

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Tree Farm Licence 5

Issued to Weldwood of Canada Limited

Rationale for Allowable Annual Cut (AAC) Determination

effective December 1, 1997

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Chief Forester

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as Chief Forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 5. The document also identifies where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 5, also known as the Mackenzie-Cariboo TFL, is held by Weldwood of Canada Limited. It is located in the Quesnel Forest District approximately 40 kilometres northwest of Quesnel. Bordering the Prince George Forest District, the TFL covers 34 447 hectares of which almost all (34 118 hectares) is Schedule B Crown land, with only 329 hectares classified as Schedule A private land. The entire TFL lies within the Sub-Boreal Spruce biogeoclimatic zone and 97 percent of the TFL area is classified as productive forest land.

The terrain is characterized by rolling hills and plateaus. The principal tree species are Interior Douglas-fir, occupying 37 percent of the total land base, Interior spruce (25 percent) and lodgepole pine (23 percent). There are also minor components of sub-alpine fir, birch, balsam, aspen, and cottonwood.

History of the AAC

In 1950, Forest Management Licence 5 was issued to Western Plywood Ltd. In 1964, the licence, now known as TFL 5, was transferred and reassigned to Weldwood of Canada Ltd., the present licence-holder. Eight Management and Working Plans have subsequently been in place since 1950. Draft Management Plan (MP) No. 9, covering the period January 1, 1998 to December 31, 2002, has been submitted for my approval coincident with this AAC determination.

The current AAC of 110 000 cubic metres is allocated as follows:

- Weldwood of Canada Ltd. - 104 546 cubic metres per year, and
- Small Business Forest Enterprise Program - 5454 cubic metres per year.

New AAC determination

Effective December 1, 1997, the new AAC for TFL 5, including Schedule A and B lands and the Small Business Forest Enterprise Program, will be 122 800 cubic metres, representing an increase of 11.6 percent. Of the total AAC, 1500 cubic metres are partitioned for deciduous volumes. This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for TFL 5 includes the following:

- TFL 5 Twenty-year Strategic Development Plan; prepared by Weldwood of Canada Limited, January 15 1997 (revised November 30, 1996);
- Weldwood of Canada Limited, TFL 5 Draft Management Plan No. 9, 1997—2002, dated March 26, 1997
- Weldwood of Canada Limited, Mackenzie-Cariboo Tree Farm Licence, TFL 5, Management Plan 9, Timber Supply Analysis Data Package; prepared and submitted by Timberline Forest Inventory Consultants on behalf of Weldwood, September 9, 1996 and accepted on January 27, 1997;
- Weldwood of Canada Limited, TFL 5 Draft Management Plan No. 9, 1997—2002, Timber Supply Analysis Report, prepared and submitted by Timberline Forest Inventory Consultants on behalf of Weldwood, on March 11 1997, and approved on June 3 1997;
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memo from the Minister of Forests to the Chief Forester, dated February 26, 1996, stating the Crown's economic and social objectives regarding visual resources;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Regulations*, April 1995;
- *Forest Practices Code of British Columbia Guidebooks*, September 1995;
- *Forest Practices Code Timber Supply Analysis*, British Columbia Forest Service (BCFS) and Ministry of Environment, Lands and Parks (MELP), February 1996;
- Technical information provided through correspondence and communication among staff from BCFS, MELP, Weldwood, and Timberline Forest Inventory Consultants;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Victoria on July 17, 1997.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires me, as Chief Forester, to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis and the inventory and growth and yield data used as inputs to the analysis typically form the major body of technical information used in my AAC determination. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply

analysis due in part to variation in physical, biological and social conditions—although ongoing science-based improvements in the understanding of ecological dynamics will help to reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural, and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide the complete answer or solution to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

In making the AAC determination for TFL 5, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the Chief Forester to consider particular factors in determining AACs for tree farm licences (TFLs) and timber supply areas (TSAs). Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. Two important ways of dealing with uncertainty are:

- (i) minimizing risk, in respect of which, in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and
- (ii) redetermining AACs frequently, to ensure they incorporate up-to-date information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce

the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the Forest Practices Code.

The impact of the Forest Practices Code on timber supply is a matter of considerable public concern. In determinations made under the first Timber Supply Review, in the period between 1992 and the coming into force of the Code, no final standards or regulations were available at the time the timber supply analyses were conducted. Accordingly, the analyses were unable to assess the impacts of any new constraints on timber production that might be imposed under the Code. In those determinations I did not consider any more stringent restrictions or additional impacts upon timber supply beyond those anticipated to occur due to the application of guidelines current at the time of determination. However, I assumed that the Code would at least entrench the standards exemplified by those guidelines as statutory requirements.

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995. Studies in selected TSAs (*Forest Practices Code Timber Supply Analysis*, BCFS and BC Environment, February 1996) indicated that under the Code there would be some impacts on timber supply additional to those expected under previous guidelines. In AAC determinations made since the coming into force of the Code, I viewed with some caution the timber supply projections in timber supply analyses that predated the Code, or that were based on information packages that largely predated the Code. At the same time, I was mindful that the full force of the Code might not be felt during the transition phase of its implementation, and that the impacts of specific factors on timber supply might not have been assessed on a local basis.

Although the Code is now fully implemented following the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

The impact on timber supply of land-use decisions resulting from strategic planning processes such as the Land and Resource Management Planning (LRMP) process is a matter often raised in discussions of AAC determinations. In determining AACs it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions that have not yet been taken by government. Thus I do not consider the potential impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made land-use decisions—such as the October 1994 Cariboo-Chilcotin Land Use Decision—it may not always be possible to analyze the full timber supply impact in an AAC determination. In most cases, government's land-

use decision must be followed by detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Although the government has issued an implementation plan for the Cariboo-Chilcotin, the actual impact of these decisions is not yet evident. Nonetheless, for this determination, I have accepted certain commitments in the *Cariboo-Chilcotin Land-Use Plan* and the implementation plan as statements of the Crown's social and economic objectives for the region and for the TSA.

Forest Renewal British Columbia is funding a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. As with all components, I require sound evidence before accounting for the possible timber supply effects of intensive silviculture on harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical or analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are superior to those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interests of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations issues, I am aware of the Crown's legal obligations resulting from the June 1993 Delgamuukw decision of the B.C. Court of Appeal regarding aboriginal rights. The AAC I determine should not in any way be construed as limiting the Crown's obligation under the Delgamuukw decision, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 5. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Aboriginal rights will be taken into account as far as possible under Section 8(7) of the *Forest Act* and will be respected in the administration of the AAC determined.

Regarding future treaty decisions, as with other land-use decisions it would be inappropriate for me to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government.

Overall, in making AAC determinations, I am mindful of my obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests (MOF) as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the base case

In considering the factors required under Section 8 to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review program for TSAs, and by the licensees for TFLs,.

For each AAC determination a timber supply analysis is carried out, using a data package of information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model, timber supply forecasts are produced. These include sensitivity analyses to assess the timber supply effects of uncertainties or changes in various assumptions around a baseline option, normally referred to as the "base case" forecast.

The base case forecast may incorporate information about which there is some uncertainty. Its validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer model used to generate it. Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current information available about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations that lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that may in part be based on uncertain information are essentially qualitative in nature and, as such, subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

For TFL 5, the base case projects an initial harvest rate of 122 800 cubic metres per year for 65 years, increasing to 129 300 cubic metres per year for the remainder of the harvest

forecast. The base case initial harvest rate of 122 800 cubic metres per year is 11.6 percent higher than the current AAC of 110 000 cubic metres. The increase is largely due to an improved understanding of site productivity and increased silviculture activity over the past 10 years on the TFL. This new information reflects the results of significant amounts of inventory information collected during the term of the current Management Plan.

Timber supply analysis

The timber supply analysis for TFL 5 was completed by Timberline Forest Inventory Consultants (Timberline) on behalf of Weldwood of Canada Ltd. (“the licensee”). Timberline used a proprietary computer simulation model called CASH_FM (Continuous Area Simulation of Harvesting and Forest Management, Version 5). Based on previous experience in examining results from this model, I am satisfied that the information generated is comparable with information generated by the BC Forest Service simulation model and that the model is capable of providing a reasonable projection of timber supply.

The timber supply analysis for TFL 5 examined two different management options. The "Status Quo" option reflects management practices as of October 1996 and incorporates the forest inventory database updated to May 1995. This option develops three alternative harvest flows, one of which is considered the “base case”.

The second option—the Planned Management Option—which the licensee submits most closely reflects its proposed management strategy and MOF and MELP guidelines, forms the basis of the licensee's recommendation for an AAC (125 100 cubic metres per year). In comparison to the “base case”, the Planned Management Option reflects a larger land base (by 110 hectares), a 5-percent decrease in the maximum permitted disturbance in the Riparian Management Zone, a 50-percent decrease in the Forest Corridor, removal of old-growth constraints in the Integrated Resource Management Zone and in the Riparian Management Zone, and an increase of old-growth constraints elsewhere in the TFL. In combination, these assumptions result in an initial harvest level that is 2 percent higher than the base case. However, I do not accept that no old-growth constraints are required in the IRM and Riparian zones, and for this reason I have not viewed this option as representing a reasonable projection for the purposes of examining a base case.

Sensitivity analyses examining the risks to timber supply resulting from uncertainty in data assumptions and estimates have assisted me in considering various factors in my determination.

Consideration of factors as required by section 8 of the *Forest Act*

Section 8 (7)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

- (a) the rate of timber production that may be sustained on the area, taking into account**
 - (i) the composition of the forest and its expected rate of growth on the area**

Land base contributing to timber harvest.

- general comments

The total area of TFL 5, as reported in the timber supply analysis, is 34 447 hectares. The productive forested areas account for 32 907 hectares, approximately 95.5 percent of the total area.

As part of the process used to define the timber harvesting land base—i.e., the land base estimated to be economically and biologically available for harvesting—a series of deductions were made from the productive forest. These deductions accounted for all the factors that operate to reduce the productive forest area, for economic or ecological reasons. In timber supply analysis, assumptions and, if necessary, projections must be made about these factors prior to quantifying appropriate areas to be deducted from the productive forest area, in order to derive the timber harvesting land base. These factors are described in more detail below.

In reviewing this process I am aware that some areas may have more than one classification—e.g., environmentally sensitive areas (ESAs) may also lie in riparian areas. To ensure the accuracy of the timber harvesting land base, it is imperative that no deduction be made more than once in respect of the same area of land, by virtue of all or part of it coming under more than one classification for timber harvesting purposes. Hence, the deduction reported in the timber supply analysis or AAC rationale in respect of a given factor does not necessarily reflect the total area with that classification; some portion of it may have been deducted earlier under another classification.

The productive land base will be further reduced due to the construction of roads, trails and landings to access and harvest timber. Following current deductions, future deductions for roads, trails and landings and the future addition of not-satisfactorily-restocked areas (NSR), the long-term timber harvesting land base is estimated to be 30 100 hectares.

- economic and physical operability

Of the total productive forest area, 92 percent is considered available for harvesting. There were no specific deductions in the timber supply analysis for inoperability. The entire TFL is considered to be economically and physically accessible. This reflects the prevalence of rolling hills and plateaus, which provides for reasonably easy access for forestry activities. Based on my review of the assumptions and my knowledge of the area, I accept the licensee's assumptions for the purposes of this determination.

- environmentally sensitive areas (ESAs)

Based on the 1985-86 forest inventory, areas have been identified in the TFL as environmentally sensitive. A total of 585 hectares were classified as either highly sensitive (ESA1) or moderately sensitive (ESA2) for sensitive soils and / or for regeneration problems. Of this total, 260 hectares were specifically excluded from the timber harvesting land base—110 hectares for ESA1s and 150 hectares for ESA2s. Given the higher sensitivity of ESA1 areas, those hectares remaining after earlier deductions—for non-commercial brush, moose calving habitat, riparian reserve zones, recreation areas, and NSR—were 100-percent excluded and the remaining ESA2s were 50-percent excluded from the timber harvesting land base.

District staff have expressed concern about slope stability in parts of the TFL abutting the Fraser River. It is expected that terrain mapping will be completed prior to the next analysis and will provide information on the extent and magnitude of any slope instability. I am unable to speculate on the potential impacts on timber supply resulting from any uncertainty regarding slope stability until the terrain mapping is complete. However, as the area is generally confined to the slopes along the Fraser River to which restrictive forest cover requirements were already applied, I do not anticipate that this uncertainty introduces a significant risk to this determination. I accept the assumptions for ESAs for the purposes of this determination and have made no further adjustments. The results of the terrain mapping should be completed for the next determination.

- deciduous (broadleaf) forest types

In total, there are 2983 hectares of deciduous-leading stands in the TFL of which approximately 835 hectares (mainly cottonwood, aspen and birch) are considered to be unavailable for timber harvesting.

Approximately 1900 hectares of deciduous-leading stands (managed and unmanaged) are located in the timber harvesting land base. These comprise: natural deciduous stands with less than 10 percent cottonwood that are not associated with riparian management zones, Forest Corridors or Core Mule Deer Winter Range Management Zones and that are assumed to be available for harvesting; and deciduous stands with a harvesting history, unless associated with riparian management zones, Forest Corridors or Core Mule Deer Winter Range Management Zones. In addition to the base case, the licensee's analysis

examined two harvest level projections which showed the timber supply implications of excluding the deciduous volumes. The first of these demonstrated that the coniferous stands alone could support a harvest level of 122 300 cubic metres per year with no contribution from the deciduous-leading stands. The second projection showed that if all the deciduous volumes found within both coniferous-leading stands and deciduous-leading stands were excluded from contributing, the initial harvest level would decrease by 500 cubic metres per year and the long-term level by 3300 cubic metres per year.

Small amounts of deciduous volumes are harvested periodically but generally only when found within coniferous-leading stands. Cottonwood has limited merchantability and there has been very little harvesting of aspen and birch. However, the licensee has proposed that a partitioned harvest level of 1500 cubic metres per year be established for the harvesting of deciduous volumes.

The licensee submits that market conditions for deciduous stands are improving and that if the partition is established they will utilize these volumes. They also submit that the partition will ensure that if deciduous volumes are not harvested then the full AAC will not be realized because they will not be allowed to switch to coniferous volumes.

MELP raised concerns regarding a possible conflict with harvesting deciduous volumes and the Fish, Forest and Wildlife Management Plan (a plan jointly approved by the licensee, by MELP and by the Department of Fisheries and Oceans, and generally known as the “Wildlife Plan”). It is not clear whether the conversion of deciduous stands which have had no logging history, to coniferous stands, would be in conflict with Wildlife Plan or whether—as the licensee asserts—maintaining a deciduous component in coniferous stands would meet wildlife requirements adequately. I am requesting that the licensee develop a management and harvesting strategy for deciduous-leading and mixed stands prior to the next determination, conferring with MELP on strategies contained in the Wildlife Plan (see below, under “Implementation”). I accept the licensee's broad conclusions regarding management of deciduous volumes, but I expect the licensee and MELP to refine or clarify the management objectives for these stands.

Based on stand volumes at culmination age, if all existing unmanaged deciduous stands regenerated to deciduous (rather than to coniferous as projected in the base case), sensitivity analysis indicates that the long-term harvest level would be decreased by approximately 1500 cubic metres per year. I note the risk of this downward pressure on timber supply if deciduous stands were to regenerate to deciduous, but given that this is in the long-term, I shall make no adjustment on this account in this determination.

The base case demonstrates that the deciduous volumes from coniferous-leading stands alone contribute approximately 1280 cubic metres per year to the total harvest level. I do not believe that it is unreasonable to establish a partitioned harvest of up to 1500 cubic metres annually for deciduous species as proposed by the licensee for the period of its 20-year plan.

In this determination, as discussed in “Utilization standards” and noted in my “Reasons for decision,” I have accepted the contribution of the deciduous volumes to the base case harvest level. I acknowledge that it is difficult to predict with certainty whether or when the deciduous volumes will be harvested, given prevailing market conditions. Therefore, at this time I believe it is best to establish a partition for the harvesting of deciduous volumes that will reduce the associated economic and environmental risks and at the same time provide for the harvesting of these species at the level proposed by the licensee, as discussed below, under “Reasons for decision.”

- roads, trails and landings

To account for existing roads, trails and landings in the timber supply analysis, 618 hectares of stands 60 years old and younger were deducted from the timber harvesting land base. Approximately 44 percent of the timber harvesting land base is currently unroaded. To account for future roads, an additional 237 hectares were assumed to be removed over the next 40 years. This reflects the assumption that all main roads are in place and that all future roads will be secondary access and small in-block roads. The combined total deduction for roads, present and future, is 812 hectares—2.5 percent of the productive forest land base.

BCFS staff submit that the Forest Practices Code will require future roads to be wider than those currently constructed, and that some existing roads may have to be widened to meet standards. Therefore staff are concerned that a reduction based on an extrapolation of existing road estimates—partially offset by the return to productivity of landings deactivated after harvesting and fully planted following harvest operations—could result in an underestimation of the productive area lost to future road construction.

If road widths have been underestimated by up to 2 metres, this could increase the deduction by 60 hectares (0.2 percent of the timber harvesting land base). A sensitivity analysis that examines a 3 percent decrease in the timber harvesting land base shows a one-percent decrease to the timber supply in the short term, and less than 0.5 percent in the long term.

The licensee has made a commitment to review this matter and to compare roads built after the enactment of the Code with those modelled in the analysis. In addition, the licensee plans to continue to deactivate, and to maintain productivity on, landings. The licensee will be providing updated estimates for the next determination.

The assumptions applied in the timber supply analysis for *existing* roads, trails and landings are reasonable. However, in reviewing the concerns raised regarding *future* roads reductions, and considering the sensitivity analysis, I conclude that the timber harvesting land base may have been slightly overestimated, and I have taken this into account as discussed below, under “Reasons for decision”.

Existing forest inventory*- age of the inventory*

The most recent forest inventory of TFL 5 was completed in 1985. In 1995, the entire TFL inventory was updated using aerial photography and operational maps to reflect harvesting and silviculture activities that have occurred since 1986. For the purposes of the timber supply analysis, ages and heights were updated and are current to May 1995. An inventory audit was completed in 1995 and indicated that VDYP volume estimates were reasonable.

- age class distribution

Approximately 38 percent of the timber harvesting land base is comprised of forest stands that are older than 100 years, of which 22 percent are older than 140 years.

Approximately 33 percent of the timber harvesting land base has stands younger than 45 years old (mainly regeneration after earlier harvesting). The balance of the timber harvesting land base has forest stands in the age range of 45 to 100 years old, although there are a few stands between 40 and 60 years old.

Available inventory is between 30 and 50 percent of the mature inventory, reflecting the amount of timber reserved from harvest because of forest cover requirements. The transition time to the long-term harvest level is closely linked to age distribution, and the proportion of significant volumes at or near the minimum harvestable age is an important factor in harvest planning.

- volume estimates for existing stands

Volume estimates for existing stands and managed stand yield curves for the Core Mule Deer Winter Range were developed using the Variable Density Yield Prediction (VDYP) model (except for the Planned Management Option). VDYP is based on information gathered from a large number of sample plots and is generally accepted in British Columbia as an appropriate model for estimating volumes in existing stands.

As discussed briefly above, under *age of the inventory*, an inventory audit was conducted in 1995. The audit showed that VDYP volume estimates are within an acceptable range of variation as compared to ground samples. I accept the estimates used in the timber supply analysis as suitable for use in this determination.

Expected rate of growth*- site productivity estimates*

Inventory data includes estimates of site productivity expressed in terms of site indexes. A site index is based on the height, as a function of the age, of a particular stand of trees.

The productivity of a site largely determines how quickly trees will grow, and therefore affects the time seedlings will take to reach green-up conditions, the volumes of timber that will grow, and the age at which stands will satisfy mature forest cover requirements and reach a merchantable size or minimum harvestable age.

Generally, stands between 30 and 150 years of age provide the most accurate measurements of site productivity. Site indexes determined from both young stands (less than 30 years), and old stands (over 150 years) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site.

Also, studies in other areas of the province suggest that site indexes may be higher than indicated by existing data from mature forests in those areas.

Site indexes for all managed stands (existing and regenerated) were assigned on the basis of data that was recently collected by the licensee, using the biogeoclimatic ecosystem classification (BEC) system site series mapping, productivity groups and leading species. This process, which addresses the problem of estimating site indexes of very old and very young stands, was approved by Research Branch staff and was applied to all species except interior spruce which was based on MOF site class mid-point data. For mixed species stands, the site index at age 50 of the leading species was used.

The methodology used in assigning site indexes for managed stands has been reviewed and accepted for use in the timber supply analysis by MOF, Research Branch. I have considered the assumptions for site productivity as reasonable and reliable, and I note that the increased site indexes and resulting yields affect a number of factors, particularly minimum harvest ages and regenerated volumes, to which timber supply is sensitive. In the case of TFL5—though this would not necessarily be true for all management units—this results in the projection in the base case analysis of an initial harvest level higher than the current AAC..

- volume estimates for regenerated stands

The timber supply analysis used the Batch TIPS Y (Table Interpolation Program for Stand Yields) to estimate volumes for existing managed, and regenerated stands. This program was developed by the BCFS and is generally accepted in B.C. as an appropriate model for projecting yields from managed stands. Operational adjustment factors (OAFs) were applied to the TIPS Y yield estimates in order to account for the expected loss of timber productivity due to particular operational conditions, such as openings in stands (OAF 1), and pests, decay, waste and breakage (OAF 2). The standard factors of 15 percent and 5 percent were used for OAF 1 and OAF 2 respectively.

The application of TIPSYP to estimate volumes for regenerated stands contributes to the increased volume projections in comparison to VDYP. Given the age-class structure of TFL 5, in this case the higher regenerated volumes also contribute to an increase in the projected short-term timber supply.

In the base case, deciduous stands were assumed to regenerate to coniferous stands. For managed stands with a deciduous component, VDYP was used to develop yield information for the deciduous component. This data was then merged with the TIPSYP coniferous data, based on species percentages, to produce yield tables for these managed, mixed stands.

Managed stands regenerated between 1950 and 1986 were largely regenerated naturally, while almost all areas harvested since 1986 have been planted. The managed stand yield tables for recent and future regenerated stands assume genetic gains from higher-quality seedling stock and better seedling survival rates. BCFS, Research Branch accepts the managed stand yield tables as reasonable for use in the licensee's analysis.

In the base case, all harvested areas within Core Mule Deer Winter Range (MDWR) were regenerated in the model using VDYP to reflect the maintenance of a desirable species composition for mule deer winter habitat.

The licensee has identified 340 hectares (1 percent of the timber harvesting land base) of immature stands which have been treated for brush. However, these stands have not yet responded and exhibit slow growth. In the analysis, a 5-year delay in growth was applied while in the previous analysis for MP No. 8, a 10-year delay was applied. This delay in growth from the date of establishment should not have changed from the last management plan. Thus, BCFS staff submit that the volumes projected for these stands have likely been slightly overestimated. Since these stands cover a relatively small portion of the timber harvesting land base and would only affect timber supply in the longer term, I do not consider this a risk to the timber supply as projected in the base case.

I consider that the analysis shows a reasonable measure of sophistication in its breakdown of the various management regimes used to model performance, site productivity and gains attributable to genetically improved stock. I accept the base case assumptions for use in this determination.

- minimum harvestable ages

Minimum harvestable age is an estimate of the earliest age at which a stand has grown to a harvestable condition. Changing the minimum harvestable age mainly affects when second growth will be available for harvest and, accordingly, how quickly existing stands may be harvested. In practice, many forest stands may be harvested at much older ages than the minimum due to constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the timber supply analysis, minimum harvestable ages were based on the age at which stands reach culmination of mean annual increment (MAI). Where culmination of MAI increased by minimal amounts (less than 0.05 cubic metres per hectare per year) over a number of years, the youngest age was assumed to represent culmination. The ages ranged from 70 to 120 years depending on species and site index. BCFS staff have reviewed the assumptions for minimum harvestable ages and consider them to be appropriate.

I accept both the methodology used in the analysis and the base case assumptions as acceptable for use in this determination.

- (ii) **the expected time that it will take the forest to become re-established on the area following denudation;**

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area is occupied by a specified minimum number of acceptable, well-spaced seedlings. The timber supply analysis assumed a regeneration delay period of two years for all recently regenerated stands (Management Plans 7 & 8), and a five- to seven-year delay period for stands regenerated under Management Plans 1 to 6. Surveys indicate that the two-year delay assumption reflects current practice, and that the licensee's strategy of replanting all harvested areas within 2 years is successful.

I am satisfied with the assumptions for regeneration delays as reflected in the base case and have made no further adjustments for this factor in this determination.

Not-satisfactorily-restocked areas

The timber supply analysis identified 176 hectares of current not-satisfactorily-restocked (NSR) area, and 447 hectares of backlog NSR. The analysis combined current and backlog NSR and assumed regeneration within the first five years of the harvest forecast. In reviewing these assumptions, there is some uncertainty regarding the amount of backlog NSR area—either because it occurs in small patches, or is difficult to locate, or because some has regenerated naturally to deciduous species. BCFS District staff consider that for those reasons the amount of NSR used in the analysis is likely to be overestimated.

In general, it appears that there is some uncertainty about the amount of area classified as NSR, the regenerating species, the stocking levels and the growth rates on these sites. Therefore, I expect that the licensee will, in cooperation with BCFS District staff, investigate and assess the extent of NSR more accurately before the next determination (see below, under “Implementation”).

Although I note the uncertainties regarding the NSR status, any changes would affect timber supply primarily in the medium to long term, rather than in the short term.

Consequently, I will make no adjustments to account for uncertainty regarding NSR for this determination. However, I reiterate the need for an assessment prior to the next determination. I accept the analysis assumptions as being based on the best data available at the present time.

(iii) silvicultural treatments to be applied to the area;

Silvicultural systems

Clearcutting is the most common silvicultural system applied in TFL 5 and was modelled as such in the timber supply analysis. Basic silviculture on the license area includes site preparation, planting of suitable species and treatments to encourage free growth. Logged areas are replanted with conifers, although some ingress of deciduous growth is expected. In response to concerns raised in the approval of previous management plans and AAC determinations, a comprehensive silviculture program was implemented and has been in place for the last ten years. The goal of the program is to improve long-term productivity of managed stands and includes conifer release, juvenile spacing, planting, brushing and weeding and vegetation management.

Intensive silviculture

In general, intensive silviculture activities include commercial thinning, juvenile spacing, pruning, and fertilization. These treatments are discussed below under their appropriate sections.

Because intensive silviculture activities are currently discretionary and are only practiced to a limited extent on the TFL, the base case did not account for these activities. However, the licensee did examine possible implications of intensive silviculture on timber supply through their Enhanced Silviculture Option. For this option, 546 hectares of deciduous-leading stands that were deducted from the land base in the base case were included and converted to coniferous stands upon regeneration. In addition, all eligible lodgepole pine and Douglas-fir sites were assumed to be fertilized and to have undergone juvenile spacing. This option showed a mid- and long-term increase in timber supply of 8 percent over the base case.

I acknowledge the licensee's interest in exploring the potential of increasing yields as a result of intensive silvicultural treatments. However, in the absence of a comprehensive strategy or proven application of these activities in the TFL, I can not account for potential timber supply increases in this determination. The opportunity to further increase yields may be realized in the future. This can be reviewed in future AAC determinations for TFL 5.

- commercial thinning

Commercial thinning is the harvesting of trees large enough in a maturing stand to be considered a commercial product. While single-entry commercial thinning regimes do not generally increase volume yields on a specific site, they can provide opportunities to harvest timber in areas where harvesting is limited to meet a variety of other resource objectives.

In Management Plan No. 9, the licensee commits to the long-term objective of continuing commercial thinning trials. The trials are part of a research project aimed at studying potential growth and yield benefits. However, due to unfavourable market conditions for the smaller piece size, low percentage removal and low market demand for pulpwood, the trial is uneconomical to continue at present. When market conditions improve it is anticipated that this project will resume and I encourage the licensee to continue the research project as much information can be gained from these types of studies.

No commercial thinning was assumed in the timber supply analysis. Consequently this factor does not affect the present determination.

- pruning and fertilization

Some small pruning and fertilization trials have been established within the TFL, but to date neither treatments are applied operationally. If plans for either are implemented, their impact on timber supply can be examined in future AAC determinations.

- (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area;**

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. These standards were incorporated in the analysis to estimate minimum merchantable stand volume and are as follows: for lodgepole pine, a minimum diameter at breast height (DBH) of 12.5 centimetres, and for all other species (including deciduous) 17.5 centimetres; for all species (including deciduous) a minimum top diameter of 10 centimetres and a maximum stump height of 30 centimetres.

Operationally, coniferous utilization standards are the same as those modelled in the analysis. However, deciduous operational standards are based on Ainsworth Lumber Ltd.'s log purchase specifications, which are: a minimum top diameter of 10 centimetres, a minimum diameter at stump height of 20 centimetres, a minimum short-log length of 16 feet and a maximum allowable rot of 20 percent. The operational standards provide for less recovery of deciduous volumes than assumed in the base case. As a result, the base case assumes a higher contribution of deciduous volume. While this may introduce some uncertainty regarding the deciduous volume contributions to the timber supply, until more

information can be provided, I believe the deciduous volume partition will ensure that any uncertainty to timber supply projections is minimized.

In addition, with improved mechanization and harvesting techniques and possible changes in mill and market standards, the licensee indicates that increased utilization of coniferous volumes is a realistic objective. Sensitivity analysis demonstrates that increasing utilization standards for all species to 12.5 centimetres DBH allows the harvest level to increase by 1 percent in the short term, and by 2.5 percent in the long term. BCFS staff consider the proposal—that utilization will be consistently increased to 12.5 centimetres for all species as applied in the sensitivity analysis—to be optimistic at this time.

If the licensee is able to demonstrate a consistent application of increased utilization, then I would be prepared to consider this factor in future determinations. In the interim, I shall accept the assumptions as applied in the base case to represent current utilization standards for the purposes of this determination.

Decay, waste and breakage

The VDYP model used in estimating volumes in existing stands incorporates standard provincial reduction factors, as indicated in the *Cruise Compilation Loss Factor Table Manual*, (BCFS Valuation Branch, April 1994), to account for decay, waste and breakage. On direction from BCFS Resources Inventory Branch, factors for mature balsam and spruce were updated. I consider the estimates for decay, waste and breakage used in the analysis to be appropriate.

- (v) **the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production;**

Integrated resource management objectives

The Ministry of Forests is required by the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

- Cariboo-Chilcotin Land-Use Plan (CCLUP)

In addition to the *Ministry of Forests Act* and the Forest Practices Code, the *Cariboo-Chilcotin Land-Use Plan (CCLUP)* provides regional guidance in managing the forest and range resources in the Cariboo Forest Region. The CCLUP, which was declared a higher-level plan under the Forest Practices Code by order-in-council on January 23, 1996, includes the area within TFL 5.

Under this plan, various land uses are designated, some of which will result in decreased availability of timber for harvesting, and some of which will work to increase timber availability. In addition, the plan provides for the establishment of resource zones, management strategies and timber targets. In TFL 5, there are two resource development zones: the Lower Blackwater Special Resource Development Zone in the northwest and northeast portions and the Quesnel Enhanced Resource Development Zone in the southeast portion.

While the CCLUP implementation report has been in place since March 1995, it is not yet possible to predict with certainty the overall implications for timber supply as there is still ongoing work. I understand that the CCLUP integration process and new operational direction is expected over the next several months. This and further implementation information developed over the next five years will be incorporated in future AAC determinations.

I expect that experience in implementing the plan during the coming years will generate information essential for consideration in future AAC determinations. For this determination, I have reviewed what is known about the forest practices as applied to the Resource Development Zones, and their relationships to wildlife strategy commitments, biodiversity, seral stage strategies, riparian reserves and recreation, and have assumed them to approximate current practice. Where discrepancies between the base case assumptions and the CCLUP have been identified, I have discussed them further in the appropriate sections below.

- green-up and forest cover requirements

To manage for resources such as wildlife, water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and maximum permissible disturbance (area covered by stands of less than a specified height) and prescribe minimum green-up heights for adjacent cutblocks. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape. The licensee's analysis applied three different types of forest cover constraints, 1) a maximum area permitted to be below a specified height for green-up and adjacency, 2) a minimum area older than a specified age for old-growth and mature cover retention, and 3) a minimum area required to be maintained in older stands for thermal cover.

In the analysis, minimum green-up heights were based on Development Plan Evaluation Criteria for the Quesnel Forest District, the Forest Practices Code and the Wildlife Plan. Disturbance percentages were based on the Wildlife Plan, Interior Fish-Forestry Guidelines and Quesnel TSA analysis values. The retention requirements were based on the Wildlife Plan, and the thermal cover requirements on MELP criteria and the Wildlife Plan. Additionally, past salvage operations in Core MDWR zones were taken into account.

The analysis incorporated several different management zones on the timber harvesting land base: Integrated Resource Management (IRM) zones, two General and one Core Mule Deer Winter Range (GMDWRa/b and CMDWR) zones, Riparian Management zones (RMZ) and Forest Corridor (FC) management zones. Forest cover constraints at the management zone level were applied to model specific management criteria.

In reviewing the assumptions BCFS and MELP staff generally considered the forest cover requirements as modelled to be reasonable. However, they also noted that the allowable maximum disturbance and the old-growth retention in the Forest Corridor, Riparian Management (discussed further below, under *riparian habitat*) and the GMDWR zones, do not entirely reflect the Wildlife Plan. The plan requires that in RMZs and FCs a maximum of 12.5 percent may be covered by stands less than 3 metres in height and at least 12 percent must be covered by stands older than 120 years.

The base case assumptions for RMZs and FC zones allowed a maximum of 25 percent of an area to be covered by stands less than 3 metres in height, and required at least 10 percent of the area be covered by stands older than 120 years, at any time. The “Wildlife Plan Implementation Option” reflected more closely the requirements of the plan. It projected a 1-percent lower initial harvest level than the base case; however, due to changes in other assumptions made in conjunction with the forest cover requirements, this option overstates the overall impact of the allowable maximum disturbance requirements from the plan.

Sensitivity analysis demonstrated that the timber supply in TFL 5 is not greatly affected by changes in permitted disturbance and green-up requirements. Also, the requirements modelled in the sensitivity analysis exceed the landscape-level requirements, and are not required by any of the Forest Practices Code, the *Cariboo-Chilcotin Land-Use Plan* or the Wildlife Plan.

I acknowledge there is uncertainty regarding forest cover requirements and the Wildlife Plan, and I anticipate that with the implementation of the CCLUP there will be a better understanding of these requirements for future determinations. The sensitivity analysis demonstrates the potential for a 1-percent overestimation of the timber supply throughout the planning period although as noted the impact is likely less than indicated in the sensitivity analysis. I consider the base case assumptions regarding allowable maximum disturbance may have led to an overestimation of the timber supply throughout the forecast period as discussed below, under "Reasons for decision".

- *wildlife habitat*

Moose and mule deer are important wildlife species in TFL 5 and their habitat receives careful consideration in forest management. Moose calving areas have been identified in deciduous and mixed stands along the Fraser River and on small islands in the river. These occupy 412 hectares, of which 349 hectares were specifically excluded from the

timber harvesting land base in the analysis. The balance was deducted along with other reductions.

Critical mule deer winter range is located primarily along the Fraser River in the drier, mature Douglas-fir-leading stands. No specific deductions were made in the timber supply analysis but portions of the Core MDWR were excluded from the timber harvesting land base under other classifications (for example as ESAs, or as deciduous areas). Only salvage operations are permitted in those critical winter range areas that remain in the timber harvesting land base. The licensee expects to harvest no more than 10 hectares annually—the historical average—for that reason. Thus in the analysis, a maximum harvest rate of 10 hectares per year was assumed.

Sensitivity analysis shows that increasing the salvage area to 25 hectares or even 50 hectares per year has a very slight upward influence on the timber supply in the short to long term. If there were no salvage harvest from the Core Mule Deer Winter Range—an unlikely scenario, as it would assume the eradication of Douglas-fir beetle—the timber supply would decrease by 2 percent.

The Cariboo Chilcotin Land-Use Plan established that 8 percent of the productive forest land in the Lower Blackwater SRDZ be managed as a mule deer winter range through modified management regimes. Although the mule deer winter range has been identified, it is not certain at this time how the constraints are going to be applied for mule deer in the TFL. It is clear, however, that the amount of area currently managed in the TFL for critical mule deer winter range under the Wildlife Plan exceeds the amount specified in the CCLUP.

I note that the Quesnel Environmental Society is concerned that forest management recognize the needs of both fur-bearing wildlife and ungulates. As demonstrated by the strategies developed in the Wildlife Plan and the CCLUP, a great deal of recognition has gone into the protection of habitat for wildlife.

Wildlife habitat has been accounted for in the timber supply analysis by the assumptions for the mule deer winter range zones, as well as under riparian and ESA reductions, seral stage distribution requirements and deciduous exclusions from the timber harvesting land base. The salvage harvest from CMDWR will be dictated by the extent of Douglas-fir beetle infestation at any given time and therefore I acknowledge that it may vary from the assumptions in the analysis from time to time. At this time, with the exception of the allowable maximum disturbance as discussed above, under *green-up and forest cover requirements*, I consider the assumptions for wildlife to be reasonable and have made no further adjustments for purposes of this determination.

- *riparian habitat*

The Wildlife Plan provides guidance in various aspects of TFL 5 management, including the 1995 stream classification using the FPC criteria. This information provided the basis for the assumptions applied in the licensee's analysis.

Riparian Reserve Zones (RRZs) are those areas along streamsides which are excluded from timber harvesting. They represent 1.5 percent of the productive forest land base in TFL 5 before other land base deductions. Riparian Management Zones (RMZs) comprise areas buffering the RRZs. These areas are included in the timber harvesting land base and are modelled with specific forest cover requirements to account for limited harvesting activities.

The Quesnel Environmental Society expressed concern that riparian areas must be recognized as important zones for wildlife and therefore require sensitive management. I agree with the concern and note that the Forest Practices Code provides standards for the protection of riparian habitat and penalties for violators. The assumptions in the timber supply analysis reflect actual constraints as well as possible. The analysis assumes that the riparian reserves areas are not available for harvesting and that in the riparian management zones, which buffer the reserve areas, old-growth requirements apply and only limited harvesting is allowed.

As discussed above, under *green-up and forest cover requirements*, BCFS and MELP staff expressed concern that the assumptions regarding the allowable maximum disturbance and the old-growth retention in the Riparian Management Zone do not entirely reflect the Wildlife Plan. As I concluded under *green-up and forest cover requirements*, I consider the base case assumptions to represent a downward influence on the timber supply by up to 1 percent throughout the forecast period as discussed below, under "Reasons for decision".

- *visually sensitive areas*

Careful management of scenic areas near recreational sites and highways is an important IRM objective and is part of the BCFS mandate to manage the recreation resource. "Recreation resource" is defined in the *Forest Practices Code of British Columbia Act* to include a "scenic or wilderness feature or setting that has recreational significance or value". In order to manage such scenic features, visual landscape foresters in BC, in collaboration with specialists in other parts of the world, have developed procedures for identifying and managing visually sensitive areas. These procedures incorporate both biophysical and social factors—including visual sensitivity ratings based on topography, slope and other biophysical factors, and social factors such as numbers of viewers and their perceptions—and provide recommended visual quality objectives (VQOs) for these visually sensitive areas. These objectives limit the amount of visible disturbance that is acceptable in these areas.

To meet these objectives, constraints must be placed on timber harvesting, road building and other forest practices in the sensitive areas. These constraints are based on research and experience and on public preferences and acceptance of degrees of alteration of visual landscapes. The constraints are expressed in terms of "forest cover" requirements that relate to the maximum allowable percentage of a landscape unit that can be harvested at any one time, and to "visually effective green-up"—that is, the stage at which regeneration is perceived by the public to be visually satisfactory, based on the results of focus tests with a cross-section of the general public in twelve communities throughout B.C.

In TFL 5, areas classified as preservation VQOs are excluded from the timber harvesting land base either because of high visual sensitivity or because they overlap with other deducted areas such as recreation areas, wildlife habitat, non-commercial, or riparian reserve areas. Retention VQO areas (459 hectares) and partial retention areas (2075 hectares) are entirely located within General and Core MDWR management zones in which harvesting is also restricted to provide thermal cover, forage, shrub production and protective screening. The VQO assumptions used in the analysis are consistent with the provisions and terms of the Lower Blackwater LRUP. I accept the analysis VQO assumptions as suitable for the purposes of this determination.

- recreation areas

The landscape and recreation inventory identified 74 hectares of high-value recreational areas along the Alexander Mackenzie Heritage Trail and in Cottonwood Canyon. In the analysis these areas are excluded from the timber harvesting land base although only 29 hectares were specifically excluded as recreation areas. Additionally, there are two high value landscape areas included in the timber harvesting land base but within Mule Deer Winter Range near the "Kilometre O" campsite on the Alexander Mackenzie Heritage Trail—one on the east bank and one on the west bank of the Fraser River. These areas are subject to mule deer winter range forest cover constraints and limit harvesting and retain old-growth.

Public input included a submission that the Alexander Mackenzie Heritage Trail be protected by a 200-metre buffer on each side—rather than the 100 metre buffer as assumed in the analysis. However, the Alexander Mackenzie Heritage Trail Management Plan requires a 100-metre buffer along the trail and the buffer width has received acceptance through a public process and has been signed off. Another submission, from North Cariboo Trails Association, requests the cooperation of the licensee in identifying, developing and protecting recreational amenities in the TFL.

I accept the base case assumptions as representing current practice for recreation, and make no adjustment for this determination.

Biodiversity

Biological diversity, or biodiversity, is the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at the stand and landscape levels.

- stand-level biodiversity

Stand-level biodiversity is managed by retaining reserves of mature timber or wildlife tree patches within cutblocks to provide structural diversity and wildlife habitat. In the timber supply analysis, because productive forest reductions for critical wildlife habitat, ESAs and deciduous stands did not provide adequate mature timber reserves, additional reductions for "in-block reserves" were made, totalling 703 acres (3.9 percent of the total area; 2.3 percent of net operable). The Wildlife Plan (which pre-dates the Forest Practices Code) prescribes retention of 2 - 4 percent of the cut area for wildlife tree patches, "to be amended to meet standards set out in the Forest Practices Code Biodiversity Guidebook when published".

MELP submits that the timber supply analysis may not adequately account for wildlife tree patches. MELP staff claim that under current operations, 8 to 9 percent of the total cutblock area is covered by wildlife tree patches, and that based on the Biodiversity Guidebook, Table 20 (a), the patches should approximate 8 percent of total cutblock area. BCFS staff estimate that 5.3 percent of the timber harvesting land base, which is 3 percent more than assumed in the base case, would be affected. However, areas not contributing to the timber harvesting land base can also contribute to providing wildlife tree patches; therefore it is likely that less than 3 percent of the timber harvesting land base would be affected.

Sensitivity analysis shows that a 3-percent reduction in the land base results in a 1-percent decrease in the short-term harvest level, declining in the mid to long term.

While I acknowledge MELP's concern regarding considerations for stand-level biodiversity, I am not convinced that this represents a 1-percent downward impact on timber supplies in view of other forest cover considerations and the full extent of wildlife tree patches outside the timber harvesting land base of the TFL. I shall discuss this further in my "Reasons for Decision".

- landscape-level biodiversity

Managing for landscape-level biodiversity involves maintaining forests with a mix of ages. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and appropriately located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

Although some general forest and range management practices can broadly accommodate the needs of all ecosystems, more often a variety of practices is needed to respond to the different natural disturbance patterns under which ecosystems have evolved. Natural disturbance patterns vary from frequent wildfires in the dry interior regions to rare events in the wetter coastal regions. Ecosystems in TFL 5 have historically been influenced by frequent stand-initiating events such as natural wildfires.

The formal designation of the management unit or “landscape unit” is also an important component of this strategy. The formal designation of landscape units has not been completed for the Cariboo Forest Region which includes TFL 5. For areas where landscape units have not yet been formally designated, the Biodiversity Guidebook recommends that the area be managed using the lower biodiversity option (assuming this is not applied to more than approximately half the area of any biogeoclimatic subzone within a subregional plan or forest district, which is consistent with the relatively small area of TFL 5). The Regional Biodiversity Conservation Strategy developed by the Region and by MELP also recommended a lower biodiversity emphasis for the whole of TFL 5. It is my understanding that the district manager is reviewing this emphasis designation for the Landscape Unit Planning Strategy due for completion later this fall. The district manager may choose to adopt the recommended lower emphasis for landscape units in TFL 5.

Currently, the management and operational development plans for TFL 5 reflect the Wildlife Plan. The Wildlife Plan recommends high biodiversity emphasis (a 16 percent old-growth requirement) in the Sub-Boreal Spruce - moist hot biogeoclimatic subzone (SBSmh), and lower-emphasis biodiversity (an 11-percent old-growth requirement) in the Sub-Boreal Spruce - moist warm subzone (SBSmw). Old growth—for the purposes of timber supply analysis and as assumed in the base case—consists of lodgepole pine-leading stands older than 120 years and stands older than 140 years for other conifers.

MELP expresses three concerns: (1) that the ages modelled as mature/old for lodgepole pine are not old enough to meet seral stage targets or to provide the desired range of forest characteristics; (2) that sufficient old-growth cannot be provided by Core MDWR, moose and forest corridors alone; and (3) that lower-emphasis biodiversity should not be implemented throughout the TFL since the most sensitive areas of the proposed draft landscape units are within the TFL. In response to the first concern, due to limited data and a scarcity of lodgepole pine-leading stands, it is difficult to determine an appropriate age, and the ages used are not unreasonable. As for the second concern, the base case does assume that old-growth or mature requirements that are not fully met from non-contributing forested areas must be met within the timber harvesting land base.

Regarding MELP’s third concern, there are indications that the Landscape Unit Planning Strategy will adopt lower-emphasis biodiversity for all landscape units covering TFL 5, which is also recommended by the Regional Biodiversity Conservation Strategy. It is therefore unlikely that the biodiversity requirements in the TFL will be more constraining than in the base case, and possible that they will be less constraining. Moreover, until the

landscape units are designated, the Biodiversity Guidebook requires that the area be managed with lower-biodiversity emphasis.

Sensitivity analysis demonstrates that relaxing constraints to lower-emphasis biodiversity would increase timber supply by one percent in the short and medium term over that projected in the base case analysis. I consider this to represent a small upward influence on timber supply and a buffer against the possible negative influences of other uncertainties, as discussed below, under “Reasons for decision”.

- (vi) any other information that, in the chief forester’s opinion, relates to the capability of the area to produce timber;**

Twenty-year plan

The purpose of the 20-year plan is to show whether or not the harvests projected in the base case over the next 20 years are spatially feasible.

The licensee provided a 20-year plan that indicates the harvest level projected in the base case is sufficiently flexible to be achievable in the short term even with the full application of all potential constraints on timber supply.

Cultural Heritage

Archaeological Overview Assessments were conducted on behalf of the licensee in 1994 and by the BCFS in 1995. Archaeological Impact Assessments were conducted on 26 blocks between 1994 and 1996. At the present time there is no information to suggest that timber supply may be adversely affected by archaeological, heritage or cultural values.

- (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area;**

Alternative harvest flows

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large volumes of older wood often permits harvesting above long-term levels without jeopardizing future timber supply.

The most notable feature of the harvest projections for TFL 5 is that the base case is a non-declining harvest forecast starting at 11.6 percent above the current AAC. Furthermore, in the long term, the timber growing stock for the base case is projected to increase under current management assumptions. This non-declining harvest forecast was possible in large part because of the amount of existing mature timber, improved silviculture treatments and improved estimates of site productivity.

In addition to the base case forecast, an alternative harvest flow was examined using the same management assumptions as those applied in the base case. The alternative harvest flow showed the consequences of maximizing the initial harvest level to the highest level without unreasonable future declines. It was possible to increase the initial level to 127 550 cubic metres per year for the first two decades—4 percent higher than the base case level; however this increase had to be offset by a future decrease of almost 7 percent to 119 000 cubic metres per year after four and a half decades. Increases in short-term harvest levels (during the first 5 decades of the planning period) would always have to be offset at some later date by at least an equivalent decline below the base case harvest level. I believe the base case forecast provides more flexibility than the alternative forecast to deal with risks and uncertainties that may result in reductions to the estimates of timber supply in the future.

The Quesnel Environmental Society submits that there should be a gradual decline in the AAC to a level sustainable in the long term and that there should be no large fall-down in 15 - 20 years.

This concern is applicable to many parts of the province. However, in keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined so as to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest levels. Thus, timber supply should remain sufficiently stable that there will be no inordinately adverse impact on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply, nor so low as to cause immediate social and economic impacts that are not necessary to maintain forest productivity and future harvest stability. While this strategy is being applied to many parts of BC, the timber supply forecasts for TFL 5 do not reflect the need for this consideration.

The timber supply harvest flows demonstrate the initial harvest level can be increased from the current AAC by up to 11.6 percent in the short term without substantial risk of unacceptable declines in timber supply in the future.

Community dependence on the forest industry

The licensee operates a plywood plant and a sawmill with planermill, both located in Quesnel. It is one of the largest employers in Quesnel with 930 jobs in the community directly related to the licensee's operations. The licensee also owns 50 percent of Cariboo Pulp & Paper, and supplies 15 to 20 percent of its chip supply. Cariboo Pulp & Paper employs approximately 450 people.

Although the community is partially dependent on the licensee's Quesnel operations, the employment level is only partially dependent on timber supply from the TFL, which only provides about 14 percent of the mill requirements.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia; and

Minister's letter and memorandum

The Minister expressed the economic and social objectives of the Crown for the province in two documents to the Chief Forester—a letter dated July 28, 1994, (attached as Appendix 3), and a memorandum dated February 26, 1996, (attached as Appendix 4). I understand both documents to apply to TFL 5. They are consistent with the objectives stated in the Forest Renewal Plan and include forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the Chief Forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have reviewed the opportunities for commercial thinning, and, as discussed under *commercial thinning*, the practice is not economically feasible at this time. I have also reviewed opportunities for harvesting in previously uneconomic areas, and have concluded that it is appropriate at this time to establish a partition for the harvesting of deciduous species.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. I consider the assumptions for visual quality in the licensee analysis to be reasonable and have made no further adjustments.

Local objectives

The Minister's letter suggested that the Chief Forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. The licensee advises that it took a number of steps to provide opportunities for public review of information included in MP No. 9, by:

- advertising in local newspapers both the initiation of the Management Plan and of the draft statement of management objectives, options and procedures (SMOOP);
- making the draft management plan available for public viewing; and

- notifying licenced users of TFL 5, adjacent landowners and other parties, in writing, of the preparation of MP No. 9.

Submissions were received from the public in response to the SMOOP, to the preparation of Recreation and Visual Landscape Inventories and to the draft management plan. Having considered the input received, I am mindful of the views brought forward and I have attempted to address concerns raised in various sections throughout this AAC rationale statement.

- (e) **abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.**

Unsalvaged losses

Unsalvaged losses are timber volumes destroyed or damaged by natural causes such as fire and disease but not recovered through salvage operations. For this determination, losses to insects were estimated at 1 percent of the current AAC, or 1100 cubic metres annually. Losses due to fire and windthrow were estimated at 0.25 percent each—approximately 275 cubic metres for each. Total unsalvaged losses were thus estimated at 1650 cubic metres annually—approximately 1.5 percent of the current AAC.

In the past, the principal insect pest was the Douglas-fir bark beetle, which attacked stands along the Fraser River; Currently mountain pine beetle infestations are becoming more common. Given the extensive existing road network and the use of helicopters to salvage affected stands, the licensee estimates that salvage operations recover most of the timber that would otherwise be lost to insects. Losses to disease were assumed to be accounted for in the development of VDYP and TIPSY yield curves and no separate allowance was made for disease. In any event, the licensee believes pathogenic losses to be minimal. As with insect-infested stands, the comprehensive road network and the use of helicopters has kept losses in stands damaged by fire and blowdown to a minimum.

BCFS district staff concur with the extent of efforts made to salvage losses in the TFL and have reviewed and accepted the assumptions used in the base case analysis. I accept the accounting for unsalvaged losses in the base case and have made no adjustment on this account in this determination.

Reasons for decision

In reaching my decision on an AAC for TFL 5, I have considered all of the factors presented above and have reasoned as follows:

For the reasons stated in the “Timber supply analysis”, and from reviewing the considerations as recorded above, I accept the licensee’s base case as an adequate basis from which to assess timber supply for the purposes of this AAC determination.

The base case demonstrates that a harvest of 122 800 cubic metres per year could be maintained for 65 years, increasing to 129 300 cubic metres per year for the remainder of the harvest forecast. However, I have identified a number of factors which indicate that the timber supply in the TFL may be either greater or less than that projected in the base case. Some of these factors can be quantified and their impacts assessed with some reliability. The majority, however, influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at present. These latter factors must be accounted for in the determination in more general terms.

The following factors are identified as reasons why the timber supply may have been overestimated in the base case:

- *roads, trails and landings*: although the reductions for *existing* roads, trails and landings were found to be reasonable, BCFS district staff are concerned that the reductions for *future* roads, trails and landings have been underestimated, as the licensee's projections for future roads were based on existing road widths, which are less than those required under the Forest Practices Code. This indicates the base case may have slightly overestimated the timber supply for the long term, but only by a fraction of a percent.
- *green-up and forest cover requirements*: BCFS and MELP staff have expressed concern that the allowable maximum disturbance modelled in the Forest Corridor and Riparian Management Zones may be too high. I have considered this uncertainty to indicate that the timber supply may have been overestimated in the base case, by no more than one percent throughout the forecast period.
- *riparian management zones*: in the base case analysis, the forest cover constraints within the riparian management zone are not sufficiently restrictive, but to what extent the base case assumptions require adjusting is not certain. However, this uncertainty overlaps with the concern raised above, under *green-up and forest cover requirements* and any implications for timber supply are included in the assessment there of up to a one-percent overestimation.
- *stand-level biodiversity*: the assumptions for wildlife tree patches in the base case may not fully account for current practices for stand-level biodiversity. The base case assumed a 2.3-percent land base reduction, while current practice and the Biodiversity

Guidebook indicate an estimate of approximately 5.3 percent. Sensitivity analysis shows that a 3-percent decrease in the timber harvesting land base results in a one-percent decrease in the short-term harvest level. Nonetheless, there is some uncertainty about the extent of actual wildlife tree patch requirements within the timber harvesting land base. Therefore, I consider the one-percent decrease to represent the maximum level of risk associated with the stand-level biodiversity factor.

The following factor indicates that the timber supply may have been underestimated in the base case:

- *landscape-level biodiversity*: Until landscape units are designated, the Biodiversity Guidebook requires that the area be managed with lower-biodiversity emphasis. Sensitivity analysis shows that under this management the timber supply will be one percent greater than projected in the base case, in the short and medium term.

From considering the above factors suggesting overestimation or underestimation of the timber supply in the base case projection, I conclude that their combined influences on timber supply result approximately in a mutual offset, with little or no significant net risk to the viability of the base case projection. I note that the base case illustrates a very stable forecast with the potential for further increases in the future.

Deciduous volumes have been included in the base case harvest level to reflect the licensee's plan to harvest these volumes. After reviewing the information and timber supply contributions, I accept this as reasonable for this determination. At this time I am prepared to establish a partition of 1500 cubic metres per year for the harvesting of deciduous volumes. I believe that this level, if fully utilized, will not introduce a risk to the timber supply or to the environment. MELP has raised some concerns and, as directed below, under "Implementation", I will require the development of management and harvesting strategies for deciduous-leading and mixed stands that include discussions with MELP as well as the resolution of any possible conflict with the Wildlife Plan. This work should be completed and available for the next determination. In conclusion, the AAC I have determined will include a partition of 1500 cubic metres per year for deciduous species. The administration of this partition will be the responsibility of the Regional Manager.

The CCLUP was declared a higher-level plan under the Forest Practices Code in 1996, and I understand this plan to apply to TFL 5. Given what is known about the strategies and targets as applied to the Resource Development Zones, and their influence on practices relating to wildlife strategy commitments, biodiversity, seral stage strategies, riparian reserves and recreation, I believe the licensee has reflected the known components of the plan as well as possible at this time. I have noted where discrepancies were identified. The CCLUP integration process is nearing completion and I anticipate that over the coming years, more information will be gathered regarding the effect of the

CCLUP on forest practices and on timber supply analysis and this information will be reflected in future determinations.

During the last review of the AAC and the management plan, it was noted that there was some uncertainty regarding silviculture activities and site productivity and that these matters required further study. The initial harvest level in the current analysis is 11.6 percent higher than the current AAC, largely due to an improved understanding of site productivity, and increased silviculture activity over the past 10 years on the TFL (see: *site productivity estimates; regenerated volumes; and silvicultural systems*). This new information reflects the results of significant amounts of inventory information collected during the term of the current Management Plan.

I acknowledge that there are uncertainties with a number of factors such as the deciduous stands, forest cover requirements, and stand-level biodiversity, and therefore at this time I am not prepared to increase the AAC beyond the level projected in base case. The Planned Management Option—which the licensee submits most closely reflects the licensee's proposed management strategy and MOF and MELP guidelines—forms the basis of the licensee's recommendation for an AAC of 125 100 cubic metres per year (a 2-percent increase over the base case harvest level). While such a harvest level could perhaps be realized in the future, I note that the Planned Management Option assumed no old-growth constraints in the IRM and RMZ zones, which I cannot accept as a reasonable basis for a timber supply projection for TFL 5 at this time. I require more certainty about the impact of various factors on timber supply before I can support a higher harvest level. I have provided instructions to this effect as discussed below, under “Implementation”.

Having considered and reviewed all the factors as documented above, and taking into account the risks and uncertainty of the information provided, it is my conclusion that the base case projected harvest level of 122 800 cubic metres per year—including a partition of 1500 cubic metres per year for deciduous stands—represents a suitable harvest level for TFL 5 at this time.

Determination

It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects the socio-economic objectives of the Crown for the area, that ensures longer-term IRM objectives can be met, that reflects current management practices, can best be achieved in the TFL at this time by establishing an AAC of 122 800 cubic metres, with a partition of 1500 cubic metres attributable to deciduous volumes.

Implementation

This determination comes into effect on December 1, 1997 and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination. In the period following this determination and leading to the subsequent determination I expect the licensee to perform the following:

- Complete terrain stability mapping prior to the next analysis and provide information on the extent and magnitude of any slope instability.
- Develop management and harvesting strategies for deciduous-leading and mixed stands, conferring with MELP on areas of possible conflict with the Wildlife Plan.
- Review practices relating to the design and management of roads, trails and landings, with particular reference to comparing those modelled in the analysis to those constructed in compliance with the Forest Practices Code.
- Investigate and assess the extent of NSR, in cooperation with BCFS district staff.

A handwritten signature in black ink, appearing to read "J. Pedersen". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Larry Pedersen
Chief Forester

October 9, 1997

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act* reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut before December 31, 1996, and after that determination at least once every 5 years after the date of the last determination, for

- (a) the Crown land in each timber supply area, excluding tree farm licence areas and woodlot licence areas, and
- (b) each tree farm licence area.

(2) If, after October 1, 1992, the minister

- (a) makes an order under section 7 (b) respecting a timber supply area, or
- (b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

then, with respect to that timber supply area or tree farm licence area, as the case may be, the chief forester is not required to make the determination under subsection (1) of this section before December 31, 1996, or within 5 years after the last determination, but is required to make the determination

- (c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and
- (d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

- (a) the allowable annual cut for the tree farm licence is reduced under section 9 (3), and
- (b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) or (2) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under this section the chief forester may specify portions of the allowable annual cut attributable to

- (a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area,
- (b) different types of timber and terrain in different parts of private land within a tree farm licence area, and
- (c) gains in timber production on Crown land that are attributable to silviculture treatments funded by the government of British Columbia, the federal government, or both.

- (6) The regional manager or district manager must determine a volume of timber to be harvested from each woodlot licence area during each year or other period of the term of the woodlot licence, according to the licence.
- (7) In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider
 - (a) the rate of timber production that may be sustained on the area, taking into account
 - (i) the composition of the forest and its expected rate of growth on the area,
 - (ii) the expected time that it will take the forest to become re-established on the area following denudation,
 - (iii) silvicultural treatments to be applied to the area,
 - (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
 - (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
 - (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,
 - (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
 - (c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,
 - (d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and
 - (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to
 - (a) encourage maximum productivity of the forest and range resources in the Province;
 - (b) manage, protect and conserve the forest and range resources of the Crown, having regard to the immediate and long term economic and social benefits they may confer on the Province;
 - (c) plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Crown and with the private sector;
 - (d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and
 - (e) assert the financial interest of the Crown in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996