

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Tree Farm Licence 14

held by Crestbrook Forest Industries Limited

Rationale for Allowable Annual Cut (AAC) determination

effective December 1, 1996

**Larry Pedersen
Chief Forester**

Table of contents

Objective of this document	3
Description of the TFL.....	3
History of the AAC	3
New AAC Determination	4
Information Sources Used in the AAC Determination	4
Role and limitations of the technical information used	5
Statutory Framework.....	6
Guiding Principles for AAC determinations.....	6
The role of the "base case" in AAC determinations	8
Timber supply analysis	9
Base case projection.....	10
Consideration of Factors as Required by Section 7(3) of the Forest Act.....	12
Existing forest inventory	12
- age of inventory.....	12
- species profile	12
- age class distribution.....	12
Land base contributing to timber harvest.....	13
- economic and physical operability.....	13
- estimates for roads, trails, and landings	14
- Bugaboo Glacier Provincial Park.....	14
- non commercial areas.....	15
- unmerchantable stands	15
- deciduous (broadleaf) stands.....	15
Expected rate of growth	15
- site productivity estimates.....	15
- volume estimates for existing stands	17
- volume estimates for regenerated stands.....	18
Regeneration delay	19
Impediments to prompt regeneration	20
Not-satisfactorily restocked areas	20
Silvicultural systems	20
Decay, waste and breakage factors.....	21
Integrated Resources Management (IRM) objectives	22
- environmentally sensitive areas	22
- forest cover requirements (adjacency and green-up)	23
- old growth retention	24
- riparian areas	24
- landscape-level biodiversity.....	25
- wildlife habitat	26
- wildlife trees.....	27
- recreation.....	28
- community water resources.....	28
- First Nations.....	28

East Kootenay Land-Use Plan..... 29
20-Year Plan..... 29
Alternative harvest flows 30
Timber processing facilities 32
Minister's letter and memorandum..... 32
Local objectives..... 33
Reasons for Decision 34
Determination 38
Implementation 38
Appendix 1: Section 7 of the Forest Act..... 40
Appendix 2: BC Ministry of Forests Act, section 4..... 41
Documents attached:
Appendix 3: Minister of Forests' letter of July 28, 1994
Appendix 4: Minister of Forests' memo of February 26, 1996

Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as Chief Forester of British Columbia in making a determination, under Section 7 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 14. The document also identifies priorities where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 14, also known as the Spillimacheen Forest, is located in the Purcell Range, about 32 kilometres south west of Golden in the East Kootenays. It encompasses the watersheds of the Spillimacheen River and Bobbie Burns and Vowell Creeks as well as the benches directly east of the Columbia River near Parson. The TFL is held by Crestbrook Forest Industries Ltd. (CFI) of Cranbrook, BC. The licence lies within the Invermere Forest District of the Nelson Forest Region.

The total land base used in the analysis for TFL 14 is 161 109 hectares, of which 85 021 hectares (53 percent) are covered by productive forest. The other 76 083 hectares (47 percent) are composed largely of alpine tundra, glaciers and snow fields, rock, lakes, swamp and roads. The total area of the TFL outside the recently designated upper Vowell creek watershed addition to the Bugaboo Glacier Provincial Park is 150 839 hectares. Of this, currently 52 121 hectares (35 percent) contribute to the net long-term operable forest area.

The forests of TFL 14 are distributed among four biogeoclimatic zones: Interior Douglas-fir, Interior Cedar-Hemlock, Montane Spruce and Engelmann Spruce-Subalpine Fir. The main commercial timber species are lodgepole pine, Engelmann spruce, subalpine fir and interior Douglas-fir.

Road access is provided by highway 95 which serves the east Kootenay region between Golden and Cranbrook. There is also a connecting Canadian Pacific rail line which is used to transport logs and chips as well as pulp and lumber. Forestry, mining and ranching are the principal forms of employment and economic activity for the region. Also significant are recreation and tourist-oriented activities.

History of the AAC

TFL 14, originally known as Forest Management Licence 14 was awarded in 1953 to Cranbrook Sawmills Limited. At that time, under Management Plan (MP) No. 1, the licence area was 95 903 hectares and the company was authorized to harvest 67 961 cubic metres per year. In 1961 Cranbrook Sawmills Limited assigned all its forest tenures to Crestbrook Timber Limited, whose name was changed in 1967 to Crestbrook Forest Industries Limited. By 1968, the licence area had been increased to 124 380 hectares, and with an updated inventory, improved utilization standards, and expanded harvesting land base, the AAC was increased to 111 852 cubic metres.

In 1980 Crestbrook renewed the licence agreement for TFL 14 for a 25-year term. In 1990 the chart area of Forest Licence A18978 (referred to as the extension area) was added to the TFL, further expanding the land base to 161 109 hectares. At the same time the licensee chose to delete an area for the Small Business Forest Enterprise Program component from the TFL. Crestbrook received a replacement licence agreement for a further 25-year term in 1995 . The company is presently owned by Mitsubishi Corporation (30.7 percent) and Honshu Paper Company Limited (19.8 percent) with the remaining stock held publicly and listed on the Toronto Stock Exchange.

The AAC under MP No. 6 is 178 926 cubic metres. The original term of MP No. 6 was from January 1989 to December 31, 1993, but three 12-month extensions were granted in order to accommodate and update information on the extension area for use in the current timber supply analysis.

New AAC Determination

Effective December 1, 1996, the AAC for TFL 14, including Schedule A private lands will be 164 000 cubic metres. 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 14 includes the following:

- Statement of Management Objectives, Options and Procedures for Management Plan No. 7, May 28, 1993;
- TFL 14 Management Plan No. 7 Timber Supply Analysis Information Package, Crestbrook Forest Industries Ltd. (prepared by Timberline Forest Inventory Consultants), December 1995;
- TFL 14 Management Plan No. 7 Timber Supply Analysis Report, Crestbrook Forest Industries Ltd. (prepared by Timberline Forest Inventory Consultants), March 1996
- TFL 14 Draft Management Plan No. 7, Crestbrook Forest Industries Ltd., March 14, 1996;
- TFL 14 20-Year Plan, March 14, 1996
- Addendum to Timber Supply Analysis Report (prepared by Timberline Forest Inventory Consultants), April 1996;
- Technical review and evaluation of current operating conditions through comprehensive discussions with Forest Service and BC Environment staff including the AAC determination meeting held in Victoria on May 30, 1996;
- TFL 14 Inventory Audit Report, Resources Inventory Branch, August 1994
- Letter to Mr D.E. Rounsville (Chief Forester, Crestbrook Forest Industries Ltd.) from Mr. Dave Gilbert (Director, Resources Inventory Branch), April 24, 1995
- Presentation by Crestbrook Forest Industries Ltd. staff to the Chief Forester, April 19, 1996
- Letter from Mr D.E. Rounsville (Chief Forester, Crestbrook Forest Industries Ltd.) to the Chief Forester, October 4, 1996

- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the Chief Forester dated February 26, 1996 stating the Crown's economic and social objectives regarding visual resources;
- *East Kootenay Land-Use Plan*, Government of British Columbia, March 1995;
- *Forest Practices Code of British Columbia Act*, July 1995
- *Forest Practices Code of British Columbia Regulations*, April 1995
- *Forest Practices Code Timber Supply Analysis*, BCFS, February 1996

Role and limitations of the technical information used

The *Forest Act* requires me as Chief Forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis and the inventory and growth and yield data used as inputs to the analysis formed the major body of technical information used in my AAC determination for TFL 14. 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.

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 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 solution to forest management problems such as AAC determination. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

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

Statutory Framework

Section 7 of the *Forest Act* requires the Chief Forester to consider various factors in determining AACs for timber supply areas and tree farm licences. Section 7 is reproduced in full as Appendix 1.

Guiding Principles for AAC determinations

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

(i) minimizing risk, in respect of which, in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate up-to-date information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 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 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, and BC Environment, 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 timber supply analyses that pre-date the Code, or that are based on information packages that

largely pre-date the Code, as is the case in TFL 14. 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 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 (C.O.R.E.) 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 such as the East Kootenay Land-Use Plan, it may not always be possible to analyze the full timber supply impact in AAC determinations. In most cases, government's land-use decision must be followed by detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made, it is impossible to properly assess the overall impact of the land-use decision. Where specific protected areas have been designated by order in council, these areas are no longer considered to contribute to timber supply. The legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

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 AAC determination 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 B.C. Court of Appeal regarding aboriginal rights. The AAC I determine should not in any way be construed as limiting the Crown's obligation under the Delgamuukw decision, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the TFL. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Aboriginal rights will be taken into account as far as possible under Section 7(3) 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*.

The role of the "base case" in AAC determinations

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 the work of the Timber Supply Review project for TSAs and, for TFLs, by the licensees.

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

The base case forecast represents only one of a number of theoretical forecasts, and may incorporate information about which there is some uncertainty. Its validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer 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 predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current information available about forest management, which—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 assembled.

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 considerations to confirm the exact AAC determined—it would be impossible for any such analysis to fully incorporate the subtleties of the judgement involved.

Timber supply analysis

The timber supply analysis for TFL 14 was conducted by Timberline Forest Inventory Consultants (Timberline) on behalf of Crestbrook Forest Industries Limited ("the licensee"). Timberline used a proprietary computer simulation model called CASH_FM (Continuous Harvesting and Forest Management). CASH_FM is a refinement of TIMSIM (TIMberline SIMulation) which is based on a model originally developed at the University of British Columbia and later modified by Timberline. I accept that the information generated by this model is comparable with information generated by the BC Forest Service simulation model and am satisfied that it is capable of providing a reasonable projection of timber supply.

All the timber supply analysis information provided to me was based on the full area of the TFL, including the newly designated portion now lying within Bugaboo Glacier Provincial Park. However, as noted below, a sensitivity analysis was provided showing the timber supply implications of the park designation, and these have been taken into account in this determination.

The timber supply analysis for TFL 14 examined six different management regimes. Timberline's "current management option" is intended to represent the management regime currently being practised by the licensee on the TFL. This option represents the base case referred to above in "The role of the base case". In addition, the analysis examined harvest level impacts resulting from changes both to the definition of the timber harvesting land base and to management objectives. The alternative options considered in the timber supply analysis included:

- A current management option (the base case) which reflects the licensee's management activity as defined by current operations and performance;
- A visual management option aimed at isolating the impacts of visual quality impacts;
- A biodiversity guidebook/habitat management option which examines the impact of meeting wildlife management and biodiversity objectives;
- An option which models the impact of excluding small diameter, poor quality stands on steep side hills
- An option which considers a reduced timber harvesting land base based on the recently delineated Bugaboo Park boundary
- A wildlife habitat management option which provides an alternate view of forest cover constraints for wildlife habitat management on the basis of thermal cover requirements.

The analysis also examined the effect on timber supply of varying many of the assumptions and estimates used, and these sensitivities have been of assistance in my determination, as discussed in my considerations below.

Base case projection

For TFL 14, the licensee proposed the Current Management Option as the base case to which further analyses were compared. This option assumed an initial harvest level of 150 000 cubic metres per year which is considerably lower than the current AAC of 178 926 cubic metres per year. Under this option a timber harvesting land base of 55 965 hectares—analyzed prior to designation of the Bugaboo Glacier Provincial Park, as noted above—supported an initial harvest rate of 150 000 cubic metres per year for the first two decades. Following this, the harvest level was projected to decline to 135 000 cubic metres in decade three, 128 000 cubic metres in decades four and five, and 122 000 cubic metres in decades six to eight. It would then increase to the long-term harvest level of 132 000 cubic metres per year in decade nine.

The base case represents a 16-percent reduction from the current AAC of 178 926 cubic metres. At first, it was not entirely clear to me why the licensee did not select a higher initial harvest level for the base case. Indeed, the analysis and other evidence suggest that a higher initial harvest level would still allow a reasonable harvest-level decline to the long-term level. While I understand the reasons the licensee gave for its selection of the base-case level, I am aware of equally strong reasons why a higher level might instead have been chosen.

In response to a request for further clarification, the licensee provided additional information explaining its position (letter from D. E. Rounsville, Chief Forester, Crestbrook Forest Industries Ltd.).

According to the licensee, the initial harvest level for the base case was chosen after careful consideration of factors exerting either upward or downward influences on timber supply. Most notable of these were the (at that time imminent) designation of the Bugaboo Park, the potential decrease in timber supply due to Forest Practices Code requirements, and the potential increase in timber supply due to the possible underestimation of volumes for existing stands.

In addition, the licensee desires a stable timber supply over the next 20 years to support over \$330 million of capital investment recently made to its timber processing facilities.

After careful consideration of the licensee's arguments, I accept that the base case recognizes that the timber supply for the TFL is clearly in decline and represents the licensee's judgement on how best to manage this decline and provide the greatest stability in the short and medium terms. The initial harvest level is projected to be constant for 20 years (before removal of the Bugaboo park area) and allows operational flexibility to guard against the uncertainties noted by the licensee. While there is still a subsequent decline to a lower long-term level, the decline from the initial harvest level chosen is more gradual than that which would result from a higher initial level. Thus I have considered the licensee's base case projection to be an acceptable reference

point for my considerations under section 7(3) which follow. Nevertheless, I am well aware of the uncertainties that exist, especially in the volume estimates for existing stands and the requirements for biodiversity. I have therefore instructed the licensee to complete a reassessment of the inventory volumes for existing stands and to clarify the timber supply implications of landscape-level biodiversity. If warranted by new information that may become available, I am prepared to revisit my AAC determination before the completion of the 5-year term of MP No. 7.

Consideration of Factors as Required by Section 7(3) of the *Forest Act*

Section 7 of the *Forest Act* requires the Chief Forester to consider various factors in determining AACs for TSAs and TFLs. These factors are listed by subsection and considered immediately below, and Section 7 is appended in full as Appendix 1.

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

Existing forest inventory

- age of inventory

The most recent inventory of TFL 14 was completed in 1986 and followed established procedures. Updates for harvesting and silviculture activities are current to January 1, 1994. Age as well as height and volume attributes were projected to the same date.

- species profile

Within the timber harvesting land base, stands with lodgepole pine as the dominant species are the most common. The next most prevalent stands are those dominated by spruce (19 percent), Douglas-fir (19 percent) and balsam (16 percent). There is a minor component of deciduous cover but for the purposes of this analysis these areas were removed from the net operable land base.

- age class distribution

Approximately 18 percent of the of the net operable land base is occupied by stands greater than 140 years of age. Although these older stands are not located on the most productive sites, they do contribute to forest values other than timber and provide the licensee some operational flexibility within the TFL.

The balance of the net operable land base is distributed among a variety of age classes with the dominant age range being 81-100 years (21 percent of the net operable land base).

Land base contributing to timber harvest*- economic and physical operability*

Stands assumed in the base case to be operable included those stands accessible using conventional, cable and heli-logging systems. In deriving the operable land base, 16 465 hectares of inoperable areas were deducted from the productive land base, based on a 1984 operability classification. BCFS district staff noted that the 1984 operable land base reflected volumes the licensee expected to harvest based primarily on accessibility. In 1992, the licensee reviewed economic operability, taking into account economic and management changes since 1984. This resulted in the identification of additional uneconomic areas, 90 percent of which—3806 hectares—were removed from the timber harvesting land base in the analysis. The licensee assumed the remaining ten percent would actually be harvested, despite higher logging costs and pulp-grade timber. Since this licensee has performed successfully for many years in marginally operable areas, using alternative harvesting technologies such as helicopter yarding, I consider this to be a reasonable assumption. I also note the similarity with the assumptions applied in the analysis of the adjacent Invermere TSA.

Nevertheless, BCFS district staff question whether immediate access to certain sub-drainages in the TFL could be developed. I acknowledge this uncertainty, but I note that a sensitivity analysis which excluded these drainages for two decades showed only a negligible medium-term downward impact on the base case timber supply forecast, and no impact in the short term.

The licensee identified 4323 hectares of questionably harvestable poor sites on steep slopes which were included in the base case. To determine this area, the licensee applied reduction factors based on slope class to sites of over 30-percent slope. This is a reasonable reduction and I note the methodology is more detailed than that used in most analyses. A sensitivity analysis which excluded these areas showed some impact beginning in the second decade, but no immediate impact.

In view of the uncertainties remaining in the assumptions used in the analysis regarding operability classification, I recommend the licensee initiate a monitoring program before the next analysis, to refine future estimates of the operable land base of the TFL. I intend to examine this more closely at the time of the next determination by reviewing the licensee's performance across the range of operability classes.

For this determination, in view of the detailed mapping work, the results of the sensitivity analyses, and the licensee's well demonstrated performance in marginally operable areas, I am prepared accept the assumptions about economic and physical operability as incorporated in the base case analysis.

- estimates for roads, trails, and landings

The inventory includes information about existing major roads, but minor roads, trails and landings are too small to be identified separately on the inventory file. In analysis, allowances for all of these must be made to ensure the long-term productive forest land base is not overestimated.

To estimate the area of existing roads, trails and landings, the licensee used a methodology developed by the BCFS Nelson Forest Region and used in the adjacent Invermere TSA. A reduction of 10.5 percent was applied to the timber harvesting land base occupied by forests younger than 40 years. A further reduction of 2.5 percent was applied to stands over 40 years of age to account for the existing development within the TFL.

For future roads, trails and landings the land base occupied by stands greater than 40 years of age was further reduced by 6.23 percent. To calculate reduction factors for main roads and landings the licensee used information based on soil disturbance surveys and road area sampling from the adjacent Invermere Timber Supply Area. For skid roads and trails, factors were based on 20 audit-level soil disturbance surveys carried out on TFL blocks harvested since 1993. I acknowledge the comprehensive nature of this methodology.

I therefore accept the projections for use in this determination, noting that deductions for roads, trails and landings vary considerably over the province, depending on the particular terrain characteristics of each TFL or TSA. The BCFS is currently developing more rigorous procedures for calculating these factors, and I expect these to be available before the next determination period.

- Bugaboo Glacier Provincial Park

The government's East Kootenay Land-Use Plan was released in March 1995. An addition to Bugaboo Glacier Provincial Park was established through this planning process, and the park boundary was mapped and was approved by Order in Council later that year; this occurred after the completion of the information package for the TFL 14 analysis. The park displaces 10 186 hectares of the TFL 14 land base, of which 3494 hectares are productive forest, including 1229 hectares—mainly older, higher-volume stands—formerly in the timber harvesting land base. Although formal deletion of the park area had not been finalized prior to assembly of the analysis information package, I note the licensee has deducted the park area in its 20-year plan.

An analysis of the sensitivity of the timber supply to removal of the contribution from the area now added to the park showed that, without the park area, the initial harvest level projected in the base case could still be maintained for one decade. However, the harvest level in the second decade is 15 000 cubic metres/year lower than the initial level. Following subsequent decline, the same mid-term level of 122 000 cubic metres is reached two decades earlier than in the base case, before rising as before to a long-term

level in decade 9, but this time 3 percent lower than the long-term level projected in the base case.

My determination assumes no contribution to the timber supply from the designated park area, as discussed further under Alternative harvest flows and in "Reasons for Decision".

- non commercial areas

Approximately 233 hectares of non-commercial cover (brush) were identified as inoperable in the TFL. Standard procedures were followed in the analysis in excluding these areas from the net operable land base.

- unmerchantable stands

In the analysis the licensee removed 587 hectares of low-productivity sites from the timber harvesting land base. These areas were classified as 'low site' in the 1984 inventory classification. The licensee also deducted 1345 hectares of lodgepole pine stands on slopes greater than 50 percent. To determine this area, reduction factors were applied to stands of stocking class three or four. Although the licensee has indicated some of these stands could be spaced and included in the timber harvesting land base, no specific areas have been identified for rehabilitation. I accept the procedures used to derive the above estimates and am satisfied this factor has been modelled appropriately.

- deciduous (broadleaf) stands

Since only coniferous stands are considered merchantable in TFL 14, in the analysis the licensee removed 592 hectares of deciduous-leading stands (inventory type groups 35-42) from the timber harvesting land base. Deciduous trees also occur as a minor component in mixed-wood stands and it is the licensee's intention to leave deciduous trees standing for wildlife habitat. For these inventory type groups therefore, the volumes assigned to each stand exclude deciduous volume. I consider these procedures to be appropriate, and I note the licensee's commitment to manage the deciduous component for its habitat values.

Expected rate of growth

- site productivity estimates

Site indexes are indicators of the productivity or growth potential of forests and are derived from existing inventory data. Site indexes are based on the relationship between tree heights and ages in forest stands. The productivity of a site 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 time required for stands to reach a merchantable size or harvestable age.

Ongoing provincial studies show that, for some species in some areas, current site indexes that have been determined using information from existing unmanaged stands underestimate the growth potential of regenerated stands. If site indexes are underestimated, volumes in regenerated stands could be higher, minimum harvestable ages could be lower, and green-up conditions could be reached earlier than projected. Except for considerations related to *green up* and *minimum harvestable ages* (discussed below) the potential underestimation of site indexes affects timber supply primarily in the medium and long terms.

In the analysis, site indexes were assigned to individual polygons using approved BCFS site curves. Stands under 30 years of age were assigned default site-class mid-point values. Special site designations were used where available.

For 1800 hectares of partially harvested balsam and fir stands, the licensee assumed the site index to be the same as for medium sites for these species. Estimation of the site productivity of partially harvested stands is difficult, due to current limitations in technical data and experience. Nevertheless, I consider this assumption to be reasonable and possibly even conservative, and in the absence of any better information I find it acceptable for use in this analysis.

The licensee's staff were concerned that old-growth site indexes underestimate the volumes projected to grow in managed regenerated stands after harvesting on the old growth sites. The licensee performed a sensitivity analysis by applying the site indexes of 35-140 year old ("thrifty") stands to regenerating stands. The site index adjustments applied consisted of increases ranging from 2.6 metres at 50 years of age for balsam stands to 4.3 for Douglas-fir stands. This sensitivity analysis showed that the initial harvest level projected in the base case could be maintained for one extra decade, and that the long-term harvest level would be increased by 28 percent.

The BCFS Research Branch did not accept this sensitivity analysis as appropriate for incorporation in the base case, and I agree with this assessment. Numerous paired-plot studies across the province confirm the need to investigate site index adjustments, but none of these studies applies specifically to TFL 14, and in the absence of empirical evidence it is not possible to quantify the degree to which site index may be underestimated in the TFL.

Uncertainty in site indexes is a provincial problem on which much work is already underway and which warrants further study. I note that the licensee has initiated field work on TFL 14; this and other provincial studies will provide more certainty about the accuracy of the site indexes, and adjustments may be warranted in future analyses. Until definitive information is available for this TFL I will accept the site index assumptions in the base case, recognizing that the long-term timber supply may prove to be higher than projected, and that there may be some additional flexibility to manage the projected rate of decline in the mid term. This is also noted under "Reasons for decision".

- *volume estimates for existing stands*

Volume estimates for existing stands were derived using the Variable Density Yield Prediction Model (VDYP) and a methodology approved by Resources Inventory Branch. VDYP is based on information gathered from a large number of sample plots, and is generally accepted in British Columbia as an adequate model for projecting volumes in existing stands.

The licensee is concerned that the VDYP volumes used in the base case are underestimated. The principal argument rests on the results of an Inventory Audit on TFL 14, released by the BCFS Resources Inventory Branch in August 1994. The licensee also notes that the volumes calculated for the previous analysis (MP No. 6) were approximately 15 percent higher than the volumes currently being generated by the VDYP model, although I note that the previous analysis used localized Chapmans-Richards yield tables, which are no longer approved by the Resources Inventory Branch.

A BCFS Inventory Audit report on TFL 14 was released in August 1994. The objective of the audit was to provide an assessment of the overall accuracy of the volume projection estimates for the TFL. The results of the audit suggest that coniferous volumes projected from the inventory file may be underestimated by about 26 percent for stands older than 60 years .

Although the audit strongly suggests the inventory volumes are underestimated, the sampling intensity does not provide me with the statistical basis to apply these results to the timber supply directly. The audit was designed to provide generalized results which are statistically reliable for the entire TFL, not to identify the accuracy of the volume estimates in the inventory data for a particular part or parts of, or for particular groups, species or site classes within, the TFL. Accordingly, sampling for the inventory audit was performed at the forest level, not at the analysis-unit level. For this reason, and since the inventory results apply to the *current standing* inventory—essentially providing a snapshot in time that may not apply equally as stands grow and age over time—the overall magnitude of the timber supply implications of this probable overestimation in volumes is uncertain.

Nevertheless, in order to assess any prevailing trend in the timber supply that may be indicated by the results of the audit, and to include in my determination a consideration in a general way of the potential implications of such a trend, it is appropriate and instructive to examine the effects of the audit results on the projected base case harvest schedule in a sensitivity analysis.

The licensee performed a sensitivity analysis by applying to the base case harvest forecast an increase of 30 percent (adjusted from 26 percent to compensate for utilization factors) in the volume estimates predicted by VDYP for stands 60 years and over. The resulting timber supply projection indicated a high level of sensitivity—the current AAC (178 926

cubic metres) could be maintained for up to six decades before starting to decline in decade seven.

In view of the considerable uncertainty in the volume estimates for existing mature stands, as shown by the inventory audit, and of the demonstrated high sensitivity in the timber supply to variation in these estimates, the licensee has already initiated work to reassess the inventory volumes for these stands, and I have instructed the licensee to complete this work for the next determination as noted in "Implementation of decision". As noted above, in "Timber supply analysis-base case projection", depending upon the information produced, I may decide to review this determination before the completion of the five-year term of MP No 7.

For the present determination, I have considered the uncertainty in existing volume estimates as an indication of a strong potential for—rather than the conclusive existence of—a substantial but currently unquantifiable increase in the projected timber supply. The AAC I have determined is compatible with this potential increase, but is not dependent upon it during the next five years. This is discussed further in "Reasons for Decision".

- volume estimates for regenerated stands

Volume estimates for regenerated stands were derived using the growth and yield model "Table Interpolation Program for Stand Yields" (TIPSY). TIPSY was also applied to NSR areas and to stands less than 20 years old. All yield tables were reviewed and approved by the BCFS Research Branch for use in the analysis.

To account for operational conditions, Operational Adjustment Factors (OAFs) are applied to TIPSY yield predictions to compensate for the loss of timber productivity due to such factors as openings in stands (OAF1), as well as age-dependent factors such as pests, decay, waste and breakage (OAF2). In TFL 14, OAF1 and OAF2 were 15 and 5 percent respectively, except for Douglas-fir and in some lodgepole pine analysis units. In these units an OAF2 of 7 percent was assigned, to account for the possibility of lower yields associated with root rot in partially harvested areas. I find these factors acceptable for use in the analysis.

The use of old-growth site indexes for certain regenerated stands (see *site productivity estimates*, above) could result in the long-term harvest level being underestimated. However, at this time the assumed higher growth rates have not been assessed or proven. Accordingly, I accept the volume estimates for regenerated stands used in the base case to be the best available information for use in this determination.

- minimum harvestable ages

Minimum harvestable age is an estimate of the age at which a forest stand has grown to a harvestable condition. In TFL 14, minimum harvestable ages for both existing and

regenerated stands were based on the culmination of mean annual increment, and range from 70 to 110 years, depending on tree species and site productivity. In specific circumstances the minimum harvest levels were adjusted (e.g., to minimize losses from balsam bark beetle and mountain pine beetle).

For the base case, it was assumed that stands are eligible for harvest when they are near to culmination age; for the purposes of this analysis this is assumed to be the youngest age when mean annual increment (MAI) increases by less than 0.05 cubic metres per hectare per year.

As discussed in *site productivity estimates*, if site indexes are underestimated, then minimum harvestable ages may be overestimated. A sensitivity analysis showed that if minimum harvestable ages are reduced by 10 years, the timber supply would be increased such that the initial harvest level projected in the base case could be maintained for an extra decade. This would provide operational flexibility and would be beneficial in managing the decline to the mid-term level.

For the purposes of this determination, I accept the methodology used to determine minimum harvestable ages, and I am satisfied that the conditions being modelled represent current practice. In the absence of definitive information regarding the need for adjustments to site indexes in the TFL I have not relied on any addition to timber supply from reduced minimum harvestable ages, although I have acknowledged the potential benefits in "Reasons for Decision".

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

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area is occupied by a specified minimum number of acceptable, well-spaced trees.

The TFL 14 analysis used estimates of regeneration delay in modelling the timber supply. A three-to-four-year delay period was used for planted stands and a three-to-six-year delay for naturally-regenerated stands. Although these regeneration delays compare favourably with those applied in the adjacent Invermere TSA, district staff note that in some areas of the TFL the delays may be overestimated. This may indicate a short- to medium-term increase in timber supply. However, in the absence of more specific information, I accept the delay periods as modelled, but I recommend that the licensee review these estimates before the next analysis.

Impediments to prompt regeneration

Root diseases, particularly *Armillaria* and *Tomentosus* exist on some sites, in response to which the licensee has committed to applying control techniques such as push-over logging and de-stumping where appropriate. Regeneration of some pine stands on steep

slopes has also been identified as a problem. The licensee has indicated these areas will be evaluated for rehabilitation individually. There is evidence that any impediments to prompt regeneration are being satisfactorily addressed and I am satisfied there is no reason to adjust the base case projection on this account.

Not-satisfactorily restocked areas

Not-satisfactorily restocked (NSR) areas are defined as land originally occupied by operable timber which has not yet regenerated to commercial species. For each area harvested there is a target regeneration delay period as discussed above, during which the area is referred to as "current" NSR land. Land that fails to regenerate during this period is considered to be "backlog" NSR. For TFL 14, there are 2173 hectares of current and backlog NSR area on the timber harvesting land base. With the exception of a minor amount of backlog, in the analysis all NSR was considered current and the licensee expects to reforest all NSR on schedule. I am satisfied that the area scheduled for regeneration each year is well-balanced with the annual harvest and I accept that this factor has been modelled appropriately.

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

Silvicultural systems

Significant areas of the TFL are being harvested using methods other than clearcutting. Several forms of partial harvesting have been used by the licensee to address Visual Quality Objectives (VQOs), biodiversity, and pest protection measures. District staff are supportive of the type and extent of partial harvesting systems used in the TFL although selective cutting as a means of averting potential pest infestations has not yet been validated operationally. I acknowledge the licensee's proven operational experience and success with alternative silvicultural systems and recognize that their use is planned to increase in the future.

In the base case analysis, due to current limitations in data and modelling technique, it was assumed that all harvesting would be by clearcutting, with the oldest available stands being harvested first, and subject to the forest cover constraints in the various zones throughout the TFL, (as noted below, in Integrated resource management objectives). In order to examine the impact of partial cutting on the timber supply projection, a sensitivity analysis was carried out, in which 45 percent of the available volume in the appropriate zones was assumed to be harvested on the first entry, with the remainder being removed later in a second entry. For this analysis, the licensee reduced the volume tables by 45 percent after the first harvest, and assumed that growth would occur at the same rates as the unharvested stand, but at a lower volume. It was assumed that, following harvest, a delay of 30 years would occur before the next and final pass, to allow for a sufficient amount of understory regeneration to develop. This analysis showed only a very small (1.5 percent) downward impact on the projected long-term supply, with no impact in the short or medium terms.

For this analysis, the licensee did not use stand-level models to project growth of partially harvested stands. The lack of information on the dynamics and growth and yield of uneven-aged stands is a provincial concern and is being addressed through ongoing research studies. I accept the assumptions and methodology used by the licensee as the best available and have no information to suggest that the current use of alternative silvicultural systems will introduce additional risks to the timber supply. I note that research into the development of growth and yield models for alternative silvicultural systems is urgently required and anticipate that new information and more sophisticated models will be applied in the next timber supply analysis.

For this determination, I note that in the clearcut harvesting system assumed in the base case, forest cover constraints require that the maximum permissible area harvested must be strictly observed. In contrast, under partial cutting, a forest cover is always present and provides a greater range in the choice of stands for harvest. Given the large extent of mature stands available for harvesting in the partial cutting zones, these harvesting methods may provide more flexibility in accessing the short-term timber supply than was assumed in the base case projection. While I have considered this factor in a general way, I have made no specific provision in my determination respecting the use of partial harvesting systems.

- (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;**

Decay, waste and breakage factors

The timber supply analysis used the standard Metric Diameter Decay, Waste and Breakage factors for Forest Inventory Zone G for all species except cedar and hemlock. Use of Lardeau local factors for cedar and hemlock was approved by the Resources Inventory Branch. I accept the factors and find them suitable for use 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 Resources 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 and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which IRM objectives for various forest resources and values affect the timber supply must be considered in AAC determinations.

Data collection and completion of the information package on which the analysis was based, took place before the implementation of the Forest Practices Code and well before the finalization of the various guidebooks. It is therefore likely that in several instances the management practices assumed in the analysis do not meet the new requirements.

The management zones for timber supply modelling were based on biophysical zones for wildlife habitat, riparian protection zones and zones for the protection of visual quality. The classification emphasizes habitat and was developed by the licensee in cooperation with BC Environment and BCFS staff.

Forest cover constraints were developed for each management zone to meet specific IRM requirements for forest cover. Visual quality objectives (VQOs) were addressed in a single zone situated largely in the Columbia bench region of the TFL as viewed from highway 95. Zones were also grouped by heavy and light logging history. District staff expressed concern that this grouping could result in over-harvesting in "light" zones over time. However a sensitivity analysis showed that the classification by logging history did not impact the short- or long-term base case harvest forecast. I am satisfied that the classification used is suitable for the purposes of this determination.

- environmentally sensitive areas

Environmentally Sensitive Areas (ESAs) are mapped units having special management requirements. ESA designations exist in the inventory for soils, regeneration problems, recreation values, wildlife values and avalanche areas. A total of 3 806 hectares of ESAs were removed in the analysis.

Two classification systems for describing ESAs are in use in the TFL. Environmental Protection Area (EPA) standards are used in the original TFL area, while in the TFL extension area (defined above, in "History of the AAC"), Environmental Protection Forest (EPF) designations in accordance with the methodology of 1973-1975 are used. Except for the TFL extension area, the ESA inventories are considered current for Management Plan No. 7 and have been approved by BCFS District staff. For the purposes of the analysis, I accept the ESA definitions and deductions as representing the best available information, and I acknowledge the licensee's commitment to evaluate and—if required—update the soil ESAs in the extension area of the TFL over the next management plan period.

- forest cover requirements (adjacency and green-up)

In TFL 14, forest cover requirements are employed to protect important resource values such as wildlife and visual quality. Both adjacency and Visual Quality Objectives (VQOs) are used to reflect acceptable levels of disturbance based on the physical characteristics and social concern for an area. The management emphasis for the Columbia Bench corridor is the achievement of VQOs, while forest cover requirements for the remainder of the TFL are managed with an emphasis on wildlife habitat.

Current harvesting practices limit the size and shape of cutblocks, and prescribe minimum "green-up" heights which must be reached before adjacent stands may be harvested. To capture this, in five management zones in the TFL, a five-pass harvesting regime was assumed, and three passes in most of the remainder of the TFL. This provides for a distribution of harvested areas and retained forest cover across the landscape. The base case included estimates of green-up ages based on FREDDIE, the BCFS site index estimation computer program. The licensee maintained that the estimates generated by FREDDIE represent provincial averages which may not be applicable to TFL 14, and BCFS district staff agree that the FREDDIE-based green-up ages may be overestimated. As an alternative, the licensee gathered local field data based on silviculture surveys and stand assessments. Local estimates of green-up ages derived from field data for specific management zones were up to five years lower. However, due to design problems and insufficient sample size, the BCFS Research Branch could not approve the licensee's reduced green-up ages. I note that green-up age is largely a function of site index, and as discussed earlier in *site productivity estimates*, I have reason to believe provincial studies now underway will improve upon current information and will likely verify some degree of underestimation in site indexes and hence will likely show a shorter green-up period. While this is not yet proven or quantified, and I have therefore made no specific adjustment on that account in this determination, there could be some associated additional flexibility in managing the rate of decline in harvest levels.

In the Columbia Bench corridor, VQO constraints were developed to determine the percentage of the area that is permitted to have stands below specified heights. The licensee used acceptable BCFS procedures and approval was given to model at the maximum permissible visual absorption capacity (15 percent) because of the extensive use of partial harvesting. In the analysis, the licensee suggested that a four-metre rather than the standard six-metre green-up height is sufficient to meet VQOs. Although the licensee's analysis did show a moderate increase in the medium-term timber supply, the harvesting experience in the VQO management zone has been insufficient to validate the adequacy of assuming a four-metre green up. In any case, I expect the licensee's extensive use of partial harvesting as a VQO management strategy will satisfy this constraint.

- old growth retention

Old-growth cover constraints are applied to maintain a defined minimum area above a specified age to provide for biodiversity and wildlife habitat. For the analysis, the licensee and BC Environment staff reviewed operability/ESA mapping to determine old-growth requirements by zone in the base case. Due to the amount of inoperable and environmentally sensitive area available to satisfy old growth requirements, only five zones required additional constraints. The licensee and BC Environment staff agreed on the required additional old-growth forest cover requirements. Subsequent to the analysis an error was noted in the derivation of the constraints. This produced a small overestimation in the amount of old-growth forest cover required and I note the resulting

area represented less than 50 hectares. I am satisfied with the methodology used, and that the very minor error will not affect the base case projection.

- riparian areas

The TFL contains numerous streams, lakes and wetland areas. Detailed fisheries inventories and revised stream classifications were completed by the licensee in 1995 but were not available at the time the analysis information package was prepared. Therefore in the analysis the licensee estimated riparian management areas by generating buffer zones around streams, lakes and wetlands based on the existing stream classification. A 30-metre buffer was assumed for Class I streams and lakes. Class II streams and wetlands were assigned a 20-metre buffer. To effectively model forest management activities the buffer was subdivided into a riparian reserve area; a riparian management zone; and areas outside the riparian zone (these areas defaulted to the appropriate biophysical zone).

Based on the area associated with each riparian type, the proportion of area associated with reserves, management zones and areas outside riparian management zones was calculated. The licensee, BC Environment and BCFS district staff agreed to deduct 1159 hectares of riparian reserve areas and 2899 hectares of riparian management zone areas in deriving the timber harvesting land base. A subsequent review concluded that this methodology closely resembles the requirements of the Riparian Management Area Guidebook, which represents the current requirements for riparian management under the Forest Practices Code.

I accept the approach used in the analysis and acknowledge that the operational management practices are representative of current Forest Practices Code standards. The methodology provides a reasonable approximation of riparian areas and I am satisfied that this factor has been modelled appropriately. I note the licensee has recently completed a stream and fisheries inventory, and I expect more explicit modelling around this information in the next analysis.

- landscape-level biodiversity

Biological diversity, or biodiversity, is the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at the landscape and stand levels. Landscape-level biodiversity objectives involve maintaining forests with a mix of ages, patches of old-growth, and forested corridors (i.e. forest ecosystem networks, or FENs). Provisions for stand-level biodiversity ensure maintenance of structural diversity and habitat for wildlife through the retention of wildlife tree patches, leave trees and coarse woody debris.

The base case harvest forecast for TFL 14 does not incorporate all aspects of the Forest Practices Code Biodiversity Guidebook. In the base case, requirements for old-growth retention were applied in five management zones in which it was considered that the forested areas that were excluded in deriving the timber harvesting land base were insufficient to meet the old-growth requirements in place at that time. For these zones a five-pass harvesting regime was modelled. For the remaining zones, a three-pass regime was modelled, and no requirements for old-growth retention were applied as it was assumed that old-growth objectives could be achieved in excluded areas such as ESAs and inoperable areas.

The licensee, and staff of the BCFS and BC Environment consider that the application of the Forest Practices Code Biodiversity Guidebook will require cover constraints additional to those modelled. For instance, although Forest Ecosystem Networks (FENs) were not modelled in the analysis, they have been mapped, and the licensee has established objectives and is currently implementing them at the field level.

To examine the timber supply implications of biodiversity considerations, the licensee performed sensitivity analyses of what was understood to be implementation of the Biodiversity Guidebook at the low emphasis level. In these analyses, the effects of combining reductions to the land base for FENs and applying forest cover constraints for old growth, riparian, and thermal cover objectives were examined.

The results in the sensitivity analysis of implementing FENs alone showed a moderate negative impact on timber supply in the medium-to-long term, but no impact in the short term. In contrast, the application of the 'Biodiversity Guidebook - low emphasis' forest cover constraints in the sensitivity analysis resulted in the projection of an 18.6-percent decrease in the short-term timber supply. However, for a number of reasons, I do not consider this to be an accurate representation of the impacts of providing for biodiversity in this TFL. First, the licensee and BCFS staff agree that the cover constraints applied in the analysis—which were based on information prepared before publication of the Biodiversity Guidebook—are in fact considerably more restrictive than required by the now published Guidebook. Second, extensive areas of the TFL will be harvested using partial-cutting systems, which will offset the need for some of the additional forest cover requirements. Third, to various extents, biodiversity requirements will be met in areas already assumed to be deducted from the timber harvesting land base for such considerations as physical or economic inoperability (almost one quarter of the productive forest in the TFL), ESAs, riparian areas, low productivity sites, and deciduous species.

Thus, while it is reasonable to expect that providing for landscape-level biodiversity will restrict the timber supply to some extent from that projected in the base case, it is not reasonable to assume that the overall impact will be in the order of magnitude of that shown by this sensitivity analysis.

Given the current uncertainties in the implications for timber supply of providing for biodiversity at the landscape level, I expect that these implications will be more rigorously modelled for the next determination. For the present determination, I accept that this factor represents an unquantified risk to the timber supply, and I have considered this in my determination as discussed in "Reasons for decision".

- wildlife habitat

In the base case, it was assumed that the five-pass harvesting regime modelled for five management zones in the TFL would meet ungulate requirements for winter thermal and snow-interception cover.

In addition to the base case, the licensee's analysis presented an alternate set of forest cover constraints specifically aimed at protecting ungulate winter range in winter habitat zones. Operationally, the extensive use of partial cutting in the TFL is expected to satisfy many requirements for ungulate winter range, such as thermal and snow-interception cover. However, in the alternate management regime, the old-growth retention constraints applied in five zones in the base case were replaced by thermal cover constraints, in combination with a 3-pass harvesting regime, except in the riparian zone, where the 5-pass regime was retained. The thermal cover constraints required a minimum percentage of the area of the zone to be covered at all times by stands of at least 15 metres in height. Assumptions for the remaining zones were unchanged.

The licensee suggested that retaining 30-percent of the zone at 15 metres or above may be sufficient to meet ungulate management requirements. Sensitivity analyses of applying 30-percent and 40-percent thermal cover constraints were examined. In each case the results projected a harvest forecast for the wildlife management option closely resembling the base case, with a small increase in the medium-term timber supply.

From these results, noting also the extensive use of partial harvesting in the TFL—including in the winter range zone—which provides additional operational flexibility, and noting the acceptance of this management option by BC Environment staff, I am satisfied that this option represents a suitable management alternative that may result in some increase to the mid-term timber supply over that projected in the base case. I have considered this further in my determination, as noted under "Reasons for decision".

- wildlife trees

The leaving of wildlife trees after harvesting assists in meeting requirements for stand-level biodiversity. Wildlife tree retention is practised on the TFL in stands where pine and Douglas-fir are the leading species. It is estimated that wildlife trees left on harvested blocks represent approximately five percent of the stand volume.

The licensee has suggested that reductions for wildlife trees are not required because of the extensive use of partial cutting and the presence of other reserves such as riparian

areas and FENs. I agree this may be a valid assumption in the short term, while very little harvesting occurs in pine- and Douglas-fir-leading stands where clearcutting is used. However, I expect that in the medium and long terms the meeting of wildlife tree objectives will reduce the timber supply relative to the base case projection, as the trees left behind during partial cutting will likely not be available for harvest in future entries into those stands, and operations must move eventually to areas where wildlife trees will be required, particularly in areas planned for clearcut harvest.

I note that the licensee plans to manage deciduous trees for wildlife purposes where possible, and that there is overlap between wildlife tree requirements and other aspects of forest management which are already accounted for. The net result is uncertain, but from the information available I estimate that the overall constraint on timber supply from this factor is likely to be very small in the short term, and in the mid-to-long term, something less than the estimated individual stand impact of five percent. I have considered this further in "Reasons for decision".

- recreation

The TFL is used extensively for a variety of recreational activities including commercial heli-skiing and backcountry use. The licensee assumed recreation objectives would be considered and protected in the layout and design of harvest blocks, and therefore did not incorporate any recreation ESAs into the analysis. The recreation analysis report in MP No. 7 provides a thorough review of recreational patterns and projects trends and demands for the future. The licensee has worked, and will continue its commitment to work, with commercial and non-commercial interests, to manage the recreation resource.

For the purposes of this determination, I am satisfied that the licensee has accounted appropriately for recreational concerns.

- community water resources

The licence area includes the entire watershed of the Spillimacheen River and its tributaries, Bobbie Burns and Vowell creeks. Although water is not drawn directly for local use, the watershed has significant downstream value as part of the Columbia River catchment area. A small number of water licences have been issued on the eastern portion of the TFL.

Management Plan No. 7 indicates that the licensee will minimize any specific impacts through operational planning and cutblock design. To date no specific concerns have come to my attention to indicate that this is not a workable strategy, and again the benefits of partial cutting serve to minimize the risk to maintenance of watershed values. I am therefore satisfied that water supply concerns can be addressed in this manner and that no adjustment is required on this account in this determination.

- First Nations

The TFL lies broadly within the traditional territory of the K'tunaxa/Kinsbasket Tribal Council (KKTC). First Nations people have indicated a concern about the effect of timber harvesting on cultural, medicinal and food values.

I note that the KKTC has submitted a letter of intent to enter into comprehensive land claims negotiations with the provincial and federal governments, but as discussed under "Guiding principles for AAC determinations", I am unable to speculate on any timber supply impacts resulting from these negotiations.

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

East Kootenay Land-Use Plan

The East Kootenay Land-Use plan was released on March 13, 1995 as part of the government's Kootenay-Boundary Land Use Plan. As noted above, under "Guiding Principles for AAC Determinations", government's land-use decisions are generally followed by detailed implementation plans. This is the case with the East Kootenay Land-Use plan. As part of the March 1995 decision, a government technical team was charged with creating a long-term implementation strategy for the Plan which would define land and resource management objectives and strategies for a range of values, as well as identify areas for enhanced timber management. The initial results of that work were released on October 21, 1996, as a draft of the implementation strategy, which includes goals and prescriptions for different management zones. Following further work and discussions with interested groups, finalized recommendations are expected to be presented to government by March 1997 for final decision.

In the Plan, three zones have been identified—Integrated Resource Management, Enhanced Resource Development and Special Resource Management. The majority of TFL 14 was placed in the Enhanced Resource Development and Integrated Resource Management (IRM) zones. A small portion of the upper Spillimacheen valley was designated as a Special Management Zone. An addition to Bugaboo Glacier Provincial Park was also created.

The timber supply implications of the addition to Bugaboo Glacier Park are discussed in this rationale document in "Timber supply analysis", "Base case projection", and *Bugaboo Glacier Park*, and are taken into account the determination as discussed in "Reasons for decision". However, it is not yet possible to accurately predict the overall implications of the new management zone designations expressed in the plan. I expect the goals, guidelines and prescriptions developed for the zones—some of which may enhance, and some restrict, the timber supply—to be fully accounted for in future determinations, following final decisions by Cabinet on the forthcoming recommendations, and that the plan will be fully respected in ongoing operations on the TFL.

20-Year Plan

The purpose of a 20-year plan is to show whether or not the proposed AAC is spatially feasible on the landscape over that period. The 20-year plan for TFL 14 for the period 1994 to 2013 was submitted by the licensee in March 1996, and was reviewed and accepted by the Invermere Forest District. The Bugaboo park area was excluded from the plan. The blocks depicted in years 1 to 10 of the plan represent field-verified or air photo block design. For years 11 through 20, harvest areas are computer-generated by identifying operable areas according to management plan assumptions. The 20-year plan demonstrates that over 2.9

million cubic metres are available for harvesting over the remaining 18 years of the planning period, under present and planned practices.

However, the 20-year plan was prepared using inventory volumes that had been adjusted on the basis of the results of the inventory audit referred to above, in *volume estimates for existing stands*. As noted in that section, the sampling intensity of the audit does not provide a suitable statistical basis from which to apply the results to the inventory polygons directly, as was done by the licensee for this plan. The audit was designed to provide generalized results that are statistically reliable for the entire TFL, but not to identify the accuracy of the volume estimates in the inventory data for a particular part or parts of, or for particular groups, species or site classes within, the TFL. For this reason, while I cannot view the plan as conclusive evidence of the attainability of the proposed harvest level throughout the twenty-year period, the plan does show validly that more wood is available during the first half of the period of the plan than in the second half. Since I have instructed the licensee to complete a reassessment of the inventory volumes, I am satisfied that 20-year plan prepared for the next determination will provide an appropriate indication of harvestable levels for the following 20 years.

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

Alternative harvest flows

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the Province. In the short term, the presence of large volumes of older wood permits harvest levels to be sustained above long term levels without jeopardizing future timber supply. 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 medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impact on current or future generations. To achieve this the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are unnecessary to maintain forest productivity and future harvest stability.

In addition to the base case harvest forecast, two alternative forecasts were presented in the analysis report:

- a forecast starting at the current AAC (178 926 cubic metres)
- a forecast starting at the long term harvest level (132 000 cubic metres).

In both forecasts the long term harvest level of 132 000 cubic meters could not be maintained throughout the entire planning horizon.

In the alternative forecast starting at 178 926 cubic metres, the harvest flow declined after one decade by 10 percent to a level of 161 000 cubic metres, then declined in each of three subsequent decades by 10 percent to reach a mid-term level slightly below the base case, rising to reach the same long-term level in decade 10 as in the base case. However, this projection included a contribution from the area now designated as part of the Bugaboo Glacier Provincial Park. As noted above, in *Bugaboo Glacier Provincial Park*, the removal of the timber supply contribution from this addition to the park reduces the projected duration of the base case initial harvest level of 150 000 cubic metres to ten years, followed by an approximately similar rate of decline to the base case mid-term level, reached two decades earlier. I have assumed that this 150 000 cubic metre total removal is approximately equivalent to a reduction in the available timber volume of 15 000 cubic metres per year in each of the first ten years on the alternative harvest flow which starts at 178 926 cubic metres, followed by a similar but earlier transition to the mid-term level. I accept this as a valid procedure since the timber supply forecast is not expected to be limited spatially by cover constraints during this period. Thus a starting harvest level of 164 000 cubic metres could be maintained for one decade, followed by continuation of the decline to the mid-term level at approximately the same rate as, but one decade earlier than, projected in this alternative forecast. I note that the rate of decline in this forecast is projected at 10 percent per decade, and that the choice of a slightly steeper rate in order to provide additional assurance of the attainability of an initial harvest level of 164 000 cubic metres for ten years, would also be reasonable, as discussed in "Reasons for decision".

In the alternative forecast starting at 132 000 cubic metres, the harvest level is reduced slightly in decade six before returning to the long term harvest level in decade eight. While the decline below the long-term level in both scenarios—as well as the base case—is in the medium-term, it does represent a small interruption of timber supply during the change from harvesting in existing stands to harvesting in second-growth stands.

I note that the timber supply analysis does not entirely reflect what is occurring operationally. For example, in TFL 14 the application of partial cutting techniques has increased in recent years and will likely continue to increase in the foreseeable future. As discussed under *silvicultural systems*, the timber supply implications of extensive partial cutting are not entirely clear. However, I accept the analysis as a suitable approximation based on the best available information, and I note the useful inclusion of a sensitivity analysis designed to help in assessing the timber supply impacts of partial cutting. I also acknowledge that partial cutting techniques will increase operational flexibility in responding to changing management objectives associated with the Forest Practices Code and the Kootenay-Boundary Land Use Plan.

As discussed above, in "Base case projection", in choosing the base case, the licensee considered the uncertainties in a range of factors affecting the timber supply in the tree farm licence. As noted in that section, the selected base case initial harvest level of 150 000 cubic metres per year would help to meet the licensee's strategic objectives for stability in timber supply, and I have considered the licensee's base case projection to be

an acceptable reference point for my considerations under section 7(3) for this determination.

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

Timber processing facilities

The licensee operates three sawmills, located at Cranbrook, Canal Flats and Elko, as well as a pulp mill located at Skookumchuck. Logs harvested from TFL 14 are directed primarily to the Canal Flats mill except for yellow pine and larger diameter logs which are sent to the Cranbrook operation. Corporately, the licensee has expended over \$330 million in capital investments since 1992 and is looking for a stable wood supply over the next 20 years. The contribution of TFL 14 to the licensee's operations is significant in that it provides approximately one quarter of the volume requirements of the licensee's Canal Flats operation.

- (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 has expressed the economic and social objectives of the Crown for the province in two documents to the Chief Forester: a letter dated July 28, 1994 (attached as Appendix 3), and a memorandum dated February 26, 1996 (attached as Appendix 4). I understand both documents to apply to TFL 14. They are consistent with the objectives stated in the Forest Renewal Plan and include forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest level changes in a managed transition from old growth to second-growth forests, so as to provide for continuity of employment.

The Minister stated in his letter that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability". The initial harvest level in the base case projection chosen by the licensee represents a 16-percent reduction from the current AAC. As discussed above, under "Base case projection", the base case was chosen by the licensee in recognition of uncertainties which exist in the TFL, and in order to meet the licensee's strategy for maintaining stability in harvest levels while still managing the necessary decline in timber supply. As I have noted, while the licensee's approach is reasonable, other approaches are also possible, as discussed in Alternative harvest flows. In particular, I note the indications that it may be possible to support an initial harvest level higher than projected in the base case for the first decade. In view of the Minister's express provincial objective of minimizing AAC reductions consistent with good long-term management, in my reasons for decision I have considered very carefully the appropriateness and feasibility of a higher initial harvest level than projected in the base case.

In his letter, the Minister placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked the chief forester to consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomic areas. The latter would likely require the use of alternative harvesting systems, and to encourage this the Minister suggested consideration of partitioned AACs. In this respect I note that in TFL 14 the licensee has been successfully applying alternative harvesting systems to significant areas for several years. The licensee has shown considerable innovation and initiative in applying a range of silvicultural systems, including selection harvesting and seed tree retention. Approximately 25 percent of the volume currently harvested on TFL 14 is removed using non-clearcut methods. The licensee has also successfully used unconventional harvesting technology such as helicopter and cable yarding systems in areas previously considered to be uneconomic to harvest. Considering this favourable performance record, I see no need at this time to establish a partition in the AAC.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. As noted earlier, under *forest cover requirements*, there is only one VQO management zone in the TFL and in respect of established partial cutting practices, the licensee was given approval to model at the maximum permissible visual absorption capacity. I expect the extensive use of partial cutting will offset any potential constraints imposed by visual management measures in this zone.

Local objectives

Public consultation opportunities were provided at four stages during preparation of the of the management plan. Comments on the plan were few and there was no attendance at advertised public open houses held in March and April 1996. While there was little local public comment, I have considered the general employment, revenue, taxation and community stability implications in my AAC determination.

7(3)(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Non recoverable losses

The major sources of non-recoverable losses (NRLs) in TFL 14 are insects, fire, disease and windthrow. Specific estimates for NRLs are not available for the TFL. With the exception of disease, estimates were based on BCFS methodology and assumptions used in the adjacent Invermere TSA analysis. To account for disease in second growth stands OAF2 was increased for Douglas-fir and pine, and root-rot was accounted for in growth estimates, as noted in *volume estimates for regenerated stands*. Annual losses overall are estimated at 10,350 cubic metres.

The Columbia Bench area is expected to experience continuing mountain pine beetle infestations. As discussed under *Forest cover requirements*, the licensee has adopted a partial retention management regime to address VQOs in this management unit. There is some concern that partial cutting in these areas may make the forest more vulnerable to infestations due to longer rotations. The licensee intends to address this either through sanitation harvesting or by switching to a five-pass clearcut harvest system should disease conditions become widespread. While this option would be less desirable for achieving VQO objectives, pest management objectives could be enhanced. I recognize that the current partial cutting approach will require careful monitoring and review since addressing forest health concerns may not be compatible with maintaining visual integrity.

Nevertheless, I accept the methodology and procedures used in the analysis as the best available information. I also acknowledge the provincial significance of non-recoverable losses and expect that the development of provincial strategies will aid in refining these estimates before the next determination.

Reasons for Decision

In reaching my decision on an AAC for TFL 14, I have considered all of the factors presented above and have reasoned as follows:

As described in "Base case projection", the initial timber harvest level projected in the base case forecast for TFL 14 is 150 000 cubic metres per year, 16.2 percent below the current AAC. The licensee chose this level based on its assessment of the uncertainties in several factors affecting timber supply for this TFL as well as a strategic objective of ensuring timber supply stability over the short and medium terms. This initial level was projected to be maintained for two decades before declining toward a mid-term level of 122 000 cubic metres, then rising to a long-term level of 132 000 cubic metres in decade nine.

My considerations have identified factors which indicate that the actual timber supply in the TFL may be either greater or less than that projected in the base case.

Some of these factors can be quantified and their impacts assessed with some reliability. Others influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at this time. These must be accounted for in the determination in a more general way.

Two factors have been identified which exert quantifiable restrictions on the projected timber supply, one with an immediate effect, and one that will affect the mid- and long-term supplies.

The designation of the addition to the Bugaboo Glacier Provincial Park, resulting from the government's East Kootenay Land Use Plan decision (March 1995), reduces the timber supply immediately from that projected in the base case prior to the designation. As noted under *Bugaboo Glacier Provincial Park*, sensitivity analysis shows that exclusion of the park area is approximately equivalent to a reduction in the short-term timber supply of 15 000 cubic metres per year for ten years, together with subsequent, but comparatively less substantial, mid-and long-term effects. Other aspects of the land use plan are expected to be finalized in 1997; their specific timber supply impacts cannot yet be determined, and as noted in "Guiding principles for AAC determinations", it is inappropriate for me to speculate on the potential timber supply implications of forthcoming decisions by Cabinet.

The second quantifiable restriction on timber supply is the impact of leaving of wildlife trees to contribute to stand-level biodiversity requirements. This impact is likely to be offset in the short term by the use of partial cutting techniques and by cover contributions from riparian zones and forest ecosystem networks. However, I am mindful of the risk that in the mid- and long-terms the impact could be up to five percent of the available inventory in the areas affected, which would result in an overall timber supply impact in the TFL of less than five percent. Given current and planned management, however, I expect no significant impact from this factor during the first decade.

Other factors have been identified which exert unquantified restrictions on timber supply. As noted, the implementation of the Forest Practices Code Biodiversity Guidebook is expected to reduce timber supply relative to that modelled. For the reasons discussed in *landscape-level biodiversity*, I do not expect the full extent of this impact to reach that projected in the licensee's sensitivity analysis. However, in determining an appropriate harvest level for the TFL I must be mindful of the risk which the uncertainty in this factor does represent to the available timber supply, and I have taken this risk into account as described below. Also in view of this risk, before the next AAC determination I expect the licensee to clarify the timber supply implications of landscape-level biodiversity, old-growth retention and forest ecosystem networks, as noted in "Implementation of decision".

Offsetting these restrictions on the timber supply are factors—all unquantified at this time—which work to increase the timber supply or to counteract the risks identified above. The most potentially significant of these is the probable underestimation in inventory volumes indicated by the recently completed BCFS inventory audit. As discussed in *volume estimates for existing stands*, due to statistical limitations, the overall magnitude of the timber supply implications for

the TFL of this probable underestimation in volumes is uncertain. However, sensitivity analysis indicates that if the full adjustment ratio shown in the audit were applied to the entire TFL inventory, the potential addition to the timber supply could be sufficient to enable continuation of the current AAC of 178 926 cubic metres for up to six decades.

In view of this considerable uncertainty I have instructed the licensee to complete a reassessment of the inventory volumes for these stands for use in the next determination, and I acknowledge that the licensee has already initiated a program to address this issue. For the current determination, I have regarded the audit results as provisional evidence of a trend in inventory information which may be accounted for only in a very general way at this time in context of an assessment of the overall effect of several risk factors present in the TSA, as discussed below.

Another factor which suggests the timber supply may be somewhat greater than projected, but to an uncertain degree, is the licensee's contention that the site indexes used in the analysis for regenerated stands are underestimated. I acknowledge that this may be a possibility, in which case regenerated volumes may be higher, and the minimum harvestable ages and green-up ages may be lower, than projected. However, as noted in my considerations, until definitive information is available for this TFL I accept the site index assumptions as incorporated in the base case. In accepting these estimates, I also acknowledge the possibility that new information may eventually prove the long-term timber supply to be somewhat higher than projected, and that faster green-up and lower minimum harvestable ages may provide some additional flexibility to manage the projected rate of decline in the short and mid terms, and potentially some addition to the short-term supply. While I acknowledge these possibilities, in determining this AAC I have not assumed any contribution to the timber supply arising from adjustments to site indexes.

In reviewing all the above considerations and argument, I note the following.

The necessary removal of the timber supply contribution from the designated addition to the Bugaboo Glacier Provincial Park reduces the period for which the base case initial harvest level can be maintained from two decades to one—i.e. a reduction of a total of 150 000 cubic metres, or 15 000 cubic metres per year for ten years, with an approximately similar subsequent rate of decline.

An alternative harvest projection provided by the licensee indicates that (before removal of the Bugaboo area) the current AAC of 178 926 cubic metres could be met for ten years, before declining to a mid-term level slightly below that projected in the base case. As noted in Alternative harvest flows, since the timber supply forecast for the TFL is not directly bound by forest cover constraints in the first decade, it is reasonable to apply the same reduction of 150 000 cubic metres to the first decade in the licensee's alternative harvest projection, to account for removal of the park area. This indicates that an initial harvest level 15 000 cubic metres below the current AAC, or 164 000 cubic metres, could be met for ten years, before declining at approximately the same rate as, but ten years earlier than, projected in this alternative forecast.

In deciding whether to base my determination in accordance with this alternative evaluation of the attainable initial harvest level as described above, or with the initial level projected in the base case, I have considered the following arguments to be persuasive.

The Minister of Forests, in his letter of July 28, 1994, expressed as a social and economic objective of the Crown, that "...decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability". Thus, in the case of TFL 14, unless there are evident biophysical reasons why a determination at the higher of the two alternative forecasts will compromise long-run sustainability, the higher should prevail.

In assessing the probability that a determination at the higher level will result in a significantly higher risk to future supply than a determination at the base case level, I have reasoned as follows.

The alternative forecast does project a slightly lower mid-term level than in the base case—118 000 cubic metres instead of 122 000—and this level is projected to be reached 10 years earlier than in the base case. Both projections reach the same long-term level of 132 000 cubic metres. The difference in mid-term levels is relatively small, and may be offset by appropriate management; as discussed in the *wildlife habitat* section, sensitivity analysis shows that the alternative management option for providing thermal cover for wildlife winter range, which was accepted by BC Environment staff, could provide an increase in the mid-term supply. (Any moderation in such an increase from wildlife tree retention would apply to the mid-term levels in both the base case and the alternative projection.) Moreover, sensitivity analysis shows that, if necessary, a reduction in minimum harvestable ages could provide some increased flexibility in the supply. I note that the projected rate of decline in the alternative forecast starting at the current AAC is 10 percent, and that if necessary, a slight increase in this rate of decline could provide an acceptable means of managing the transition to the mid- and long-term harvest levels.

The potential for a reduction in timber supply from managing to meet landscape level biodiversity requirements applies to both the alternative projection and the base case, and in each case must be weighed against the potential for a substantial increase to the timber supply from the probable underestimation in inventory volumes indicated by the BCFS audit. The net result of considering these two risks is uncertain, and the AAC determined cannot be dependent upon taking either of them into account in a quantitative way. I have requested the licensee to provide new information on both of these issues, and when available, this will reduce this uncertainty. Until then it is impossible to assess the relative validities of the base case and the alternative harvest forecast with respect to accuracy in taking these variables into account.

From this reasoning I am satisfied that a harvest level could be established at either of the two levels under consideration and maintained for ten years without compromising the projected future timber supply. Since a starting level of 164 000 cubic metres represents a smaller reduction from the current AAC than does an initial level of 150 000 cubic metres, and since this smaller AAC reduction is in accordance with the expressed social and economic objective of the Crown, I consider this higher harvest level to represent the more appropriate level for an AAC at this time.

While I am satisfied that an AAC of 164 000 cubic metres can be maintained for ten years, the AAC must by law be reviewed in five years and can be confirmed or varied at that time. Moreover, if the licensee or the BCFS provide new information at an earlier date, which resolves the identified uncertainties associated with the inventory, site index and biodiversity, and which provides conclusive support for either a substantially higher or lower timber supply, I am prepared to redetermine the AAC at an earlier date than the five-year review required by the *Forest Act*.

Determination

Effective December 1, 1996, the new AAC for TFL 14 will be 164 000 cubic metres. This determination will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Implementation

In the period following this determination and leading to the subsequent determination I expect the licensee:

A) in conjunction with BCFS staff and the licensee's planned program "Improving volume estimation on TFL 14", to:

1. reassess the inventory volumes for existing stands for the next AAC determination;
2. complete the necessary field work and analysis to clarify site indexes;
3. evaluate alternative analytical approaches to assessing the growth and yield and timber supply implications of uneven-aged silvicultural systems;

and B), to:

4. clarify the timber supply implications of landscape biodiversity, old growth retention and forest ecosystem networks;
5. initiate a monitoring program to refine the operable land base assumptions; and
6. closely monitor any forest health considerations of current and planned use of partial cutting, particularly in the Columbia Bench VQO zone.

I also expect the Forest Service and the licensee to work together to submit any findings on the above items as soon as they become available. Should the information significantly change the timber supply situation for this TFL, I am prepared to revisit the AAC determination earlier than the five year review required by the *Forest Act*.

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

Larry Pedersen
Chief Forester
November 5, 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 devastations of, and major salvage programs planned for, timber on the area.

Appendix 2: BC *Ministry of Forests Act*, section 4

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: July 28, 1994 letter from Minister of Forests to the Chief Forester re: Economic and Social Objectives of the Crown.

Appendix 4: February 26, 1996 memorandum from the Minister of Forests to the Chief Forester re: The Crown's Economic and Social Objectives Regarding Visual Resources.