048	1 415	595	2 010
2049	1 415	595	2 010
2050	1 415	595	2 010
2051	1 415	595	2 010
2052	1 415	595	2 010
2053	1 415	595	2 010
2054	1 415	595	2 010
2055	1 415	595	2 010
2056	1 415	595	2 010
2057	1 415	595	2 010
2058	1 415	595	2 010
2059	1 415	595	2 010
2060	1 415	595	2 010

Notes:

Table 3: Nelson Wood Avaliability under Scenario 3

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield)

Year Ending	Large-Scale	Small-Scale	All	Pruned	Unpruned	Pulp Logs
December	Owners	Owners	Owners			
	(000 m ³)					
2021	782	622	1 404	76	1 014	314
2022	842	862	1 704	187	1 169	348
2023	782	1 222	2 004	143	1 426	435
2024	923	1 081	2 004	180	1 384	440
2025	983	1 020	2 004	207	1 367	429
2026	1 074	930	2 004	197	1 378	429
2027	1 138	865	2 004	183	1 389	432
2028	1 228	476	1 704	82	1 232	390
2029	1 263	350	1 613	56	1 184	373
2030	1 344	337	1 680	25	1 263	392
2031	1 439	241	1 680	21	1 268	391
2032	1 479	201	1 680	11	1 275	394
2033	1 479	201	1 680	6	1 280	395
2034	1 479	201	1 680	16	1 281	383
2035	1 479	201	1 680	12	1 292	376
2036	1 479	201	1 680	8	1 289	384
2037	1 479	201	1 680	15	1 271	394
2038	1 479	251	1 730	17	1 308	405
2039	1 479	382	1 862	17	1 423	422
2040	1 479	629	2 108	8	1 597	503
2041	1 479	629	2 108	48	1 586	474
2042	1 479	629	2 108	24	1 607	477
2043	1 479	629	2 108	32	1 627	449
2044	1 479	629	2 108	3	1 640	465
2045	1 479	629	2 108	0	1 634	474
2046	1 479	629	2 108	60	1 560	488
2047	1 479	629	2 108	0	1 614	494
2048	1 479	629	2 108	0	1 620	488
2049	1 479	629	2 108	3	1 635	470
2050	1 479	629	2 108	0	1 611	497
2051	1 479	629	2 108	0	1 628	480
2052	1 479	629	2 108	0	1 627	481
2053	1 479	629	2 108	0	1 625	483
2054	1 479	629	2 108	3	1 621	483
2055	1 479	629	2 108	5	1 646	457
2056	1 479	629	2 108	0	1 616	492
2057	1 479	629	2 108	0	1 614	494
2058	1 479	629	2 108	31	1 594	483
2059	1 479	629	2 108	63	1 577	468
2060	1 479	629	2 108	1	1 625	483

Notes:

Table 4: Nelson Wood Avaliability under Scenario 4

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield with target rotation ages of 25, 27 and 29 years)

Year Ending	Recoverable	Average	Recoverable	Average	Recoverable	Average
December	Volume Target	Age	Volume Target	Age	Volume Target	Age
	Age 25 (000 m ³)	(Years)	Age 27 (000 m ³)	(Years)	Age 29 (000 m ³)	(Years)
2021	1 388	26	1 404	27	1 142	28
2022	1 688	28	1 704	28	1 442	28
2023	1 988	27	2 004	28	1 742	29
2024	2 108	26	2 004	27	1 872	29
2025	2 108	27	2 004	28	1 872	28
2026	2 108	27	2 004	28	1 872	28
2027	2 108	28	2 004	28	1 872	28
2028	1 808	25	1 704	27	1 756	28
2029	1 531	25	1 613	27	1 784	28
2030	1 531	25	1 680	27	1 784	28
2031	1 531	26	1 680	27	1 828	29
2032	1 531	25	1 680	27	1 987	29
2033	1 531	25	1 680	27	1 987	29
2034	1 531	25	1 680	28	1 991	29
2035	1 531	25	1 680	29	2 029	29
2036	1 531	25	1 680	28	2 029	29
2037	1 531	26	1 680	27	2 029	29
2038	1 531	26	1 730	27	2 029	29
2039	1 531	27	1 862	28	2 029	29
2040	1 938	31	2 108	27	2 029	29
2041	1 938	26	2 108	28	2 029	29
2042	1 938	27	2 108	28	2 029	29
2043	1 938	26	2 108	31	2 029	29
2044	1 938	25	2 108	30	2 029	29
2045	1 938	25	2 108	29	2 029	28
2046	1 938	26	2 108	27	2 036	28
2047	1 938	25	2 108	27	2 079	29
2048	1 938	26	2 108	28	2 079	29
2049	1 938	27	2 108	29	2 079	29
2050	1 938	26	2 108	27	2 079	30
2051	1 938	26	2 108	28	2 079	29
2052	1 938	25	2 108	28	2 079	29
2053	1 938	25	2 108	28	2 079	29
2054	1 938	25	2 108	28	2 079	29
2055	1 938	26	2 108	30	2 079	29
2056	1 938	27	2 108	27	2 079	29
2057	1 938	28	2 108	27	2 079	29
2058	1 938	27	2 108	28	2 079	29
2059	1 938	27	2 108	28	2 079	29
2060	1 938	26	2 108	28	2 079	29

Notes:

Table 5: Nelson Wood Avaliability for Douglas-fir

(Assumes that large-scale owners harvest at stated intentions with yield regulated and a target rotation age of 35 years)

Year Ending	Large-Scale	Small-Scale	All	Average
December	Owners	Owners	Owners	Age
	(000 m ³)	(000 m ³)	(000 m ³)	(Years)
2021	163	25	188	43
2022	204	36	240	40
2023	188	0	188	40
2024	188	0	188	40
2025	180	0	180	40
2026	193	0	193	39
2027	189	5	194	38
2028	196	50	246	38
2029	183	48	231	37
2030	145	62	207	37
2031	145	62	207	37
2032	145	62	207	37
2033	145	62	207	37
2034	145	62	207	36
2035	45	24	69	36
2036	45	24	69	36
2037	45	24	69	36
2038	45	24	69	37
2039	45	24	69	37
2040	0	8	8	37
2041	0	8	8	35
2042	0	8	8	35
2043	0	8	8	36
2044	0	8	8	37
2045	6	0	6	35
2046	6	0	6	36
2047	6	0	6	37
2048	6	0	6	40
2049	6	0	6	42
2050	0	27	27	42
2051	0	27	27	35
2052	0	27	27	36
2053	0	27	27	37
2054	0	27	27	37
2055	1	2	2	40
2056	1	2	2	38
2057	1	2	2	35
2058	1	2	2	35
2059	1	2	2	36
2060	61	0	61	36

Appendix 3 - Marlborough Wood Availability Forecasts for the Period 2021-2060

Table 1: Marlborough Wood Avaliability under Scenario 1

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and target harvest age of 27 years)

Year Ending	Large-Scale	Small-Scale	All
December	Owners	Owners	Owners
	(000 m ³)	(000 m ³)	(000 m ³)
2021	349	1 610	1 959
2022	482	4 518	5 000
2023	533	1 033	1 566
2024	558	1 040	1 598
2025	516	539	1 055
2026	786	423	1 209
2027	904	885	1 789
2028	850	485	1 335
2029	792	336	1 128
2030	670	418	1 088
2031	575	345	920
2032	523	290	812
2033	577	377	954
2034	604	251	855
2035	706	152	859
2036	706	0	706
2037	706	133	840
2038	706	247	954
2039	706	270	977
2040	706	201	908
2041	706	223	929
2042	706	1 578	2 285
2043	706	1 431	2 138
2044	706	1 130	1 837
2045	706	1 222	1 928
2046	706	941	1 648
2047	706	339	1 045
2048	706	552	1 258
2049	706	1 509	2 215
2050	706	4 032	4 738
2051	706	1071	1 777
2052	706	1 087	1 794
2053	706	573	1 279
2054	706	440	1 146
2055	706	926	1632
2056	706	500	1 206
2057	706	359	1 065
2058	706	434	1 141
2059	/06	363	1 069
2060	/06	320	1 026

Notes:

Table 2: Marlborough Wood Avaliability under Scenario 2

(Assumes that large-scale owners harvest at stated intentions and then at non-declining yield, and total wood availability is modelled at a non-declining yield)

Year Ending	Large-Scale	Small-Scale	All
December	Owners	Owners	Owners
	(000 m ³)	(000 m ³)	(000 m ³)
2021	349	1 120	1 470
2022	482	987	1 470
2023	533	937	1 470
2024	558	912	1 470
2025	516	953	1 470
2026	786	683	1 470
2027	904	566	1 470
2028	850	619	1 470
2029	792	678	1 470
2030	670	799	1 470
2031	575	894	1 470
2032	523	947	1 470
2033	710	760	1 470
2034	710	760	1 470
2035	710	760	1 470
2036	710	760	1 470
2037	710	760	1 470
2038	710	760	1 470
2039	710	760	1 470
2040	710	760	1 470
2041	710	760	1 470
2042	710	760	1 470
2043	710	760	1 470
2044	710	760	1 470
2045	710	760	1 470
2046	710	760	1 470
2047	710	760	1 470
2048	710	760	1 470
2049	710	760	1 470
2050	710	760	1 470
2051	710	760	1 470
2052	710	760	1 470
2053	710	760	1 470
2054	710	760	1 470
2055	710	760	1 470
2056	710	760	1 470
2057	710	760	1 470
2058	710	760	1 470
2059	710	760	1 470
2060	710	760	1 470

Notes:

Table 3: Marlborough Wood Avaliability under Scenario 3

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield)

Year Ending	Large-Scale	Small-Scale	All	Pruned	Unpruned	Pulp Logs
December	Owners	Owners	Owners			
	(000 m ³)					
2021	349	1 147	1 496	144	980	372
2022	482	1 314	1 796	289	1 112	394
2023	533	1 550	2 083	287	1 313	483
2024	558	1 526	2 083	194	1 387	502
2025	516	1 567	2 083	293	1 360	430
2026	786	1 297	2 083	254	1 359	470
2027	904	1 179	2 083	194	1 406	483
2028	850	933	1 783	159	1 203	421
2029	792	692	1 483	124	1 002	357
2030	670	513	1 183	64	803	316
2031	575	308	883	56	593	234
2032	575	308	883	43	607	233
2033	716	168	883	36	600	247
2034	716	190	905	32	618	255
2035	716	190	905	19	627	259
2036	716	190	905	3	626	276
2037	716	190	905	18	619	268
2038	716	218	934	37	630	267
2039	716	601	1 316	51	886	379
2040	716	812	1 528	74	1 016	438
2041	716	812	1 528	128	991	409
2042	716	812	1 528	88	1 014	425
2043	716	812	1 528	154	981	392
2044	716	812	1 528	149	991	387
2045	716	812	1 528	21	1 063	443
2046	716	812	1 528	30	1 066	432
2047	716	812	1 528	1	1 081	446
2048	716	812	1 528	12	1 087	428
2049	716	812	1 528	8	1 088	432
2050	716	812	1 528	18	1 063	447
2051	716	812	1 528	23	1 075	430
2052	716	812	1 528	15	1 073	440
2053	716	812	1 528	16	1 075	437
2054	716	812	1 528	17	1 058	452
2055	716	812	1 528	15	1 058	454
2056	716	812	1 528	10	1 066	452
2057	716	812	1 528	8	1 067	453
2058	716	812	1 528	6	1 082	439
2059	716	812	1 528	5	1 105	418
2060	716	812	1 528	4	1 100	423

Notes:

Table 4: Marlborough Wood Avaliability under Scenario 4

(Assumes that large-scale owners harvest at stated intentions then at non-declining yield, and total wood availability is modelled at a split non-declining yield with target rotation ages of 25, 27 and 29 years)

Year Ending	Recoverable	Average	Recoverable	Average	Recoverable	Average
December	Volume Target	Age	Volume Target	Age	Volume Target	Age
	Age 25 (000 m ³)	(Years)	Age 27 (000 m ³)	(Years)	Age 29 (000 m ³)	(Years)
2021	1 504	30	1 496	28	1 757	31
2022	1 804	29	1 796	29	1 840	30
2023	2 104	27	2 083	28	1 840	29
2024	2 104	28	2 083	29	1 840	29
2025	2 104	29	2 083	32	1 840	30
2026	2 104	28	2 083	30	1 840	29
2027	2 104	31	2 083	30	1 840	29
2028	1 804	29	1 783	30	1 540	31
2029	1 504	29	1 483	30	1 560	31
2030	1 204	30	1 183	28	1 260	29
2031	904	29	883	28	960	29
2032	904	26	883	28	984	29
2033	904	25	883	27	984	29
2034	904	27	905	27	984	29
2035	904	27	905	27	1 113	28
2036	905	25	905	26	1 322	28
2037	905	25	905	26	1 322	26
2038	905	25	934	26	1 322	26
2039	905	25	1 316	26	1 322	28
2040	1 478	25	1 528	26	1 322	26
2041	1 478	25	1 528	26	1 457	26
2042	1 478	25	1 528	26	1 457	28
2043	1 478	25	1 528	27	1 531	28
2044	1 478	27	1 528	27	1 531	28
2045	1 478	27	1 528	27	1 531	28
2046	1 478	27	1 528	28	1 531	29
2047	1 478	29	1 528	28	1 531	29
2048	1 478	27	1 528	29	1 531	29
2049	1 478	26	1 528	28	1 531	29
2050	1 478	27	1 528	27	1 531	29
2051	1 478	26	1 528	28	1 531	29
2052	1 478	25	1 528	28	1 531	29
2053	1 478	25	1 528	28	1 531	29
2054	1 478	25	1 528	27	1 531	29
2055	1 478	31	1 528	27	1 531	29
2056	1 478	26	1 528	27	1 531	29
2057	1 478	29	1 528	27	1 531	29
2058	1 478	28	1 528	28	1 531	30
2059	1 478	28	1 528	29	1 531	30
2060	1 478	28	1 528	29	1 531	30

Notes:

Table 5: Marlborough Wood Avaliability for Douglas-fir

(Assumes that large-scale owners harvest at stated intentions with yield regulated and a target rotation age of 35 years)

Year Ending	Large-Scale	Small-Scale	All	Average
December	Owners	Owners	Owners	Age
	(000 m ³)	(000 m ³)	(000 m ³)	(Years)
2021	17	52	. 69	48
2022	52	7	59	40
2023	78	0	78	39
2024	57	0	57	39
2025	22	0	22	39
2026	0	0	0	39
2027	0	0	0	0
2028	2	0	2	41
2029	2	0	2	35
2030	12	6	18	36
2031	12	6	18	36
2032	12	6	18	35
2033	12	6	18	36
2034	12	6	18	36
2035	15	8	23	38
2036	15	8	23	38
2037	15	8	23	39
2038	15	8	23	40
2039	15	8	23	37
2040	0	2	2	35
2041	0	2	2	35
2042	0	2	2	36
2043	0	2	2	38
2044	0	2	2	39
2045	0	4	5	35
2046	0	4	5	35
2047	0	4	5	36
2048	0	4	5	36
2049	0	4	5	38
2050	14	0	14	37
2051	14	0	14	38
2052	14	0	14	39
2053	14	0	14	40
2054	14	0	14	41
2055	1	1	2	43
2056	1	1	2	36
2057	1	1	2	35
2058	1	1	2	35
2059	1	1	2	36
2060	9	0	9	36

Notes: