

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Tree Farm Licence 39

Held by MacMillan Bloedel Limited

Rationale for allowable annual cut (AAC) determination

effective July 1, 1996

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Objective of this Document

This document is intended to provide an accounting of the factors considered and the rationale employed in making my determination, under section 7 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 39. The document will also identify where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 39, currently held by MacMillan Bloedel Limited, consists of seven separate supply blocks on northern Vancouver Island, the mainland coast, and the Queen Charlotte Islands. The administration of the TFL spans six of the licensee's working divisions and five of the Forest Service's forest districts. It is the largest TFL in the province covering an area of 803 727 hectares and supporting an AAC of 3 818 000 cubic metres.

Of the 803 727 hectares that the TFL covers, 68 percent or 549 122 hectares are considered productive forest. Approximately 17 percent of the productive forest land base is covered by stands the licensee considers to be of poor-timber quality or low-volume timber or unmerchantable species, or are physically inoperable, or are otherwise unavailable for timber harvesting in order to provide protection for riparian habitat or environmentally sensitive areas. The area of the productive forest land base which the licensee considers currently available for timber harvesting is 461 027 hectares or 57 percent of the total area of the TFL. This land base includes areas that are currently considered to be of insufficient timber value to permit economically feasible harvest operations. As a result, and as discussed further under *economic and physical operability* below, I have evaluated the current timber harvesting land base to be 444 399 hectares in size.

The majority of the TFL is within the Coastal Western Hemlock biogeoclimatic zone and the most predominant tree species in the TFL is western hemlock. Approximately half of the TFL's timber harvesting land base is covered by stands over 130 years of age.

Block 1, known as the Powell River block, is located on British Columbia's mainland, on the Sunshine Coast. The southern border of block 1 lies along Malaspina Strait, just north of Texada Island. The block stretches north between Jervis Inlet to the east and Desolation Sound to the west to meet a northern border just southeast of Toba Inlet. The community of Powell River is in block 1. The topography of the block is generally mountainous, especially in the more inland areas. This mountainous topography and associated high rainfall produce a very diverse climate and ecology which are expressed in a variety of ecosystems ranging from nutrient-rich, moist, flood plains in valley bottoms to high-elevation alpine meadows. The primary biogeoclimatic zones are Coastal Western Hemlock, Coastal Douglas-fir, Mountain Hemlock and Alpine Tundra. Almost half of block 1 is considered productive forest land, and 43 percent of the block's total area is considered available for harvest. The timber harvesting land base associated with block 1 is 78 183 hectares in size and represents approximately 18 percent of the TFL's total timber harvesting land base. The first and most extensive harvesting that occurred on lands now part of TFL 39 was in block 1. Harvesting in this area dates back to the 1890s, and some of the areas harvested and regenerated have undergone a second harvest.

Block 2, known as the Adam River block, is located on Vancouver Island. It extends in a north-westerly direction from Brewster Lake, northwest of Campbell River to the Tsitika River watershed, and in an easterly direction including coastal areas such as Kelsey Bay and Sayward. The communities of Campbell River, Sayward and Kelsey Bay are in or near block 2. The terrain is varied, ranging from rugged mountains to marshy lowlands. The major biogeoclimatic zones are Coastal Western Hemlock, Mountain Hemlock and Alpine Tundra. Eighty-two percent of block 2 is considered productive forest and 66 percent is considered part of the TFL's timber harvesting land base. The timber harvesting land base associated with block 2 is 138 256 hectares in size. It represents 31 percent of the TFL's timber harvesting land base. Timber harvesting in the southern part of block 2 began about 1910, and in the northern part, in the Tsitika Valley, harvesting began in the 1960s.

Coast Islands block and Port Hardy block, blocks 3 and 4, are located on and near Vancouver Island. Block 4 is on Vancouver Island. It stretches from the height of land north of Snowsaddle Mountain in the south to Port McNeill in the northeast and Port Hardy in the northwest. Block 3 consists of a several separate areas located on islands and peninsulas in the waters between Queen Charlotte Strait and Johnstone Strait between Vancouver Island and the mainland. This area has varied topography, which ranges from the rolling terrain with flat valley bottoms found on northern Vancouver Island, to the rugged mountains and numerous inlets characterizing the coastal portion of the blocks. These blocks include or are adjacent to the communities of Port McNeill and Port Hardy. Eighty-two percent of blocks 3 and 4 is considered productive forest and 74 percent is considered part of the timber harvesting land base. The timber harvesting land base for blocks 3 and 4 is 49 666 hectares and represents 11 percent of the TFL's timber harvesting land base. Harvesting in block 3 began in the 1920s and most of the older stands were harvested before the block became part of TFL 39. Harvesting in block 4 largely began in the 1930s and 1940s.

Block 5, known as the Phillips River block, is located on the mainland and encompasses the Phillips River drainage between Loughborough Inlet and Bute Inlet at the head of Phillips Arm. There are no major communities in or near block 5 and harvesting operations are camp-based. The terrain is varied, ranging from rugged mountains to marshy lowlands. The major biogeoclimatic zones are Coastal Western Hemlock, Mountain Hemlock and Alpine Tundra. Productive forest land makes up 31 percent of block 5 and 22 percent of the block is considered part of the timber harvesting land base. The block 5 timber harvesting land base is 10 370 hectares and represents approximately 2.3 percent of the TFL's timber harvesting land base. Small scale harvesting operations started in this area in the 1940s.

Block 6, in the Queen Charlotte Islands, is across Hecate Strait from Prince Rupert. Most of block 6 lies on Graham Island, the more northerly of the two major islands of the Queen Charlotte group, with a slightly smaller portion of the block on Louise Island and the northern portion of Moresby Island. The majority of this block lies in the centre of the islands within the rolling uplands of the Skidegate Plateau. The major communities associated with block 6 are Sandspit, Queen Charlotte City, Port Clements/Tlell, Masset and Skidegate. The topography of block 6 on Graham Island is primarily a long strip of rolling uplands on the Skidegate Plateau in

the central interior. Moresby Island shares the Queen Charlotte Mountains range and the plateau, but includes a small lowland patch on the northeast coast. Most of block 6 is in the Coastal Western Hemlock biogeoclimatic zone. On the plateau and mountains there are also small areas of the Mountain Hemlock, and Alpine Tundra zones. Of the total block 6 area, 79 percent is considered productive forest and 62 percent is considered part of the timber harvesting land base. The timber harvesting land base is approximately 150 167 hectares or 34 percent of the TFL's timber harvesting land base. Some harvesting took place in block 6 to provide high quality Sitka spruce for World War I airplanes. In the mid 1930s, harvesting was initiated again to supply spruce for airplanes.

The Namu block, block 7, is located on the mid coast of the mainland, along Fitz Hugh Sound. It extends in a north-easterly direction from just north of Elizabeth Lake, encompassing the Koye River Watershed, along part of Burke Channel. There are no major communities in the block and harvesting operations are camp-based. The terrain is varied, ranging from rugged mountains to marshy lowlands. The major biogeoclimatic zones are Coastal Western Hemlock, Mountain Hemlock and Alpine Tundra. Fifty-three percent of block 7 is considered productive forest and 31 percent is considered part of the timber harvesting land base. The timber harvesting land base of block 7 is 17 757 hectares, which represents 4 percent of the TFL's timber harvesting land base. Very small volumes of timber were harvested by hand-loggers before 1987 when large-scale harvesting development began.

History of AAC

TFL 39, originally known as Forest Management Licence No. 39 and covering 713 172 hectares, was issued on October 27, 1961, to MacMillan, Bloedel and Powell River Limited. (In 1966, the name was changed to MacMillan Bloedel Industries Limited, subsequently shortened to MacMillan Bloedel Limited in 1981.) The initial AAC under Management Plan No. 1 was set at 1 243 000 cubic metres. Since that time the AAC has been adjusted eight times to reflect, among other factors, additions to the land base, higher utilization standards, increased yield estimates for regenerated stands, reductions in rotation ages, and the amalgamation with former TFL 7 completed in 1987. The AAC determined in 1989 is still in effect and is divided as follows:

Schedule A private lands	Schedule B Small Business Forest Enterprise Program lands	Schedule B licensee-operated lands	TOTAL
542 200 m ³	162 218 m ³	3 113 582 m ³	3 818 000 m³

New AAC Determination

Effective July 1, 1996 the new AAC for TFL 39, including Schedule A private land and Schedule B land in the Small Business Forest Enterprise Program, will be 3 740 000 cubic metres. Of this, 40 000 cubic metres per year will allow for the harvest of deciduous stands, as identified in MP No. 7. This 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 39 includes the following:

- MacMillan Bloedel Limited, Tree Farm Licence No. 39, Management Plan No. 7, August 2, 1994;
- Statement of Management Objectives Options and Procedures for Management Plan No. 7, TFL No. 39, July 30, 1993;
- Timber Supply Analysis Report: TFL 39, MP No. 7, July 1994;
- Additional Sensitivity Analysis for the Timber Supply Report: TFL 39, MP No. 7, February 1995;
- TFL 39 Management Plan No. 7, 20-Year Plan: 1993-2012 August 12, 1994;
- MacMillan Bloedel Limited Economic Evaluation of some Resource Management Issues Governing the Timber Supply in TFL 39, submitted as part of MP No. 7, B.M. Gellner, July 1994;
- summary of the public input solicited by the licensee regarding the contents of Management Plan No. 7;

- Letter and memorandum from the Minister of Forests to the Chief Forester, dated July 28, 1994 and February 26, 1996 respectively, stating the Crown's economic and social objectives and the Crown's economic and social objectives regarding visual resources; and
- Technical review and evaluation of current management practices through comprehensive discussions with British Columbia Forest Service and Ministry of Environment, Lands and Parks staff, notably a meeting held in Victoria on July 20 and 21, 1995.

Role and limitations of the technical information used

The Forest Act requires me to consider biophysical as well a 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 formed the major body of technical information used in my AAC determination for TFL 39. The timber supply analysis is 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. The analysis also indirectly incorporates some economic information such as an operability classification that defines the types of terrain and timber that can be physically and economically accessed given current technology and markets.

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 insights 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 39, I have considered known limitations of the technical information provided. I am satisfied that this information provides a sound basis for my determination. In particular I have taken the following into account:

- the amount of area within the TFL that is accessible for timber harvesting and is occupied by stands of sufficient value to offset harvesting costs is uncertain, particularly in block 6 (discussed under *economic and physical operability* below).
- site productivity estimates may underestimate the productivity of second-growth stands which replace old stands after harvest (discussed under *site productivity estimates* below).

- volume estimates for existing stands used in the licensee's timber supply analysis may underestimate the actual volumes contained in some stands (discussed under *volume estimates for existing stands* below).
- minimum harvestable age requirements that will ensure economically feasible harvest operations in the future are uncertain (discussed under *minimum harvestable ages* below).

Statutory Framework

Section 7 of the *Forest Act* requires the Chief Forester to consider various factors in determining AACs for TFLs. Section 7 is reproduced in full as Appendix 1.

Guiding Principles

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, and (ii) redetermining AACs frequently to ensure they incorporate up-to-date information and knowledge. In respect of these: (i) 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 AACs from a range of possible harvest levels; and (ii) the benefits of frequent decision making have been recognized in the legislated requirement to redetermine AACs every five years. This principle is central to many of the guiding principles that follow.

In considering the various factors that section 7 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 (IRM) 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 before the Code was brought into force, 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 which 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, February, 1996) indicate that under the Code there will 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 have viewed with some caution the timber supply projections in the timber supply analyses for TFLs such as TFL 39, which pre-date the Code. At the same time, I am mindful that the full force of the Code may not be felt during the transition phase of its implementation, and that the impacts of specific factors on timber supply may not yet have been assessed on a local basis.

The impact on the timber supply of land-use decisions resulting from planning processes such as the Commission on Resources and Environment (CORE) process or 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 possible 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, it may not always be possible to analyze their timber supply impact in an AAC determination. In most cases, as in TFL 39 government's land-use decisions 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. Until such implementation decisions are made, it is impossible to properly assess the impact of the land-use decision. However, the legislated requirement for five-year AAC reviews will ensure such decisions are addressed in a reasonable time period.

The Forest Renewal Plan will fund a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. In general, it is too early for me to assess the consequences of these activities, but wherever feasible I will take their effects into account. The next management plan and timber supply analysis will be better positioned to determine how the Plan may affect timber supply.

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 has created the extensive delays that have resulted in the current urgency to redetermine many outdated AACs. 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 BC Court of Appeal regarding aboriginal rights. The AAC I determine for a TFL 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 the TFL and that it is 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 7(3)(a)(v) 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 attempt 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 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*.

Timber Supply Analysis

In considering the factors required under section 7 to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through timber supply analysis. The timber supply analysis for TFL 39 that I have considered as part of this determination was undertaken by the licensee and reviewed by Forest Service staff. MacMillan Bloedel Limited uses a simulation timber supply model, which they developed in 1991, to project the harvest forecasts contained in the timber supply analysis. While the specific workings of their model differ from those of the BC Forest Service simulation model, their model incorporates the same general processes of forest growth and harvest under specified management regime, which provides a reasonable projection of timber supply.

The MacMillan Bloedel Limited analysis examined ten different management regimes. In addition to a base case option intended to represent the management regime currently practised on the TFL by MacMillan Bloedel Limited, changes were examined both to the definition of the timber harvesting land base and to management objectives. Changes to the timber harvesting land base included accounting for biological diversity, including in the timber harvesting land base areas that are currently classified as infeasible economically to harvest, excluding from the timber harvesting land base all areas that are not the most economically feasible to harvest using only conventional means, and including as part of the timber harvesting land base all areas except those where soils are too unstable to allow timber harvesting operations. Changes in management objectives included varying visual quality objectives and assuming that the current

silvicultural management standards would be enhanced and reduced. The analysis report also included additional forecasts projecting yields if MacMillan Bloedel Limited's estimate of revised site index for old-growth stands is applied. As well, six forecasts were provided that incorporate land base reductions for specific areas of interest in blocks 2, 6 and 7.

Following the analysis, dated July 1994, MacMillan Bloedel Limited provided an addendum to the analysis dated February 1995, which included extensive sensitivity analysis used to examine the effect on timber supply of varying many of the assumptions and estimates used in the base case. This sensitivity analysis included an examination of the implications of varying volume estimates for existing stands, an examination of the implications of reducing the size of the timber harvesting land base and an examination of many other changes to management objectives. I have used these, and describe them in some detail, in my considerations below.

The role of the "base case"

For TFL 39 the timber supply analysis base case (presented as Option 2 in Management Plan No. 7) projects that under current management assumptions harvesting would decline gradually at a rate of approximately 3.4 percent per decade from an initial harvest level of 3 733 000 cubic metres per year (2.2 percent below the current AAC) over a period of 85 years. Over the three decades that follow this period, the harvest level increases slightly and then declines to the long-term harvest level of 3 236 000 cubic metres per year.

The base case harvest forecast was generated by adding the timber supply contributions of the seven supply blocks that comprise the TFL. Separate base case harvest forecasts were generated for each block, except blocks 3 and 4 which were combined and projected in a single harvest forecast.

The base case harvest forecasts for block 2 and blocks 3 and 4 have similar characteristics. The initial rates of harvest for these blocks are less than 20 percent greater than their long-term levels, which in both cases allow a very gradual transition to long-term harvest levels. Together these three blocks contribute slightly less than half of the TFL's initial harvest level and represent over 40 percent of the timber harvesting land base.

The base case harvest forecasts for blocks 5, 6 and 7 also share common characteristics. The initial harvest forecast for blocks 5 and 7 are greater than their projected long-term harvest levels by 24 percent and 47 percent respectively. Although the initial harvest level of the forecast for block 6 is only 17 percent greater than the projected long-term level, the forecast includes a mid-term decline to below the long-term level which is greater than 6 decades in duration. This decline to below the long-term harvest level is a result of the transition from harvesting higher-volume existing stands to harvesting second-growth stands. Alternative harvest forecasts to this base case indicate that even if the initial harvest rate for block 6 was reduced to the block's long-term harvest level, the decline is still projected to occur, albeit to a lesser degree.

The transition to the long-term harvest level in the harvest forecasts for blocks 5, 6 and 7 are all more rapid than for the other blocks in the TFL. The forecast for block 5 projects a rate of decline of 7 percent per decade; the block 6 forecast projects a decline of 9 percent per decade; and the block 7 forecast projects a decline of 15 percent per decade. Together these three blocks contribute over 40 percent of the TFL's initial harvest level and timber harvesting land base.

The base case harvest forecast for block 1 does not involve a decline from the initial harvest level to the long-term level as the others do, rather it increases to the long-term level at a rate of approximately 10 percent per decade. As discussed under *Description of the TFL* above, harvesting in parts of this block has been underway for over 100 years and, as a result, the majority of the large volumes of older wood that typically permits harvest levels to be sustained above long-term levels has been harvested. This block contributes approximately 12 percent of the TFL's initial harvest level and approximately 18 percent of the timber harvesting land base.

The base case forecast forms the basis for comparison when assessing the effects of uncertainty on timber supply. The base case forecast represents only one in a number of theoretical forecasts, and is only one possible forecast of timber supply. Its validity—as with all other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation 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 estimates 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—particularly during the period leading up to, and now during the implementation of, the Forest Practices Code—may well have changed since the original data package was produced.

Thus it is important to remember, in reviewing the considerations which 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. But once an AAC has been determined that reflects appropriate assessment of all the factors required to be considered, no additional precision or validation may be gained by attempting a computer analysis of the combined consideration to confirm the exact AAC determined—it would be impossible for any such analysis to fully incorporate the subtleties of the judgement involved.

The base case harvest forecast, along with an alternative harvest forecast, is discussed further under Harvest flow below.

Consideration of Factors as Required by Section 7 of the *Forest Act*

Section 7 (3)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 10, shall 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

Composition of the Forest:

Land base contributing to timber harvest

The total area of TFL 39 is 803 727 hectares. The land base that is considered available for timber harvesting is limited by a number of factors. The most significant limiting factors in TFL 39 are the presence of environmentally sensitive areas and wildlife and riparian habitats. Areas defined as unavailable for harvest because of terrain-related reasons also present significant limitations to the size of the timber harvesting land base. Reasonable assumptions and, if necessary, projections must be made about these factors and appropriate areas must be deducted from the productive forest area to determine the timber harvesting land base. The current timber harvesting land base, as assumed in the base case harvest forecast, is 461 027 hectares, or approximately 55 percent of the TFL. Although concerns have been raised by Forest Service staff regarding economic and physical operability and the protection of riparian areas, which are discussed below, I am otherwise satisfied from the information presented to me, that in general this land base was determined using reasonable assumptions and projections.

- Economic and physical operability

The size of the timber harvesting land base in TFL 39 identified by the licensee is limited by physical and economic constraints. In 1980, an operability study was conducted to classify stands according to timber value, the kind of harvesting technique necessary to harvest difficult or sensitive terrain, and the location or accessibility of the area. In addition, as part of the preparation of MP No. 7 the licensee provided an assessment of operability based on inventory attributes including species, timber quality, required harvest method and stand timber volume per hectare. The results of this assessment were mapped and reviewed by field staff from both MacMillan Bloedel Limited and the Forest Service. Modifications were made to the maps by field staff according to their local expertise and experience. In conformity with this assessment, the timber supply analysis included a reduction to the timber harvesting land base of 24 973 hectares. This reduction accounts for stands which were not expected to contribute to the timber harvesting land base because they were located on land that was either so steep or rocky, or both, that trees could not be safely felled or yarded, or because harvesting activities would result in a significant proportion of the tree volume being damaged and rendered unrecoverable.

The licensee is of the view that over the next 100 years all of the mature timber, physically safe to fell and extract without unacceptable environmental damage, will be of sufficient value to offset harvesting costs. This view applies to stands that are currently considered to be of marginal or lower timber value and require non-conventional harvesting techniques such as helicopters, balloons and long-line cable systems to permit harvesting. These non-conventional harvesting techniques are more costly than conventional harvesting techniques such as yarding using grapples, highlead, backhoes and skidders.

Forest Service staff have raised concerns about the harvesting economics, maintaining that there is considerable uncertainty associated with the assumption that stands other than those currently considered economically feasible to harvest will be feasible to harvest in the future. The timber supply analysis indicates, according to the licensee's criteria, that there are approximately 16 628 hectares of the TFL, less than 4 percent of the timber harvesting land base, currently covered by stands considered uneconomic to harvest by any means. The base case harvest forecast excludes these stands and projects the timber supply from stands classified by the licensee to be economically feasible to harvest, even if only marginally so. The timber supply analysis also includes a sensitivity analysis which examines the implications of increasing the timber harvesting land base to include the uneconomic stands. The results of this sensitivity analysis indicate that given the relatively small area occupied by stands classified by the licensee as uneconomic, timber supply is relatively insensitive to their inclusion in the timber harvesting land base.

In addition to the Forest Service's view of future harvest operations in stands which are currently considered economically infeasible to harvest there are other concerns regarding operability. Queen Charlotte and Mid Coast Forest Districts have concerns that the licensee's operability classification may not reflect accurately the combined economic and physical factors that influence harvest operations on the land base.

District staff indicate that the minimum stand volumes asserted by the licensee to allow economically feasible harvest operations are insufficient in block 7, as evidenced by actual harvesting performance observed on recent operations. In addition, district staff indicate that some of the areas that were identified by the licensee as harvestable by conventional means are expected to require the application of non-conventional harvesting systems. These observations may be balanced somewhat by an underestimation of volumes in "management class III" stands in block 7. As discussed under *Volume estimates for existing stands* below, the underestimate of existing volumes may reduce to some extent the downward influences the potential overestimation of economically viable harvest operations in block 7.

Queen Charlotte Forest District staff indicate that approximately 6000 hectares of the timber harvesting land base in block 6 that were classified by the licensee as economically feasible to harvest using conventional means are actually only of marginal value. As part of MP No. 6, these stands were reclassified from being considered only marginally economic to harvest conventionally to being considered economically feasible to harvest using conventional means. As discussed under *Harvest profile* below, district staff indicate that during the period of MP No. 6 there was virtually no harvesting in these stands or in others similarly classified.

If the timber harvesting land base is actually less economically viable to harvest and requires more non-conventional harvesting techniques than is reflected by the licensee's classification assumed in the base case forecast, harvesting must increase in these kinds of stands so that operations become balanced in recognition of the portion of the timber harvesting land base that these stands comprise. This is necessary so that future harvesting will not be forced to concentrate in lower-value stands that require more expensive harvesting techniques. This shift in harvesting performance will reduce the risk of future harvesting operations not being viable. This is discussed further under *Harvest profile* below.

Based on my review, I have concluded that over 90 percent of the timber harvesting land base is estimated to be economically feasible to harvest conventionally. Furthermore, it is my expectation that most of the noted concerns can be addressed through operational planning and approval processes. Therefore, for the purposes of this determination, I am prepared to accept the licensee's operability classification of the timber harvesting land base. However, as discussed further under 'Reasons for decision' below, I have included specific conditions in my approval letter which will necessitate the review of operability criteria.

- Deciduous forest types

The timber harvesting land base in the timber supply analysis includes 3711 hectares of deciduous stands (broad-leafed species in the case of this TFL), most of which are in block 1 and a lesser amount in block 2. This area represents approximately half of the deciduous stands in blocks 1 and 2 that are potentially available for timber harvesting. The timber supply analysis assumes that the stands included in the timber harvesting land base will be harvested and planted with coniferous species within the next 50 years. Deciduous harvests from blocks 1 and 2 between 1987 and 1991 have been approximately 52 hectares per year. Negligible harvesting of deciduous stands has occurred in the remainder of the blocks in TFL 39. Nevertheless district staff indicate that they expect harvesting of deciduous stands in blocks 3 and 4 presently. Public concern was expressed that alder stands in block 3 be considered for harvesting, to ensure timber supply to support local employment.

The 20-year plan identifies a total deciduous harvest volume of 531 000 cubic metres, which if harvested over a 20-year period represents 26 550 cubic metres per year. MP No. 7 proposes a slightly higher rate of deciduous harvest—200 000 cubic metres between 1995 and 1999. This involves the harvest of approximately 500 hectares of deciduous stands over this 5-year period, contributing a timber volume of 40 000 cubic metres annually. This volume is not represented in the base case harvest forecast. The timber supply analysis assumes that the area covered by deciduous stands does not contain any merchantable timber volume until after the deciduous stand has been harvested and the site has been reforested with coniferous species.

Given the extent of these stands, and the licensee's demonstrated experience in harvesting stands of this kind, I consider it reasonable to accept their proposal with the following conditions. It may become apparent at some point in the future that the harvesting of deciduous stands followed by planting of coniferous species has implications for the maintenance of biodiversity. I expect the licensee to work closely with the Ministry of Environment, Lands, and Parks to locate harvest operations in accordance with the foregoing caution, and to address this issue as part of the development of MP No. 8. To account for this deciduous volume and to recognize the licensee's proposal, I have allowed for 40 000 cubic metres per year of the AAC I have determined to be harvested from stands predominated by broad-leafed species.

- Vancouver Island Land Use Plan and the Lower Tsitika

Part of the Tsitika River Watershed, known as the Lower Tsitika and representing approximately 3800 hectares, was designated as a park in the July 1995 *Park Amendment Act*. This area contains significant anadromous fishery values, old-growth biodiversity, and elk populations; and maintains an important relationship with killer whale habitat along the shore. It was identified as part of the Protected Areas Strategy to serve as a buffer to Robson Bight.

The timber supply analysis included sensitivity analysis that examined the implications of a withdrawal of the Lower Tsitika from the block 2 timber harvesting land base. The sensitivity analysis projects a very small decrease in timber supply that is not apparent until at least one decade from now.

Given the recent designation of the Lower Tsitika as a park, I consider it reasonable to expect that uses of the area for purposes other than timber production will eliminate the availability of this area for timber harvesting. Nevertheless, this designation is part of a larger strategy to be established through the Vancouver Island Land Use Plan. From the sensitivity analysis discussed above, I expect the timber supply implications of the Lower Tsitika park designation to be extremely small in the short term, and I consider it prudent to assess the implications of the park designation among the other elements of the land-use plan including management regimes for low intensity areas and high intensity areas, which are likely to increase timber supply. Specific objectives for some of the other elements of the plan have not been determined and therefore their implications for timber supply are unknown. Once these implications are determined with reasonable certainty and can be assessed in combination with the implications of the designation of the Lower Tsitika it will be possible to address the timber supply implications of the land-use plan as a whole through timber supply analysis and AAC determination. Until then, however, I am satisfied given the results of the sensitivity analysis, that the designation of the Lower Tsitika does not present a risk to achieving short-term harvest levels in block 2 or the TFL as a whole.

Therefore, for the purposes of this determination I consider the park designation of the Lower Tsitika to impose very little risk given the very large scale of this TFL and the overall flexibility in the timber supply forecast. I consider it appropriate to account for this factor more completely in the next AAC determination for this area once other features of the land-use plan are more fully clarified and both the restrictive and augmentive effects on timber supply can be considered in aggregate.

Existing forest inventory

- General comments

Public concern was expressed that future harvest levels in block 6 should be adjusted to reflect any overcutting that may have occurred as a result of any previous overestimate of timber volumes. In fact, the inventory information used to generate the timber supply forecasts in the analysis does reflect all the harvesting that has occurred in TFL 39, up to 1991. However, it does not reflect forest growth or depletion due to harvesting and natural causes since the end of 1991. This means essentially that 5 years of the timber supply shown in the base case harvest forecast has been depleted.

The inventory information used in the timber supply analysis also includes an adjustment which reduced volume projections based on the findings of a recent inventory audit—although it is noted that there is still some disagreement over those findings, as discussed under *Volume estimates for existing stands* below.

In addition, MP No. 7 commits to re-inventory stands over 31 years old at a rate of 3000 hectares per year. The licensee also plans to re-inventory approximately 46 000 hectares of second growth in block 1 within a 5-year period which began in 1994.

- Age class structure

As a whole the TFL contains a substantial amount of older forest. Approximately half of the timber harvesting land base is covered by stands that are currently over 130 years old. Of the other half, approximately 3 percent has recently been harvested and the balance, 47 percent, is covered by regenerated forests. Regenerated stands under 31 years old make up 27 percent of the timber harvesting land base.

The age-class structure of stands in block 1 is approaching an even distribution, where roughly equal proportions of the forest are in each age group. Nevertheless, there is still a large area covered by stands over 130 years old. The licensee considers that some of these stands are of marginal timber quality or are harvestable only by non-conventional harvesting means, or both. However, the largest component of this age class consists of stands that the licensee considers to be of sufficient timber value to allow economically feasible harvest operations using conventional means.

In block 2 more than half the timber harvesting land base is covered by stands that are over 130 years old, of which approximately a fifth is considered by the licensee to be of marginal timber quality or harvestable only using non-conventional harvesting means, or both. The balance of stands in this age class is considered by the licensee to be of sufficient timber value to allow economically feasible harvest operations using conventional means. There are virtually no stands in this block aged between 70 and 130 years old.

Blocks 3 and 4 contain a larger proportion than block 2 of stands under 50 years of age. However, there is still a significant portion of the timber harvesting land base in these blocks covered by stands that are over 130 years old. Over a third of these are considered by the licensee to be either of marginal timber value or requiring non-conventional harvesting techniques, or both.

Virtually all of the timber harvesting land base of block 5 is covered by stands over 130 years old, over half of which are considered by the licensee to be either of marginal timber value or requiring non-conventional harvesting techniques, or both. There is a small proportion of the land base covered by stands under 30 years old and very few stands aged between 30 and 130 years old.

Almost two-thirds of the timber harvesting land base of block 6 is covered by stands over 130 years old, of which about an eighth are considered by the licensee to be either of marginal timber quality or requiring non-conventional harvesting techniques, or both. Most of the other stands in the timber harvesting land base are under 50 years old.

All but a very small portion of the stands that cover the timber harvesting land base in block 7 are over 130 years old. A third of these are considered by the licensee as either of marginal timber value or requiring non-conventional harvesting techniques, or both. The small portion of stands under 130 years old are all less than 10 years old.

The predominance of old stands with accumulated timber volumes in the TFL as a whole is the primary reason that harvest levels can be maintained in the short term above long-term harvest levels.

- *Species profile*

The predominant species on TFL 39, covering over half of the timber harvesting land base, is western hemlock. Both old and young stands are predominated by this species with 58 percent of the area covered by western hemlock stands younger than 130 years old and 55 percent older than 130 years old. Western redcedar is the second most plentiful species on the TFL. It covers 15 percent of the timber harvesting land base. Twenty-five percent of stands older than 130 years old, and 6 percent of stands younger than 130 years old are composed primarily of this species. Yellow cedar, which is often included in statistics related to cedar, covers an additional 4 percent of the timber harvesting land base and over 90 percent of these stands are considered old growth. Douglas-fir covers 12 percent of the timber harvesting land base and 5 percent of this area is considered old growth. Amabilis fir and sitka spruce cover 7 percent and 5 percent of the timber harvesting land base, respectively. Deciduous species, which are predominantly red alder, cover less than 1 percent of the area. The species distribution of each block varies from the overall TFL distribution largely due to the ecology of each of these widely distributed areas. While western hemlock predominates in all but block 7, the distributions for the blocks are different from each other and from the average derived for the TFL as a whole.

Block 1 includes over half of the total area in TFL 39 covered by Douglas-fir; 5 percent of this area is older than 130 years old.

Western hemlock covers almost two-thirds of the area of block 2. Douglas-fir and amabilis fir each comprise about 15 percent of this block. Redcedar comprises a relatively small proportion of block 2, covering approximately 3 percent of the timber harvesting land base in block 2. With over 70 percent of blocks 3 and 4 covered by western hemlock, these blocks contain the highest proportion of this species in the TFL. Redcedar stands occupy 14 percent of the land base associated with blocks 3 and 4 and are more abundant than in the more southerly Vancouver Island block, block 2. Douglas-fir and amabilis fir each cover about 5 percent of the blocks 3 and 4 timber harvesting land base.

The distribution of species on block 5 is relatively similar to the distribution of the TFL as a whole, except for an increased proportion of amabilis fir, which covers approximately 18 percent of this area.

Block 6 on the Queen Charlotte Islands includes a higher proportion of sitka spruce relative to other blocks. This species covers approximately 12 percent of the timber harvesting land base in this block. Also, red and yellow cedar together comprise over 30 percent of the timber harvesting land base, while Douglas-fir and amabilis fir are absent from the block.

Redcedar predominates in block 7 with approximately 44 percent of the timber harvesting land base covered by this species. Western hemlock covers approximately 39 percent of

the timber harvesting land base associated with block 7. Sitka spruce comprises approximately 6 percent—a relatively high proportion of the area compared to the rest of the TFL except block 6. Similar to block 6, Douglas-fir is not present on this block.

- Volume estimates for existing stands

Volume estimates for existing stands in TFL 39 are based on average volume lines.. These were generated from measurements taken in stands over 130 years old and compiled according to species and site productivity.

MacMillan Bloedel Limited performed a statistical audit of the block 6 forest inventory in cooperation with the Forest Service's Resources Inventory Branch. The audit indicated that, on average for the entire block, existing mature stand volumes generated from average volume lines were overestimated by approximately 12.5 percent. In order to account for this in the timber supply analysis, volumes were reduced to, on average, 616 cubic metres per hectare. Since this adjustment, MacMillan Bloedel Limited has conducted further review of the sample information they used for the audit and believe that the reduction made to the average volume lines used in the timber supply analysis was not necessary and results in an underestimation of the timber supply. Resources Inventory Branch is currently reviewing this information. Until this review is complete, I accept the adjusted volume estimates as representing the best information available for consideration as part of this determination.

In blocks 2, 4 and 7 MacMillan Bloedel Limited conducted studies of their inventory information in accordance with standards that are satisfactory to Resources Inventory Branch. The results of these studies, which have not been thoroughly reviewed by Resources Inventory Branch, report to indicate that inventory information for blocks 2 and 4, as well as the information for the majority of stands in block 7, appear to be statistically valid.

The licensee's review also examined stands in block 7 categorized in 1964 as management class III. The review indicates that the actual volumes of the 1964 management class III stands in block 7 may be underestimated by up to 21.3 percent. These stands represent about 16 percent of the timber harvesting land base in block 7. Since these stands were considered outside of the timber harvesting land base in 1964 when average volume lines were generated for them, the averages were generated through an ocular estimation. A great deal of uncertainty is associated with this past method of estimation and may in part account for the results of the audit for these stands. Additional studies are planned to assess the management class III stands in blocks 2 and 6.

The overall result of the licensee's inventory audits in block 7 indicate that existing stand volume estimates assumed in the base case harvest forecast may underestimate timber supply. Further inventory reviews are planned as part of MP No. 8, which should reduce uncertainty associated with existing stand volume estimates. With regard to the ongoing

review of the audit findings for block 6, I consider the timber supply forecast of this area to be based on the best information available (i.e. the reduced volume projections) for consideration as part of this determination. If ongoing analyses of inventory volumes produces different information from that used for block 6—or any other block in the TFL—then this will be taken into account in a future determination.

For the purposes of this determination, however, I consider it appropriate to account for the risk associated with the underestimation of existing stand volumes in management class III stand in block 7 and view this as exerting an upward influence on timber supply, which I have discussed further under 'Reasons for decision' below.

Expected rate of growth

- Site productivity estimates

Site productivity is the ability of a particular site to grow trees and is usually expressed in terms of "site index". 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 expectations of the time seedlings will take to reach green-up conditions, the volumes of timber that will grow in regenerated stands, and the age at which those stands will satisfy mature forest cover requirements and reach a merchantable size or minimum harvestable age.

Past growth of both young and old stands may not reflect accurately the productivity of a site. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. Old stands may have experienced repression or suppression (where trees compete for sunlight and nutrients because of stand density or competition from an overstorey), or may have been damaged, and therefore may not reflect the true growing potential of the site. Public input expressed concern that existing site productivity information may not accurately reflect the actual timber growing potential of sites in block 6.

Concern about the accuracy of site productivity estimates for TFL 39 are also held by the Forest Service's Research Branch. Productivity estimates assumed in the base case forecast for 44 percent of the TFL are based on 1964 inventory information and Research Branch believes that this information likely underestimates site productivity.

MacMillan Bloedel Limited has developed an alternative method for determining site index for regenerated stands. This method relates a known series of site indexes measured from second-growth stands to biophysical attributes such as species, location, elevation, slope, aspect, and biogeoclimatic variant. Using these relationships, site index is estimated for all stands in the forest based on the stand's specific biophysical site factors. This biophysical method was under review at the time that the timber supply analysis was conducted. Subsequent to the initiation of the analysis, however, the biophysical method was approved for use in a management plan for another TFL held by

MacMillan Bloedel Limited. As a result, the licensee chose to examine through sensitivity analysis, the implications for timber supply in TFL 39 of adjusted estimates in accordance with their biophysical method.

The results of sensitivity analysis that made use of the adjusted site productivity estimates for the entire TFL indicate a medium- and long-term increase to the TFL's timber supply of almost 20 percent. This results in a harvest forecast which does not decline to a long-term harvest level, but rather is maintained in the medium term and increases slightly to long-term harvest levels. According to the sensitivity analysis, the largest proportional increases to harvest levels are possible in blocks 1, 3, 4, and 5. In block 6, the most significant effect of revised site productivity estimates is a more gradual rate of decline to a medium-term shortfall that is of smaller magnitude than projected in the base case forecast. In block 7, the current relative absence of regenerated stands minimizes the short- and medium-term implications of revised site productivity estimates. The harvest level for this sensitivity analysis in block 7 declines at the same rate as the base case forecast to a slightly higher medium-term harvest level and ultimately a long-term harvest level 18 percent greater than that of the base case forecast.

These results are significant to this determination mainly because of their implications for other assumptions about forest growth and conditions. As noted above, site productivity affects the length of time required for seedlings to reach green-up conditions, as well as regenerated stand volumes and minimum harvestable age. I have considered additional sensitivity analysis examining these factors to determine the significance of potentially underestimated site productivity.

As discussed under *Forest cover requirements* below, timber supply is very sensitive to increases in green-up requirements in blocks 6 and 7, which ensure that integrated resource management objectives are met in block 6 and visual quality objectives are met in block 7. The earlier attainment of green-up conditions as a result of underestimated site productivity would assist in offsetting some of the downward influences present in block 6.

Sensitivity analysis indicates that any increase in regenerated stand volumes does not affect short-term timber supply for the TFL.

Additional sensitivity analysis indicates that a 20-year reduction in minimum harvestable ages does not affect short-term timber supply for the TFL as a whole, with the exception of block 6, which is discussed under *Minimum harvestable ages* below.

For this determination, I have not made adjustments to the short-term timber supply with respect to potentially higher site indexes, although I have acknowledged the influence this potential change may have on some of the factors discussed below which tend to reduce timber supply. This is discussed further under 'Reasons for decision' below.

Acknowledging that the adjusted site productivity estimates examined in the sensitivity analysis have not been formally approved for use in this analysis, I consider them to primarily affect medium- and long-term timber supply giving rise to a more stable or optimistic timber supply forecast for the TFL than shown in the base case forecast. As further information is developed, it will be accounted for in future determinations for this TFL.

- Volume estimates for regenerated stands

Estimates of volumes for regenerated stands were projected in the timber supply analysis using Y-XENO—MacMillan Bloedel Limited's growth and yield model.

Research Branch indicated that the yield projections generated by Y-XENO for hemlock and Douglas-fir stands required adjustment in order to be acceptable for use in the base case harvest forecast assumptions. In response the licensee reduced their yield projections for Douglas-fir stands by 10 percent and increased projections for hemlock stands by 5 percent to more closely approximate yields estimated using Forest Service methods. Subsequent to the adjustments and completion of the timber supply analysis, Research Branch discovered that the upward adjustment to hemlock stand yield projections was not warranted. Research Branch staff indicate that the use of the adjusted hemlock yield projections may overestimate to some extent the timber supply from these stands.

Operational Adjustment Factors (OAFs) were applied to the yield predictions in the timber supply analysis to account for the loss of timber volume due to particular operational conditions, such as openings in stands, pests, and decay, waste and breakage. Research Branch also indicated that for the base case, the OAF that the licensee used to account for openings in stands, OAF 1, needed to be increased by 5 percent to approximate Forest Service standards. The licensee complied with this requirement. I am satisfied that the base case forecast represents the OAFs adequately. I also acknowledge that the licensee holds a more optimistic view of the volumes that may be present in future, regenerated stands. Since the volumes present in these stands does not affect short-term timber supply it does not have a bearing on the harvest level established as part of this determination. I expect the gradual reduction of uncertainty associated with regenerated stand volumes to be reflected in future timber supply analyses conducted for this TFL.

Furthermore, I am mindful of the uncertainties associated with site productivity estimates, as discussed above. Any underestimate of site productivity would more than offset the downward impact of the adjusted yield projections for regenerated hemlock stands used in the timber supply analysis. For the purposes of this determination, however, since adjustments to site productivity have not been formally approved at this time and the base case forecast reflects the adjustment to hemlock stand yields, I consider the overestimation of the regenerated hemlock stand yields as a very small downward

influence on future timber supply. I have discussed this further under 'Reasons for decision' below.

- Genetically improved stock

Incorporated in the projection of regenerated stand yields are volume and growth gains made through planting genetically improved seedlings. MacMillan Bloedel Limited have their own seed orchards and also purchase suitable coastal seed to use in reforesting harvested sites in TFL 39. For all stands planted after 1995 with more than 600 stems per hectare, gains of 3 percent were applied to volume estimates. This gain was determined as part of a Tree Improvement Agreement signed in 1990 and accounts for the fact that not all of the planted stock is improved genetically. In TFL 39, approximately 40 percent of the stock planted is from wild seed. I acknowledge this practice and am satisfied that it was accounted for appropriately in the timber supply analysis.

- Minimum harvestable ages

Minimum harvestable age is the estimated average time required for forest stands to grow to a harvestable condition. The minimum ages assumed in the timber supply analysis for TFL 39 were estimated using Y-XENO and range from 35 to 300 years.

Minimum harvestable ages in TFL 39 are established using two criteria. The first criterion is the age at which a stand's annual growth is within 0.2 cubic metres per hectare per year of its culmination mean annual increment. This is the point that the stand is at or very close to the age at which its average annual volume growth is at its greatest. Harvesting at this age maximizes the volume of timber that can be generated from a piece of forest land over the long term. Harvesting before or after culmination theoretically does not maximize the potential timber volume that can be generated over time.

The second criterion is that stand volume is at least 250 cubic metres per hectare, and that the trees that make up the stand, on average, have a diameter at breast height (dbh) of at least 25 centimetres. This criterion accounts for the possibility that stands at culmination age may not contain sufficient volumes or suitable diameter trees to ensure profitable harvest operations.

These criteria result in an average minimum harvestable age for TFL 39 of 86 years based on average ages for each block (93 years for block 1, 82 years for block 2, 80 years for blocks 3 and 4, 83 years for block 5, 87 years for block 6 and 91 years for block 7). These ages represent the lower age limit for harvesting. Actual harvest ages depend on many factors including the ages of other stands, limits on the overall harvest level, and forest cover requirements, such as those in visually sensitive areas. The forest cover objectives necessitate the retention of mature forest cover—often this retained forest cover is much older than the minimum harvestable age. The diameter of trees in these stands is therefore larger than the requirements for minimum harvestable age.

Moreover, minimum ages specified by the minimum volume and diameter criterion only applies to stands growing on sites with low productivity. This is because stands on more productive sites generally exceed these volumes and diameters when they approach their culmination age. In addition, the timber supply analysis assumes the harvest of older stands before younger stands and the harvest of more productive sites before less productive sites. As a result, the analysis indirectly assumes that low productivity stands would be harvested at ages older than their minimum harvestable ages.

Nevertheless, there was concern expressed by Queen Charlotte Forest District staff that the minimum diameter requirements assumed in the timber supply analysis may underestimate minimum harvestable ages in block 6. Minimum harvest ages on management units adjacent to TFL 39 are roughly based on a minimum 45-centimetre diameter which in those management units is projected to be requisite to economically feasible harvesting. In these units, the minimum diameter requirement is adjusted in accordance with site productivity. For instance, sites with relatively low timber growing potential have minimum harvestable ages that do not require a minimum 45-centimetre diameter.

Forest Service Silviculture Practice Branch staff also expressed concern that trees of 25-centimetre diameter will be too small to manufacture into a sufficiently valuable product to offset the costs of harvesting and production. This is compounded by concern that the relatively difficult harvesting terrain of block 6 gives rise to increased harvesting costs, thereby reducing the overall viability of harvesting small-diameter stands. In contrast to these concerns, the licensee indicates that some current markets actually place a higher value on smaller diameter sawlogs. It is my observation that there are many factors which affect the economic viability of operations, and these often change over time.

In order to address concerns however, sensitivity analysis was conducted examining the implications of changes to minimum harvestable ages from those assumed in the base harvest forecast for TFL 39. These changes simulate the timber supply implications of harvesting trees at ages associated with larger diameters and greater stand volume. The results indicate that short-term timber supplies for the TFL as a whole are not affected by an increase in minimum harvestable age of 10 or 20 years or a decrease of 10 years. In the case of these two increased harvestable ages however, the TFL's timber supplies in the medium term are reduced by 7 percent and 17 percent respectively. The sensitivity analysis also indicates that a 10-year increase in minimum harvestable ages, which brings these ages closer to culmination ages, results in a higher long-term level. Increasing the minimum harvestable age by 20 years or decreasing the age by 10 years reduces the long-term harvest level because the minimum harvestable age in these cases is further from the culmination age.

Separate analysis of minimum harvestable ages specific to block 6 was also conducted. The timber supply analysis indicates that for block 6, given the minimum harvestable age criteria, less than 26 percent of the stands that make up the block 6 timber harvesting land base would be harvested at a 25-centimetre diameter. As referred to above, the exact

projection of the proportion of the timber harvesting land base supporting stands of 25-centimetre diameter would be less than 26 percent because of forest cover objectives, particularly in visually sensitive areas. The results of sensitivity analysis examining the implications of increasing minimum harvestable ages by 10 and 20 years on block 6 are similar to the results when these adjustments are made for the entire TFL, as discussed above. However, the medium-term shortfall projected for block 6 is expected to increase as a result of either a 10 or 20 year increase in minimum harvestable age. Sensitivity analysis was also conducted to examine the implications of increasing the minimum harvestable ages on block 6 to ages associated with a 45-centimetre diameter. In this case, the average minimum harvestable age is 202 years. The sensitivity analysis assumed a harvest age of 300 years for stands which were not projected to reach the 45-centimetre diameter requirement at 300 years of age. These ages are considerably higher than the minimum harvestable ages assumed in the timber supply analysis for the Queen Charlotte TSA, which ranged from 100 to 150 years. Sensitivity analysis indicates that if minimum harvestable ages are established in accordance with a 45-centimetre diameter requirement, short-term timber supply in block 6 declines 14 percent from that of the base case forecast. Similarly, the medium- and long-term supplies are reduced by 26 percent and 23 percent respectively.

In the short term, however, I am satisfied that the minimum harvestable ages assumed in the timber supply analysis are not a risk to short-term harvest levels. This is because currently the presence of older, larger diameter wood in the TFL supplies the majority of the volumes harvested in the short-term. These stands are already considerably older than the minimum harvestable ages assumed in the timber supply analysis. Because of this relative abundance of older stands, harvesting has only occurred to a small degree in younger, smaller diameter wood and therefore the ability to assess the merchantability of these stands is limited and is also subject to considerable uncertainty. The stands described by the 25-centimetre diameter criteria are not expected to be harvested in the short term. In the case of block 6, the base case forecast projects the initiation of harvesting 25-centimetre diameter stands does not occur until at least 70 years from now. The market conditions that will prevail at the time that they are harvested and which ultimately determine the merchantability of small-diameter stands, are obviously uncertain and difficult to predict.

It is therefore difficult to assess with certainty the suitable minimum harvestable ages for future stands. Nonetheless, the licensee's assumptions regarding the merchantability of stands containing trees of an average diameter of 25-centimetres signals a shift in economic assumptions used for TFL 39. The uncertainty is further complicated to some extent by the influence of other forest management practices which tend to reduce minimum harvestable ages. This includes the spacing of juvenile stands. As discussed under Juvenile spacing below, current information indicates that juvenile stands that have been spaced are likely to reach large enough dimensions to permit economically feasible harvest operations sooner than stands that are not spaced.

In addition, the implications of changes to site productivity estimates for minimum harvestable age could exert a considerable influence in block 6. As discussed under *Site productivity estimates* above, if site productivity is actually higher than defined for the analysis, trees will reach a harvestable condition sooner. The timber supply analysis indicates that for block 6, if site index is increased by 3 metres, less than 11 percent of stands in block 6 could be harvested at a diameter of 25-centimetres.

Given the uncertainties associated with minimum harvestable ages, I am prepared to accept the licensee's assumptions for the purposes of this determination. Clearly, it is impossible to predict future product prices and demand with certainty. However, given that these assumptions mark a departure from previous criteria, I have specified certain conditions in my approval letter.

In addition, Queen Charlotte Forest District staff plan to undertake further evaluation of product objectives and desirable forest stand conditions as these relate to minimum harvestable ages in the Queen Charlotte TSA. This evaluation may also provide information for consideration in the next AAC determined for TFL 39.

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

Regeneration delay

Silvicultural standards require establishment of fully-stocked stands by the end of a specified regeneration delay period. The timber supply analysis assumed an average regeneration delay of 2 years for all species.

Public input included concern that replanting of harvested sites was not occurring soon enough. I consider 2 years to represent prompt regeneration relative to other management units in the province and this estimate has been verified by a review of records as reasonable given practices on the TFL. Although as discussed below there are some impediments affecting regeneration establishment in parts of the TFL, they are manageable and I am satisfied that the regeneration delay estimate assumed in the timber supply analysis are reasonable for consideration as part of this determination.

Impediments to prompt regeneration

Difficulties encountered in regenerating forests in TFL 39 have largely been a result of competition from brush and the effects of deer browsing. District Forest Service staff expressed concern about whether or not these difficulties are adequately reflected in the assumptions included in the timber supply analysis.

Forest Service staff acknowledge that the licensee has conducted very aggressive reforestation practices and that reforestation has been prompt on recent cutblocks and various strategies are employed to address brushing concerns. However, Forest Service staff observe that there is a trend to more of the harvesting occurring on less productive sites which are sometimes more difficult to reforest and which may take longer to regenerate than the higher productivity sites that have comprised a significant proportion of the areas harvested to date.

Public concern was expressed that cedar stands in Block 6 which are harvested should be replanted with western redcedar and cypress wherever possible. Because western redcedar plantations on block 6 are browsed heavily by deer, the licensee generally replants harvested cedar sites with other species. The degree to which this conversion may occur on all sites is limited by requirements for biodiversity and the ecological suitability of alternative species to sites currently growing cedar stands. Other techniques such as fencing around cutblocks, using vexar netting to protect seedlings from browsing, and the use of systemic repellents in planting stock or external deer repellents all contribute to the range of practices being employed for managing regeneration success on areas that are likely to be browsed by deer.

Having reviewed all of the information pertinent to this matter, and acknowledging that some of the questions which have been raised have uncertain outcomes or can be addressed through careful management, I conclude that the regeneration assumptions

included in the timber supply analysis do provide adequate representation of regeneration in TFL 39 for the purpose of this determination. I am satisfied that any changes in regeneration performance documented during the term of MP No. 7 can be incorporated the next AAC determination.

Not-satisfactorily-restocked areas

MP No. 7 reports that about 14 772 hectares of the TFL were considered in 1991 to be current, not-satisfactorily-restocked (NSR) area. Most of this consists of recently harvested areas that are not covered by a sufficient number of tree stems of desirable species, but which are expected to be reforested within the acceptable regeneration delay period. There are also approximately 295 hectares of area that is considered backlog NSR area in TFL 39. These are areas that have not reached stocking standards by the end of the specified regeneration delay period. Both backlog and current NSR areas are planned to be restocked within the next 3 years. Together the NSR areas represent a small portion of the timber harvesting land base, and records indicate that compliance with restocking standards has been good.

The amount of NSR in TFL 39 is within the limits of regeneration delay (with the exception of the insignificant amount of backlog NSR area present in this TFL) and I am satisfied that the timber supply analysis provides satisfactory representation of NSR for consideration in this determination.

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

Alternative silvicultural systems

MP No. 7 includes the commitment to use one or more variations of a shelterwood harvesting system where it is necessary to protect values other than timber or where amelioration of visual disturbance is necessary. As discussed under *Visually sensitive areas* below, the plan identifies the highly visible landscapes adjacent to Powell Lake and other lakes in block 1 as initial candidates for these systems. The 20-year plan identifies a small area of montane timber—timber above an elevation of 4000 feet—that is scheduled for shelterwood harvesting.

Public concern was expressed that for the TFL as a whole alternative silviculture systems should be used to harvest old-growth forests. These practices could have implications on timber yields but no information is available at this time. It will be important to determine timber growth and yield under these alternate systems, particularly if their use becomes more extensive. As new growth and yield information becomes available it will be incorporated in future determinations.

Stand tending

Stand tending in TFL 39 consists mainly of the spacing of juvenile stands. In MP No. 7 the licensee projects spacing about 1250 hectares per year for 4 years and increasing this amount to 2690 hectares per year beginning in 1999. I consider this a reasonable commitment based on the magnitude of past spacing programs that have been conducted in this TFL. The base case assumptions identify approximately 55 000 hectares or 12 percent of the timber harvesting land base that is considered suitable for juvenile spacing. The licensee acknowledges the need expressed by staff from the Ministry of Environment, Lands and Parks (MELP) to space specific stands earlier and to a lower density in order to provide habitat for wildlife. Given guidance from MELP staff, the licensee has committed to conduct spacing operations to meet these objectives.

As discussed under *Minimum harvestable age* above, current information indicates that juvenile stands that have been spaced are likely to reach large enough dimensions to permit economically feasible harvest operations sooner than stands that are not spaced. As a result of this relationship, the evaluation of minimum harvestable ages that I have directed for inclusion in MP No. 8 will necessitate an examination of current stand tending techniques, such as the spacing of juvenile stands and expectations for the future practices such as fertilizing, will also likely need to be examined.

At present, and as assumed in the timber supply analysis, no fertilizing or pruning is being conducted in TFL 39. Public concern was expressed that, for the TFL as a whole, pruning should be conducted in older stands. At present, pruning is conducted in juvenile or younger stands in order to achieve maximum benefit and justify expenditures. The objective of pruning is primarily to increase timber quality and value rather than volume. I am satisfied that stand tending practices for TFL 39 were adequately accounted for in the timber supply analysis.

Commercial thinning

Public concern was expressed that, for the TFL as a whole, more selective harvesting techniques and thinning activities should be conducted. According to MP No. 7, the licensee plans to conduct commercial thinning activities under the following circumstances: where the combined volume yield from thinning and clearcut harvesting is greater than or equal to the yield from clearcutting alone, and in visually sensitive areas where thinning would allow more flexibility in harvest scheduling.

Commercial thinning in TFL 39 has been conducted on a total of 2716 hectares to produce a total sawlog and pulp volume of approximately 490 000 cubic metres. The 20-year plan includes commercial thinning in Blocks 1 and 4 that together contribute approximately 147 000 cubic metres to the 20-year harvest. However, the timber supply analysis does not assume any volume implications from commercial thinning activities. Although as the 20-year plan indicates, the thinnings themselves do not contribute significantly to timber supply, they may provide additional operational flexibility, particularly in visually sensitive areas. I have accounted for the contribution of commercial thinnings under *visually sensitive areas*, discussed below.

- (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 and compliance

The standard and level of timber utilization define the species, dimensions and quality of trees that must be cut and removed from the site during harvesting operations. The timber supply analysis for TFL 39 assumes that in old-growth stands all trees of at least 22.5 centimetre diameter at breast height be harvested and removed from the site. The analysis also assumes that no stumps from old-growth stands be taller than 30 centimetres and that all wood in these stands to a top diameter of 15 centimetres be removed from the site. Assumptions for second-growth forests also require that no stumps be taller than 30 centimetres but the standards require that all second-growth trees of at least 17.5 centimetre diameter at breast height and all wood in these stands to a top diameter of 10 centimetres be removed from the site. Any merchantable wood that is left on the site is accounted for in residue and waste surveys and is considered to contribute to the AAC. Forest district staff report that, in general, these standards are complied with. The timber supply analysis includes these standards as assumptions in the timber volume projections. I consider the assumptions to be a reasonable representation of current practices and suitable for consideration in this determination.

Decay, waste and breakage

The timber supply analysis assumes an average volume loss to decay, waste and breakage of 7.82 percent for all stands. This percentage was derived from waste survey results from 1985 to 1989 and was reviewed and accepted for use in 1993 by Resources Inventory Branch of the Forest Service. Resources Inventory Branch has requested additional substantiation of the use of this estimate as part of the next management plan prepared for this TFL.

For the purposes of this decision, I consider the existing estimates incorporated in the timber supply analysis to be the most reliable indicator of decay, waste and breakage in TFL 39 available for consideration in this determination.

- (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 (IRM) 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, having regard to the immediate and long-term economic and social benefits, and, in consultation and cooperation with other agencies, to plan, coordinate and integrate the use of a variety of forest-related resources. The extent to which integrated management objectives for various forest resources and values constrain the timber supply must be considered in AAC determinations.

- *Forest cover requirements*

In order to protect forest resources such as wildlife, water quality and aesthetics, harvesting regulations limit the size and shape of cutblocks, and forest cover objectives prescribe the forest growth or green-up conditions that must occur on a reforested site before timber on adjacent cutblocks can be harvested. This provides for a distribution of harvested areas and retained forest cover across the landscape. The objectives for and the management of specific forest resources in TFL 39, such as visually sensitive areas, are discussed under relevant sections below. The remainder, about two-thirds of the timber harvesting land base in TFL 39, is subject to forest cover requirements for general integrated resource management. These requirements limit the amount of a drainage or landscape that may be under cover of stands that have not attained green-up conditions. The base case harvest forecast assumes that no more than 25 percent of the this area may be under cover of stands that are under approximately 3 metres tall. In TFL 39, on average, it takes trees 12 years to reach a height of 3 metres. (This green-up age includes a regeneration delay of 2 years.) The forest cover objectives assumed in the analysis describes a four-pass system. A four-pass system assumes that to harvest all of a particular portion of the timber harvesting land base four harvest passes, each followed by sufficient time for harvested areas to reach green-up conditions, would be necessary in order to meet forest cover objectives.

Queen Charlotte Forest District staff indicate that, in their view, green-up conditions are not likely to be met in block 6 until stands are at least 15 years old. Sensitivity analysis was conducted examining the implications of a five-pass harvesting regime with a green-up age of 15 years in block 6. The results indicate a short- and medium-term reduction to timber supply in block 6 of approximately 30 percent. Queen Charlotte Forest District staff indicate that this sensitivity to more constraining forest cover objectives and the longer amount of time necessary to meet green-up conditions are reflected in the licensee's 20-year plan. The 20-year plan, according to district staff, fails to demonstrate the availability of timber supply from block 6 over the next 20-year period to meet current harvest levels while at the same time meeting green-up conditions required before adjacent areas may be harvested.

Forest cover objectives in the majority of the Queen Charlotte TSA specify a four-pass harvesting system with a green-up height of 5 metres, which on average and including a regeneration delay of 3 years, requires 16 years to achieve. This exemplifies the uncertainty associated with the description of forest cover objectives necessary to achieve integrated resource management on adjacent landscapes. This is further complicated by the possible underestimation of site productivity. As discussed under *Site productivity estimates* above, any increase in estimates of site productivity would result in the attainment of green-up conditions at younger ages.

While concerns have been raised about the attainment of green-up on block 6, I do not have enough information before me to conclude that projected green-up requirements will

not be attained. The information put forward by the forest district requires further validation before it can be taken into account in an AAC determination. Therefore, for the purpose of this determination I accept the findings of the analysis albeit with some caution and having reviewed the implications of an assumed range of uncertainty. I expect the forest district to undertake further specific analysis of their concerns, in conjunction with the licensee, prior to the next timber supply analysis conducted for this TFL.

- Visually sensitive areas

Forests managed by the Forest Service include recreation resources, which are defined in the Forest Practices Code of British Columbia Act to include 'scenic or wilderness features or settings that have 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, numbers of viewers and their perceptions—and provide recommended visual quality objectives for visually sensitive areas.

Meeting these objectives requires special consideration during timber harvesting, road building and other forest practices in the sensitive areas. Based on research and experience, and on public preferences and acceptance of degrees of alteration of visual landscapes, forest cover requirements have been designed which describe the maximum allowable percentage of a landscape unit that can be harvested at any one time. "Visually effective green-up" is the stage at which regeneration is perceived by the public to be visually acceptable. These requirements are based on the results of focus tests with a cross section of the general public in 12 communities throughout BC.

The timber supply analysis reflects the management of visual quality using currently recommended visual quality objectives that reflect practices in visually sensitive areas. MP No. 7 commits to the completion of a further review of landscape inventories and consequent recommendations for visual quality objectives by the middle of 1997.

The forest cover objectives for visual quality assumed in the analysis apply to about one third of the timber harvesting land base. Objectives for these areas require that, at any time, no more than between 3 and 37 percent of the visually sensitive area may be under cover of stands that have not reached green-up conditions. Sensitivity analysis indicates that the short-term timber supply is relatively insensitive to a relaxation of forest cover objectives for visual quality.

While the licensee reports that the landscape inventory used in the timber supply analysis is broad-based and dated, I accept that the inventory information used in the timber supply analysis represents the best available information about visually sensitive areas in TFL 39 for consideration as part of this determination. Nevertheless, I hold the licensee to their commitment to review their landscape inventories by the middle of 1997.

The Minister of Forests has expressed the provincial socio-economic objective of ensuring an appropriate balance between protecting visual resources and minimizing the impact of such protection measures on timber supplies, recognizing that protecting visual resources may overlap with other objectives now required under the Forest Practices Code (see below, section 7(3)(a)(d) and Appendix 4). Consideration of this objective is required to ensure consistency between this AAC determination and other Code requirements. Some public comments were received on this topic, expressing concern that timber supply in block 6 was being restricted because of visual quality objectives. In addition, the economic evaluation submitted by the licensee as part of MP No. 7 as discussed under *Community dependence on forest industry* below, includes an assessment of the economic implications of requiring different intensities of visual quality management.

As discussed above, the forest cover requirements analysed in the base case forecast applied to visually sensitive areas in the TFL are based on current visual quality objectives for the TFL. These objectives provide a range of disturbance levels acceptable within a visually sensitive area, expressed as the maximum percentage of area covered by stands that have not met green-up conditions. In the timber supply analysis, the midpoint of the range was used, and then adjusted to account for the contribution to the maintenance of visual quality of areas excluded from the timber harvesting land base, and for the dispersion of openings and forested areas. In consideration of the recent direction provided by the Minister of Forests discussed under 7(3)(a)(d) below, it may be more appropriate to examine a greater allowable disturbance for visually sensitive areas.

Sensitivity analysis examined the implications of the dispersion of areas excluded from the timber harvesting land base within visually sensitive areas. This analysis also provides a reasonable indication of the implications of allowing a greater amount of disturbance in visually sensitive areas. The results of the analysis indicate that short- and medium-term timber supplies remain virtually unchanged from the base case forecast when requirements are adjusted to allow a greater degree of disturbance in visually sensitive areas. In block 6, however, the decline to below the long-term harvest level is eliminated if requirements were to reflect these changes. A significant increase in timber supply is projected when height requirements for visually effective green-up are reduced.

Mid Coast Forest District staff indicate that stands in block 7 must be at least 6 metres tall to achieve visually effective green-up conditions. The base case forecast assumes a visually effective green-up at 5 metres tall. In the case of block 7 a taller green-up height may be reasonable given the steep terrain and coastal waterways that comprise most of the block. Moreover, approximately a quarter of the timber harvesting land base in the block is managed specifically for visual sensitivity. The block is also adjacent to the Hakai Pass Recreation Area and contains the Koeye River Watershed. Sensitivity analysis of a 7-metre visually effective green-up height for block 7 indicates a slightly more rapid rate of decline to long-term harvest levels. An increased green-up height would therefore have a very small downward pressure on short-term timber supply.

However, the entire harvest from block 7 only represents 5 percent of the TFL's current harvest. Moreover, as discussed under *Site productivity estimates* above, any increase in estimates of site productivity would result in the attainment of green-up conditions at younger ages. I am satisfied therefore that the underestimation of green-up conditions in block 7 does not pose a risk for timber supply in the TFL. To the contrary, the potential underestimation of site productivity and its implications for reduced green-up ages may lead to an increase in timber supply for the TFL as a whole and is a reason for optimism.

In addition, the use of alternative silvicultural systems such as shelterwood harvesting systems—which involves harvesting only a portion of the stand so that the remaining trees provide seed and shelter for the younger trees—may provide additional harvesting flexibility in visually sensitive areas. As discussed under *Alternative silvicultural systems* above, MP No. 7 includes the commitment to use one or more variations of a shelterwood system where it is necessary to protect other values or to ameliorate visual disturbance. The plan identifies the highly visible landscapes adjacent to Powell Lake and other lakes in block 1 as initial candidates for these systems.

Also, as discussed under *Commercial thinning* above, the licensee plans to conduct commercial thinning activities in stands in TFL 39. This may provide additional operational flexibility, particularly in visually sensitive areas.

I note that there is some potential to increase the availability of timber for harvesting by using alternative silvicultural systems and commercial thinning in visually sensitive areas. In addition, improved cutblock design in visually sensitive areas could increase the availability of timber in the short term. I also note the potential to increase the availability of timber in the medium term in block 6 if a greater degree of disturbance in visually sensitive areas is permitted. These upward influences tend to offset the downward pressure on timber supply resulting from the need for taller trees to meet green-up conditions in block 7. Taking all of these influences into consideration, I expect it is reasonable that timber availability may be increased in visually sensitive areas beyond that assumed in the base case harvest forecast. I have taken this into account in my determination, as discussed below, under "Reasons for decision".

- *Riparian areas*

Public concern was expressed that timber supply in block 6 was being restricted because of objectives for the protection of biodiversity and environmentally sensitive areas. However there were also suggestions that streams are being damaged in block 6 because of increasing siltation from logging.

The timber supply analysis includes assumptions that describe the protection of these resources. The protection of riparian habitat was accounted for in the timber supply analysis through a 10 354 hectare reduction to the timber harvesting land base. Additional riparian areas were also deducted because of inoperability or very low timber growing potential. The reduction represents a 20-metre buffer on both sides of all streams having fish spawning and highly productive rearing areas. In addition, it

accounts for 30-metre protective buffers established around estuaries and lakes. The deduction also was intended to represent the protection of areas containing braided stream channels and flood plains that are suitable for spawning and fish rearing.

Since the completion of the timber supply analysis, new Forest Practices Code requirements for the protection of riparian habitat have introduced additional requirements for the protection of and harvesting in riparian areas. New requirements necessitate wider buffers on high-value streams. Forest Service staff estimate that a timber harvesting land base reduction at least 2 percent larger than assumed for riparian protection in the timber supply analysis would be necessary to account for these additional requirements.

These new requirements are likely to exert a downward pressure on timber supply. Based on my review of the constraints applied in the analysis, based on my experience reviewing the influence of this factor in other management units, and based on the further evaluation by Forest Service staff of the Forest Practices Code riparian requirements, I consider the protection of riparian habitat to be more restrictive on short-term timber supply than shown in the analysis. I have accounted for this in 'Reasons for decision' below.

- Community watersheds

The Forest Practices Code will require the structured assessment of forest practices proposed in forest development plans for interior and coastal watersheds to evaluate the occurrence and risk of cumulative effect impacts. These assessments involve a set of environmental indicators focusing on five potential hydrological hazards: peak flows, suspended sediment, landslides, riparian impacts, and stream channel stability. The timber supply analysis does not account for watershed assessment procedures described by the Forest Practices Code because the procedures were not in existence at the time that the timber supply analysis was conducted. However, Forest Service district staff believe the assessments will likely result in reduced timber supplies, possibly in the short term. At this time, the implications of these assessments to timber supply in TFL 39 cannot be reliably estimated or quantified. I expect the preparation of the next timber supply analysis conducted for TFL 39 to address the implications of any assessments that are complete at that time.

In the meantime, however, I note that public concern was expressed about the spraying of herbicides in community watersheds in Block 1. According to MP No. 7, MacMillan Bloedel Limited favours the use of non-herbicide methods where results and costs are comparable to herbicide use. MP No. 7 indicates annually herbicides are applied to 120 hectares of the TFL, while brush growth is controlled through the use of mechanical treatments on approximately 560 hectares per year. MP No. 7 also includes the commitment to adjust logging and silviculture treatments to maintain water quantity and quality in watersheds providing domestic water. I am satisfied that any adjustment to management practices to meet these commitments that may have implications for timber

supply can be addressed in conjunction with requirements of the Forest Practices Code as part of the next timber supply analysis conducted for this TFL.

For the purposes of this determination I have made no adjustment from the base case harvest forecast to account for the protection of community watersheds. I accept the commitments of the licensee regarding the maintenance of water quality and quantity in watersheds providing domestic water supplies.

- Biodiversity

Public concern was expressed that a biodiversity study of Louise Island in block 6 should be conducted before any further harvesting on the island occurs. Public concern was also expressed that the implications for genetic diversity of harvesting and reforestation practices in general are uncertain. These are both issues that are addressed to some extent as part of this determination. The discussion that follows in the remainder of this section examines the current requirements of the Forest Practices Code with regard to the maintenance of biodiversity. I also note that the protection of riparian habitat, as discussed above, also contributes to the maintenance of biodiversity in this TFL at this time, as do other reductions made to the timber harvesting land base. Some of the broader concerns regarding the maintenance of biodiversity are the subject of plans that have not yet been prepared, and these concerns likely will be addressed as the Forest Practices Code continues to be implemented. Any new practices or requirements will be reflected in the next analysis and determination conducted for this TFL.

Measures to ensure the maintenance of biological diversity in the TFL 39 were not explicitly included in the timber supply analysis, because at the time that the analysis was conducted these measures were not required. However, sensitivity analysis conducted by the licensee approximates the implications of managing for biodiversity in TFL 39. One sensitivity analysis examines the implications of reducing the mature forest area available for harvest by approximately 4 percent. A second sensitivity analysis was conducted which examined the implications of reducing the mature forest area available for harvest by 10 percent and also reducing the regenerated forest area available for harvest by 5 percent. The results of both of the sensitivity analyses indicate that the short-term timber supply for the TFL as a whole is very stable and sufficient flexibility is available to maintain options for biodiversity management while maintaining the initial harvest levels shown in the base case, although future rates of decline and long-term harvest levels are affected. However, these analyses are speculative and further planning and analysis are required before this factor can be fully considered. In the meantime, based on the stability of short-term harvest under these management regimes, I am satisfied that the uncertainty does not introduce an unacceptable degree of risk for timber supplies considered in this determination..

Objectives for the retention of wildlife trees on harvested cutblocks, in accordance with the Forest Practices Code, are now required to be incorporated in plans. Wildlife trees provide many kinds of important habitat for birds, mammals and amphibians including

nesting cavities and platforms, nurseries, dens, roosts, hunting perches, foraging sites and display stations.

For the purposes of this determination, I consider the requirements for the retention of wildlife trees to represent a very small downward pressure on timber supplies. I have accounted for this factor and discussed it further under 'Reasons for decision' below. Finally, I expect landscape biodiversity objectives to be developed over the term of MP No. 7 and accounted for in the next determination for this TFL.

- Archaeological and heritage resources

Culturally significant areas are located throughout TFL 39, primarily in blocks 6 and 3. The majority of these areas are associated with culturally modified trees. These trees, primarily western redcedar, have been altered by aboriginal peoples as part of their traditional use of the forest. Uses include bark collection, plank splitting and canoe construction. These trees are protected by the *Conservation Heritage Act*.

In block 6, 176 hectares have been identified as archaeological and heritage sites. The timber supply analysis accounted for the protection of these sites through a reduction to the timber harvesting land base of 158 hectares, based on the assumption that only 90 percent of the total area of heritage sites would be unavailable for harvesting. According to the licensee, none of these areas, nor any other area of TFL 39, have been proposed by archaeology authorities for permanent protection under the *Conservation Heritage Act* and consequent removal from the timber harvesting land base.

Nevertheless, forest district staff and the licensee indicate that since the heritage sites in block 6 were identified and the timber supply analysis was initiated, additional culturally modified trees and concentrations of them have been encountered. Harvesting has been deferred in areas with concentrations of culturally modified trees.

In block 3, an extensive survey was conducted along the islands' coastlines to locate archaeological sites so they could be identified in harvesting plans and deferred from harvest. As discussed under Deferral of harvest operations below, the avoidance of harvesting in a number of areas within the TFL while maintaining harvest rates attributable to these areas represents a potentially serious pressure on the remainder of the timber harvesting land base. Queen Charlotte Forest District staff also expect that, as harvest operations expand over the land base, additional culturally modified trees will be encountered which will require protection and possibly increase the pressure exerted by harvest deferrals. I note, however, that there will be some overlap between this protection and the protection of riparian areas and the maintenance of cutblock reserves.

Concern was expressed by First Nations that cedar stands be made available for cultural use and that culturally modified trees, traditional use areas and middens be adequately considered in forest management and planning in general. In this TFL and other management units in the Queen Charlotte Islands, continued consultation with the Haida

Nation toward the completion of a strategy for the protection of the culturally modified trees is necessary to reduce uncertainty about the implications of protecting this resource. In addition to the estimates used in the timber supply analysis, the protection of archaeological resources, in this case primarily culturally modified trees, represents a downward pressure on the timber harvesting land base and hence, a downward pressure on long-term timber supply. The desire for access to the cedar resource is not a matter over which I have jurisdiction. Furthermore, to the extent that there is First Nations interest associated with this request, no part of my decision should be seen as incompatible with the exercise of First Nations interests.

(vi) any other information that, in his opinion, relates to the capability of the area to produce timber;

Deferral of harvest operations

As discussed under *Archaeological and cultural heritage resources*, above, harvesting is being avoided in TFL 39 in areas with concentrations of culturally modified trees.

In addition, harvesting has been avoided in a number of areas that together represent approximately 9 percent of the TFL's timber harvesting land base. In block 6 harvesting is being avoided in the Tlell River Watershed, the Yakoun Basin and River Corridor, Gray Bay, Security Inlet, Boom Chain Bay and Kundis Island, which together represent approximately 25 percent of the block 6 timber harvesting land base. In block 7, no harvesting is occurring in the Koeve River Watershed which represents approximately a third of the timber harvesting land base in block 7.

No harvesting is occurring in the Tlell River Watershed and the Yakoun Basin and River Corridor because of concerns for significant fishery, wildlife and recreational values. In addition, part of the Yakoun Basin has been identified as a study area under the Protected Areas Strategy. Concern about harvesting in the Tlell and Yakoun areas was also expressed by the Council of the Haida Nation.

In 1990, the Koeve River Watershed was identified under the Protected Areas Strategy as a study area to be considered for protection as part of a land and resource management plan (LRMP) being conducted for the Central Coast area. This area contains significant old growth values including grizzly bear habitat.

The informal interim strategy of avoiding harvesting in these areas has been adopted to maintain their integrity until official land-use decisions are made regarding their future use. In this respect and with regard to block 6, Queen Charlotte Forest District staff undertook public information sessions regarding potential timber shortages brought on in part by the harvesting deferrals throughout the Islands. In response, local communities collectively formed the Islands Community Stability Initiative (ICSI), which is now engaged in ongoing meetings with the general public, the Council of the Haida Nation, the forest industry, including MacMillan Bloedel Limited, and the Forest Service. Issues being examined in this community process include the future use of the Tlell River

Watershed, the Yakoun Basin and River Corridor, Gray Bay, Security Inlet, Boom Chain Bay and Kundis Island.

While the final resolution of land-use issues in block 6—which have the potential to significantly affect timber supply—is presently unclear, Queen Charlotte Forest District staff hope to resolve the uncertainty through the completion of strategic plans involving all stakeholders working toward a consensus decision, from which final recommendations may be made to Cabinet. Similarly, the LRMP process expected to be initiated in the near future is expected to result in recommendations to Cabinet on these matters. It is anticipated that the recommendations delivered to Cabinet from both the ICSI and LRMP may lead to resolution of many of the concerns before the next AAC determination.

As discussed earlier, under "Guiding Principles", it would be inappropriate for me to speculate on the implications for timber supply of the outcome of land-use decisions that have not yet been taken by government. Until and unless government makes land-use decisions prohibiting or restricting harvesting in contentious areas, my interpretation of section 7 of the *Forest Act*, read in conjunction with section 53 and part 15 of the *Act*, is that in an AAC determination under section 7 of the *Forest Act*, these areas must be considered as part of the timber harvesting land base, even though the timber in these areas is not expected to provide any of the actual harvest in the short term.

I am aware that the community process is examining land-use in this area and that resolution is expected in the near future. Nevertheless, under these circumstances, for harvesting to continue in blocks 6 and 7 at the levels indicated by their contribution to the TFL's AAC, the continued avoidance of harvesting in contentious areas means that the remaining areas of the timber harvesting land base must be harvested at higher rates. If the deferrals continue, at some point, the achievement of integrated resource management objectives may prevent higher rates of harvesting in these remaining areas.

If the district manager in either the Queen Charlotte Forest District or Mid Coast Forest District becomes concerned that the allowable harvest level cannot be met on the remaining available land base while continuing to meet integrated resource management objectives, they may wish to take steps towards an application to Cabinet for the specification of designated areas which would allow a temporary AAC reduction under Part 15 of the *Forest Act*.

Moreover, if the recommendations from the local community processes—ICSI group, or the LRMP—and potential decisions by Cabinet, result in important changes or variations from current land use and management practices that form the basis of this determination, I am prepared to revisit this determination at an earlier date than the five-year redetermination required by the *Forest Act*.

I have discussed these matters further under 'Reasons for decision', below.

Harvest profile

The mixture of different stands that make up the harvest at any point in time is known as the harvest profile. Stands differ in characteristics such as their location in a management unit, or landscape, age, species, potential timber quality, volume per hectare and the means by which they are harvested. The harvest levels projected in the timber supply analysis assume that actual harvests correspond with the mix of stands on which the timber supply is predicated.

In the case of TFL 39, one of the most significant considerations related to the harvest profile is the distribution of harvesting activities among all seven of the TFL's blocks. This distribution is central to the management of the TFL because of the TFL's size and geographically discontinuous blocks, as well as the considerable diversity of its forest resource and consequent management. Forest district staff indicate that harvesting during the period of MP No. 6 has been distributed amongst the blocks in accordance with the timber supply contribution that each block makes to the TFL.

Public opinion was expressed that harvest levels attributed to block 6 should be sustainable according to the timber supplies of the block. As discussed further under 'Reasons for decision' below, I am satisfied from the results of the base case harvest forecast in combination with the results of the sensitivity analysis examining forest cover objectives, minimum harvestable age, and operability classification of the timber harvesting land base that the contribution of block 6 to the TFL's AAC is reasonable for the duration of MP No. 7. I have considered this information in combination with the apparent implications of underestimated site productivity, existing stand volume estimates and the potential changes to the attainment of management objectives in visually sensitive areas. As discussed under 7(3)(a)(i) and 7(3)(a)(v) above, there are a number of uncertainties regarding forest management on block 6 which must be resolved before the next AAC is determined for this area. I have also specified certain conditions to address the distribution of harvests and community stability in my approval of MP No. 7.

Another significant characteristic of TFL 39's harvest profile is the potential timber quality and the means by which stands are expected to be harvested. In blocks 1 and 2, forest district staff are satisfied that the mixture of stands harvested is proportional to their representation in the timber harvesting land base. In blocks 3 and 4, recent harvesting activities have been located in stands which are harvested using non-conventional means. Forest district staff are satisfied from this recent performance that the overall mixture of stands harvested is likely to continue to be approximately proportional to their representation in the timber harvesting land base. In block 7, where the land base is composed of a higher proportion of marginal-value stands requiring non-conventional harvesting techniques than any other block in the TFL, there has also been recent harvesting activity in this kind of stand. District staff note that a significant portion of the volume projected for harvest in the 5-year development plan for block 7 is located in stands which are available for harvest only with the use of helicopters.

In block 6, district staff are concerned that there has been virtually no harvesting in stands of marginal economic value or stands which are expected to be harvested using only non-conventional means. A recent evaluation by Queen Charlotte Forest District staff of areas in block 6 where either harvesting has been planned or where it has actually occurred indicates that almost all harvesting activity has been located in stands that are considered economically feasible to harvest only by conventional means. In contrast, the timber supply analysis is predicated on a contribution to timber supply from stands harvestable only by non-conventional means or of relatively lower timber quality or value. This was also the subject of public input which expressed concern that the lower quality stands in block 6 should be harvested in proportion to their contribution to the timber harvesting land base.

Sensitivity analysis indicates that if the timber harvesting land base for the TFL is reduced to include only stands classified by the licensee as economically feasible to harvest using conventional means, the initial harvest level for the TFL would have to decrease by slightly more than 2 percent in order to maintain the same rate of decline to the long-term harvest level as in the base case forecast. This same sensitivity analysis performed for block 7 indicates an 18 percent decrease in the initial harvest level. In block 6, where 93 percent of the timber harvesting land base is classified by the licensee as economically feasible to harvest by conventional means, this same sensitivity analysis indicates a very small decrease in the initial harvest level. However, this sensitivity analysis fails to examine the implications of the timber harvesting land base actually being less economically viable to harvest and requiring more non-conventional harvesting techniques than is reflected by the licensee's classification, as discussed under *Economic and physical operability* above. Given the apparent tendency of harvests in block 6 to be focused on higher-value stands that can be harvested using conventional means there likely will be more serious implications if, as discussed under *Economic and physical operability* above, the licensee's classification of the timber harvesting land base overestimates the amount of stands that are economically feasible to harvest by conventional means.

I recognize that concentrating harvests in the short-term where operations are less costly may be rational from an economic viewpoint, particularly if timber values were expected to increase in the future. However, if the transition to increased operations in these lower-value stands that are more difficult and expensive to harvest is deferred until the future, maintaining the harvest levels indicated in the base case harvest forecasts established for each block would require that a larger proportion of future operations occur in areas that are expensive to harvest and contain lower-value timber. If harvesting and development costs in these areas are high on average, the viability of operations could be threatened during times when market prices are not also high. I believe it would be risky to assume that prices for timber from these areas will be high enough to support harvesting that occurs predominantly in areas of low-timber value or difficult access.

It should be understood that the harvest levels indicated in the base case harvest forecast and the AAC I have determined assume that actual harvests are reasonably balanced with

the mix of forest stands on which the timber supply is predicated. Because of this, I have directed the licensee to, in conjunction with the Vancouver Forest Region, initiate procedures for approval and monitoring which ensure the harvest profile objectives are achieved, consistent with the timber supply analysis and my review of it which support this determination. The assessment of harvesting performance in this regard will likely be a significant factor in the next timber supply analysis and AAC determined for this licence.

I consider the limited harvesting activity in lower-value stands which are more difficult or expensive to harvest to represent a potentially significant downward pressure for block 6, which I have discussed further under 'Reasons for decision' below. Additional clarification of criteria used to determine operability classification is needed and I have specified corresponding conditions in my approval letter of MP No. 7.

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

Harvest flow

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in TFLs that have a significant old-growth component, such as TFL 39. In the short term, the presence of large volumes of older wood permits harvest levels above long-term levels without jeopardizing the future stability of harvests. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and mid-term harvest rates will be compatible with a smooth and orderly transition toward the usually (but not always) lower long-term harvest rates. Thus, timber supplies should remain sufficiently stable that there will be no inordinately adverse impacts on current or future generations. To achieve this, the rate set must not be so high as to cause later disruptive shortfalls in supply, nor so low to cause immediate social and economic impacts that are unnecessary to maintain forest productivity and future harvest stability.

The timber supply analysis shows that, due to the presence of higher-volume older stands, harvest levels in TFL 39 can remain above the long-term harvest level in the short-term, but must decline toward, and in some blocks fall below a long-term steady harvest level to be reached about 110 years from now. However, I acknowledge that different in the estimates of site productivity could alter this projection significantly as discussed under *Site productivity estimates* above.

In establishing the harvest forecasts for each block that form the base case harvest forecast for the TFL, the licensee assumed harvest flow objectives that prohibit the decline of the harvest level to below the long-term level, and where this could not be avoided, to allow the harvest level to fall no lower than the approximate long term average productivity that would be expected if stands grew according to natural (unmanaged) stand yield projections. This approach recognizes that, in many cases, stand management will increase expected yield above natural, unmanaged conditions, but that

the increased yields will not be realized until the second-growth stands reach merchantable conditions, several decades into the future.

The licensee's harvest flow objectives also allow the harvest level to decline no more than 10 percent per decade in blocks 1, 2, 3, 4 and 6 where the stability of communities within the blocks is a concern. Declines greater than 10 percent per decade were permitted in blocks 5 and 7 which do not directly support specific communities. The initial harvest level for the base case forecast was also established in accordance with the licensee's harvest assumption strategy included in the previous management plan for this TFL. The strategy is to gradually adjust harvest levels towards the licensee's best estimate of the long-run harvest level. According to the licensee this strategy allows for stability in the forest-dependent communities of the TFL.

As a result of these objectives, the base case harvest forecast in the timber supply analysis shows an initial harvest rate of 3 733 000 cubic metres per year—2.2 percent below the current AAC. From this initial rate, the harvest declines by 3.4 percent per decade over approximately 75 years. Over the three decades that follow this period, the harvest level increases slightly and then declines to the long-term harvest level of 3 236 000 cubic metres per year.

The slight increase in the timber supply between decades 8 and 11 is projected to occur as a result of the increasing timber volumes that become available for harvest from regenerated stands in block 2.

Using the same forest management information and practices assumed for the base case harvest forecast, the timber supply analysis examined an alternative harvest projection which assumed an initial harvest level of 4 161 000 cubic metres per year. From this initial harvest level, the harvest declines to the long-term harvest level at a rate of 8 percent per decade over a period of 50 years. According to current forest management practices, this harvest forecast would involve the harvest of existing stands at a greater rate than the base case forecast. This harvest flow pattern would decrease the ability to buffer against uncertainty and consequently increase risks of future timber supply disruptions. The harvest level would also decline to the long-term harvest level at least 25 years earlier than projected in the base case forecast. To establish the allowable harvest level in accordance with this alternative forecast implies acceptance of a more rapid rate of social adjustment over time than does the base case.

The range of management options available in TFL 39 as a whole is wider than in most management units in the province. With regard to the possibility of increasing the AAC at this time, the timber supply analysis indicated that current assumptions and practices would theoretically permit the initial harvest level to be raised on the existing timber harvesting land base without, for the TFL as a whole, inducing an unreasonable rate of decline to the long-term harvest level. However, as discussed above, this would not be true for all blocks and would expose the TFL to an increased likelihood of adverse consequences from various uncertainties including the possible underestimation of

minimum harvestable ages and possible overestimation of the size of the land base for which harvest operations are economically feasible using conventional harvesting means. The harvest level would also decline to the long-term harvest level earlier than projected in the base case forecast. Each of these characteristics implies a willingness to accept greater rates of social adjustment. Instead, I consider it reasonable to view opportunities such as the abundance of short-term timber supply that is indicated by the analysis, as an agent to reduce, rather than intensify, any potential adverse impacts resulting from the currently projected decline to long-term harvest levels.

Associated employment and community impacts are discussed in detail in the *Economic Evaluation of Some Resource Management Issues Governing the Timber Supply in TFL 39, July 1994*, which was submitted by the licensee as part of MP No. 7. The general results presented in this evaluation are discussed under Community dependence on the forest industry below. In addition, as part of the evaluation, the licensee addresses the implications to timber supply and consequently to employment over a 50-year period of managing forest resources for different intensities of integrated resource use. In this sense, the evaluation provides a discussion of the societal merits associated with different integrated resource management regimes. This information is likely most useful in the development of management objectives for the TFL. For the purpose of this determination, I accept the base case forecast proposed by the licensee as reasonable for use in this determination. This matter is further discussed under 7(3)(d) below and the flexibility associated with the harvest flow noted throughout this discussion is further discussed under 'Reasons for decision'.

Community dependence on forest industry

In MP No. 7 the licensee acknowledges the communities that derive economic well-being from the timber that is harvested from TFL 39. It describes TFL 39 as embracing lands tributary to the communities of Powell River, Campbell River, Sayward, Kelsey Bay, Port McNeill, Port Hardy, Sandspit, Queen Charlotte City, Skidegate, Port Clements, Juskatla and Massett. The management plan indicates that most of the TFL's harvesting jobs are associated with the communities of northern Vancouver Island, Queen Charlotte Islands and the Sunshine Coast, whereas the processing jobs are primarily in Powell River, Nanaimo, Chemainus and the lower mainland.

The separate analysis of supply blocks and the harvest flow objectives discussed above are aspects of the timber supply analysis which address the dependency of communities on timber supply and assist in evaluating the influences the management of this TFL as a whole may exert on individual communities. I have specified conditions in my approval of MP No. 7 to address the dependence of communities on the timber supply of associated blocks.

The licensee's *Economic Evaluation of Some Resource Management Issues Governing the Timber Supply in TFL 39* was reviewed by Forest Service staff of the Economics and Trade Branch and I am satisfied that with certain exceptions noted below, the assumptions made, methodologies used, and conclusions drawn for the TFL are comparable with those used in other management units and are suitable for consideration in this determination. The evaluation concludes that TFL 39 contributes through direct and indirect employment, a total of 17 400 jobs to the provincial economy. In addition the evaluation estimates direct revenue from TFL 39 to municipal and provincial governments of \$140 million annually as a result of stumpage, direct taxes and employee taxes.

The evaluation makes use of methodology similar to that used by the Forest Service to generate socio-economic assessments of timber supply in other management units of the province. However, the licensee's evaluation makes use of somewhat larger employment coefficients and multipliers (to generate estimates such as those for the province presented above) than those used by the Forest Service. Nonetheless, given the difficulties inherent in definitively producing such estimates, I find the evaluation to be reasonable in its projection that the harvest from TFL 39 in 1993 supported 1680 harvesting jobs and 3700 processing jobs. The evaluation projects an overall decline of 14 percent to both harvesting and processing jobs as harvesting declines to long-term levels. These impacts will largely occur over the next 50 years.

Dependence on the forest sector for employment is greatest in the smaller, more remote communities such as Sayward in block 2 where, according to the licensee's evaluation, over half of the labour force is employed by the forest industry. The evaluation projects that jobs associated with harvesting in this block will decline by a total of 18 percent as harvesting gradually shifts to long-term levels over the next 150 years. Over 40 percent of the labour force in Port McNeill in block 4 is employed by the forest industry. Harvesting jobs in this block were estimated by the licensee to have been approximately 190 in 1993 and are not projected to decline for 45 years. In block 5 where harvesting operations are camp-based, employees are brought in from communities such as Powell River. Harvesting operations in block 7 are also camp-based, and approximately a third of the employees in these camps are from communities on northern Vancouver Island. However, job impacts are expected to be minor. In block 6, between 50 and 60 percent of harvesting operation employees are from the Queen Charlotte Islands. The licensee estimated that the total number of harvesting jobs associated with block 6 was approximately 550 in 1993, and this number is projected to decline by a total of 21 percent as harvesting declines to long-term levels. Employment associated with harvesting in block 1 and the Powell River area was estimated by the licensee to total approximately 200 jobs in 1993 and is expected to increase by 30 percent as harvesting increases to the long-term level within 3 decades.

I am aware of the importance of forestry activities to both the local and provincial economies, and I have considered this, along with the social and economic objectives of the Crown (discussed below) in my determination.

Difference between AAC, proposed harvest and actual harvest

The initial harvest levels for blocks 1, 3, 4 and 7 included in the base case forecast represent increases from the levels proposed in the last management plan. The initial harvest levels proposed in the base case forecast for blocks 2, 5 and 6 represent decreases from the last management plan. With the exception of block 5, which represents less than 3 percent of the TFL's timber harvesting land base and which supports camp-based operations only, the magnitudes of the proposed changes are relatively small and, in my opinion, therefore do not pose a threat to the vitality of communities within the TFL.

A review of actual harvests in TFL 39 from 1988 to 1992 indicates that the licensee has been harvesting the AAC for the TFL as a whole and that harvesting has been distributed amongst the TFL's seven blocks according to the timber supply contributions of each block. It is apparent from this that the implications of avoiding harvesting in certain areas, as discussed under Deferral of harvesting operations above have not yet developed to the point that the achievement of integrated resource management objectives on remaining areas of the timber harvesting land base have precluded the achievement of the AAC.

- (c) **the nature, production capabilities and timber requirements of established and proposed timber processing facilities;**

Processing facilities

Most of the wood harvested from TFL 39 is processed in facilities in Nanaimo, Chemainus, Powell River, and the lower mainland. The annual fibre requirements of MacMillan Bloedel Limited's processing facilities is estimated to be about 6.5 million cubic metres. MacMillan Bloedel Limited is currently entitled to harvest a total of approximately 6.2 million cubic metres of wood from Crown tenures annually. A substantial portion of this fibre is harvested from TFL 39.

Residents of the Queen Charlotte Islands commented on the desirability of establishing a value-added or remanufacture processing facility in the Queen Charlotte Islands. This is an issue potentially relevant to timber allocation and licencing as well as to private sector initiative, and is beyond the scope of AAC determination.

- (d) **the economic and social objectives of the Crown, as expressed by the minister, for the area, for the general region and for the Province; and**

Minister's letter and memorandum

The Minister of Forests has expressed the economic and social objectives of the Crown for the province (letter to Chief Forester dated July 28, 1994, attached as Appendix 3, and memo to Chief Forester dated February 26, 1996, regarding visual quality resources, attached as Appendix 4), and I understand these to apply to TFL 39. They are consistent with the objectives stated in the Forest Renewal Plan of BC 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 continuity of employment.

The Minister also stated in his letter of July 28, 1994, 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. The latter would likely require the use of alternative harvesting systems, and to encourage this the Minister suggested consideration of partitioned AACs. As discussed under 7(3)(a)(iii) above, the use of alternative silviculture systems and commercial thinning operations may provide opportunities in visually sensitive areas. In addition, to encourage harvesting in areas containing deciduous stands I have attributed a portion of the AAC I have determined to these areas. This is likely to result in higher-than-historic use of deciduous stands and will require more activity in these stands which may assist in offsetting the mid-term shortfall projected to occur in Block 6.

The Minister's memo of February 26, 1996 asks that pre-Code constraints applied to timber supplies in order to meet visual quality objectives be re-examined when determining AACs

in order to ensure that they do not unreasonably restrict timber supplies. I have discussed this above, under *Visually sensitive areas*, where I noted that there is the potential to increase timber availability relative to that projected in the base case harvest forecast resulting from the minor changes to the degree of allowable disturbance, but more importantly through the use of alternative silviculture systems and improved cutblock design in visually sensitive areas.

Associated employment and community impacts are discussed in detail in the *Economic Evaluation of Some Resource Management Issues Governing the Timber Supply in TFL 39, July 1994*, which was submitted by the licensee as part of MP No. 7. I am familiar with the varying impacts of different harvest levels (as discussed under section 7(3)(b) above).

Local objectives

The Minister's letter of July 28, 1994, suggests that the Chief Forester should consider important local social and economic objectives that may be derived from the public input where these are consistent with the government's broader objectives. A total of 33 open houses and meetings were held by the licensee between February 1992 and December 1994 in communities within TFL 39 to allow public review and comment on the development of MP No. 7.

Public concerns, different for each block, included the use of under-utilized timber types, harvesting old-growth forests, alternative silviculture techniques, stand tending practices, community and workforce stability, reforestation and maintenance of biodiversity.

Where possible, I have attempted in this rationale to respond briefly to many of those views, and consideration of this input has been an important component of this determination.

- First Nations

Since government must be cognizant of and not infringe upon aboriginal rights, it is critical that the Forest Service and the licensee continue to seek input from First Nations in planning. In TFL 39, this is of particular importance in relation to archaeological and cultural heritage resources which First Nations groups, such as the Council of the Haida Nation's Forestry Unit, have made efforts to identify.

MP No. 7 includes "Aboriginal Involvement Objectives" which commit to providing opportunity for aboriginal bands living in communities or reserves adjacent to MacMillan Bloedel Limited operations, or bands having traditional territorial claims on areas of MacMillan Bloedel Limited operations to be involved in forest management and economic benefits through three objectives. The first is to consult when planning forestry practices and proposed activities. The second objective is to provide employment opportunities to aboriginal people as employees or contractors in a wide variety of forest management

activities. The third objective is to assist aboriginal groups who are involved in Small Business Forest Enterprise Program proposals with planning, training and joint venture use of equipment and facilities.

The licensee solicited input from First Nations as part of the preparation of MP No. 7. In addition to three series of open houses conducted in 10 different communities within TFL 39, specific invitations were made by the licensee to the Sliammon, Haida, Heiltsuk, Tlowitsis-Mumtagila and Nuxalk in order to gather information for the preparation of MP No. 7. The licensee met with all of these groups except the Nuxalk who did not respond to the licensee's invitation. In the licensee's meetings with First Nations, the majority of the concerns expressed about MP No. 7 were related to block 6. Concern was expressed that cedar stands be made available for cultural use and concern was expressed that culturally modified trees, traditional use areas and middens be adequately considered.

As I have indicated in "Guiding Principles" above, as far as possible I have taken into account specific identified activities in traditional areas in my considerations under section 7(3)(a)(v). I have considered this information under *archaeological and cultural heritage resources*, and Deferral of harvest operations, above.

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

Non-recoverable losses and salvage operations

Non-recoverable losses are timber volumes destroyed or damaged by natural causes such as fire, disease, insects and wind that are not recovered through salvage operations. The timber supply analysis for TFL 39 assumes annual losses of approximately 28 000 cubic metres. The licensee reports that losses from disease and insects are minimal. This appears reasonable given current forest management and the relative absence of infestations in the TFL and in view of losses in comparable management units. In TFL 39, 20-year fire records indicate an annual timber loss resulting from fire of 10 000 cubic metres. From this it is possible to deduce that the remaining 18 000 cubic metres estimated as part of total non-recoverable losses is to account for timber damage by wind.

The licensee commits to salvaging all timber damaged by wind. This commitment implies very ambitious salvage operations and, while I wish to encourage this recovery, I am concerned about the degree to which this commitment can be met. My concerns are consistent with those expressed in the public input that additional timber damaged by wind should be recovered from block 6. An examination of losses resulting from wind damage in the Queen Charlotte TSA, where losses of this kind were estimated to be proportionately twice the percentage estimated for TFL 39 as a whole, indicates some difficulty in accessing and salvaging all the identified timber of this kind. This apparent discrepancy between estimates made for, in some cases, contiguous geographical areas is indicative of the variance of procedures used throughout the province to estimate non-recoverable losses and the uncertainty surrounding the estimates. I have directed Forest Service staff and other licensees to examine and review procedures used to estimate non-recoverable losses so that

uncertainty associated with these estimates may be reduced, and to develop a consistent approach to the estimation of losses. This direction is also appropriate in the case of TFL 39.

For the purposes of this determination I am prepared to acknowledge and support the licensee's salvage commitment. However, given its uncertainty I will await documented performance before incorporating its implications in an AAC determination. Also for the purposes of this determination I am prepared to accept the licensee's estimate of non recoverable losses. However, I expect salvage operations and residual losses resulting from wind to be monitored and examined as part of MP No. 8.

AAC Determination

Reasons for decision

In reaching my decision on an AAC for TFL 39, I have considered all of the factors presented above and have reasoned as follows.

The timber supply analysis shows a base case harvest forecast with an initial harvest level of 3 733 000 cubic metres, 2.2 percent below the current AAC of 3 818 000 cubic metres per year. The harvest level is projected to decline at a rate of 3.4 percent per decade to a long-term level 13 percent lower than the projected initial harvest rate.

My considerations have identified factors that either increase or decrease the timber supply relative to that projected in the base case harvest forecast, due to changes in practice or information since completion of the analysis in 1994.

Factors identified as limiting the timber supply in the short term relative to the timber supply analysis base case include:

- inventory information used in the timber supply analysis does not reflect forest growth or depletion due to harvesting and natural causes since the end of 1991. This means essentially that 5 years of the timber supply shown in the base case harvest forecast have been used;
- new Forest Practices Code requirements specify the retention of wildlife trees to assist in maintaining biodiversity within stands and this was not accounted for in the timber supply analysis;
- new Forest Practices Code requirements for riparian zone management will involve reservation of more area than was accounted for in the timber supply analysis;
- a very small downward pressure associated with green-up conditions in block 7 necessary to meet visual quality objectives; and

- additional reductions to the timber harvesting land base are necessary to account for the presence of culturally modified trees, primarily in block 6.

Factors indicating that the short-term timber supply may be greater than projected in the timber supply analysis base case include:

- increased timber availability in visually sensitive areas resulting from changes such as the use of alternative silviculture systems and improved cutblock design;
- the underestimate of volumes in management class III stands in block 7; and
- an increase in timber supply through the proposed harvest of deciduous stands.

In addition to these influences on short-term timber supply, the overestimation of regenerated stand volumes, represents a downward pressure to the medium- and long-term timber supply.

Also as part of my considerations, I have examined the influence of factors that cannot be quantified for the purposes of this determination. Nonetheless, these factors are potentially significant influences and present risks to attaining the harvest levels projected in the timber supply analysis. As discussed under *Minimum harvestable ages* above, the minimum harvestable age of future stands is uncertain. However, to the extent that the ages used in the timber supply analysis underestimate the minimum age at which future stands may be harvested, the analysis overestimates medium-term timber supply. Similarly, as discussed under *Economic and physical operability*, to the extent that the assumptions used in the timber supply analysis may overestimate the size of the timber harvesting land base on which harvest operations are economically feasible using conventional means, the analysis may overestimate timber supply. These factors viewed in isolation present risks to achieving the harvest levels projected in the base case harvest forecast. However, a number of other factors, with which considerable uncertainty is also associated, present potential upward influences on timber supply that would tend to offset the downward pressures and risks to timber supply. It is possible that an increase in site productivity, over that assumed in the base case harvest forecast, may reduce the time needed to attain the minimum harvestable ages assumed for the base case forecast. Similarly, an increase in site productivity would decrease the chance that regenerated volumes used in the base case may overestimate future yields. Moreover, an increase in site productivity would tend to offset any downward pressure associated with more restrictive green-up requirements which may become necessary for block 6 and offset the downward pressure associated with increased visually effective green-up requirements in block 7. There is also a chance that volume estimates for existing stands have been underestimated in the base case harvest forecast, in which case this factor would offset some of the downward influences to short-term timber supply discussed above.

The relative abundance of mature timber in this management unit is a prominent characteristic of its timber supply. This characteristic, coupled with the very gradual rate of decline to long-term harvest levels projected in the base case forecast indicates considerable flexibility and capacity to absorb some of the potential changes in management practices and uncertainties discussed above. Uncertainties or potential changes in management practices that would impose a downward

pressure on timber supply would likely result in a more rapid rate of decline to long-term harvest levels, but given the robustness of timber supplies in this TFL, a more rapid rate of decline would still be within reasonable limits.

This flexibility is also exemplified in the results of sensitivity analyses, discussed under *Biodiversity* above, which indicate some additional capacity to implement specific measures for the protection of biodiversity, such as forest ecosystem networks or reserves, that may be required by the Forest Practices Code, without limiting short-term timber supply.

In assessing the upward and downward influences on the short-term timber supply listed above, I conclude that it is reasonable that the licensee can achieve the proposed initial harvest level, comprised of the coniferous volumes projected in the timber supply analysis, as well as an annual harvest of deciduous volumes comparable with recent deciduous harvests from TFL 39. I consider this an acceptable harvest level determined under section 7 of the *Forest Act* for TFL 39 at this time—with the following significant cautions.

It is necessary to maintain a cautious approach to the harvest levels projected for the base case harvest forecast, in particular for block 6. The AAC I have determined relies heavily on two conditions:

The first condition is the prompt resolution of land-use issues in blocks 6 and 7 of the TFL where harvesting is currently being deferred. The current avoidance of harvesting, as discussed under *Deferral of harvest operations* above, has created an inconsistency as defined in the analysis between the total timber harvesting land base and the reduced remaining land base from which the harvest is expected to be obtained. As noted, I am able to find no statutory support for determining an AAC for this TFL which reflects the avoidance of harvesting in some areas, in the absence of approved land-use designations.

Furthermore, I am aware that the current community process underway in the Queen Charlotte Islands and Land and Resource Management Plan about to be initiated for the Central Coast may lead to resolution of the planning issues in blocks 6 and 7 before the next AAC determination. As noted earlier in *Deferral of harvest operations*, if the deferrals continue, at some point, the achievement of integrated resource management objectives may preclude the achievement of the approved harvest levels in remaining areas. Therefore, if the district managers become concerned that harvest levels cannot be met on the remaining available land base, they may wish to take steps toward an application to Cabinet for the specification of designated areas that would allow for a temporary AAC reduction under Part 15 of the *Forest Act*.

Moreover, as noted above in *Deferral of harvest operations*, if the recommendations from the local community process involving the ICSI group or the Land and Resource Management Plan for the Central Coast, and any potential decisions by Cabinet, result in important changes or variations from the land use and current practices that form the basis of this determination, I am prepared to revisit this determination at an earlier date than the five-year redetermination required by the *Forest Act*.

The second condition is that the AAC I have determined requires compliance with the principle of harvesting all of the types of stands that on which the timber supply is predicated in reasonable balance with their occurrence on the TFL. This is of particular importance to stands containing less valuable timber and requiring more expensive harvesting techniques, especially in block 6. The assessment of performance in this regard will likely become a significant factor in the next management plan, timber supply analysis and AAC determination for this area.

In addition, it should be noted, as was discussed under *Harvest profile* above, that the distribution of harvesting activities between all seven of the TFL's blocks is of great importance to community stability and maintenance of the timber supply indicated in the base case. The diversity of the forest resource within the TFL and the dependence of communities on the timber supply of specific blocks necessitate a carefully considered and reasonably balanced distribution of harvest activities between blocks.

From the foregoing reasoning and with the cautions expressed, it is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that provides for requirements of the Forest Practices Code as they are currently implemented, that ensures longer-term integrated resource management objectives can be met, that meets provincial objectives and that avoids disruptive shortfalls in future timber supply, can best be achieved in this TFL at this time by establishing the overall AAC at 3 740 000 cubic metres.

Determination

The new AAC for TFL 39 will be 3 740 000 cubic metres. Of the 3 740 000 cubic metres, 40 000 cubic metres per year will allow for the harvest of deciduous stands.

This AAC comes into effect on July 1, 1996 and will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Implementation

As noted, some specific work must be completed to resolve uncertainties with respect to timber supply in TFL 39, which I have included in my approval of MP No. 7. Of most significance to this determination, I am directing the licensee to work with Forest Service staff to address the following priorities:

- review operability criteria and establish a monitoring system to evaluate the harvest profile;
- evaluate minimum harvestable age criteria with regard to the economic feasibility of harvest operations in small-diameter stands; and
- examine and review procedures used to estimate non-recoverable losses.

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

Larry Pedersen
Chief Forester

June 27, 1996

Appendix 1: Section 7 of the *Forest Act*

Section 7 of the *Forest Act* reads as follows:

Allowable annual cut

7. (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.

(1.1) If, after the coming into force of this subsection, the minister

- (a) makes an order under section 6 (b) respecting a timber supply area, or
- (b) amends or enters into a tree farm licence to accomplish the result set out under section 33.1 (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.

(1.11) If

- (a) the allowable annual cut for the tree farm licence is reduced under section 7.1 (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 7.1 (6).

(1.12) If the allowable annual cut for the tree farm licence area is reduced under section 7.1 (3), the chief forester is not required to make the determination under subsection (1) or (1.1) of this section at the times set out in subsection (1) or (1.1) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 7.1 (2).

(1.2) [Repealed 1994-39-2.]

(1.3) 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 Province, the federal government, or both.

(2) The regional manager or district manager shall determine a volume of timber to be harvested under a woodlot licence during each year or other period of its term, according to the licence.

(3) In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 10, shall 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 his opinion, relates to the capability of the area to produce timber;
- (b) the short and long term implications to the Province 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 Crown, as expressed by the minister, for the area, for the general region and for the Province; and
- (e) abnormal infestations in and devastation's of, and major salvage programs planned for, timber on the area.

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