BRITISH COLUMBIA
MINISTRY OF FORESTS

Golden
Timber Supply Area

Rationale for
Allowable Annual Cut (AAC)
Determination

Effective June 1, 2004

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Chief Forester

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Golden timber supply area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the Golden Timber Supply Area

The Golden TSA is one of fifteen TSAs lying within the Southern Interior Forest Region in mid-eastern British Columbia. The TSA straddles the Rocky Mountain Trench and the upper Columbia River Valley northward to the Big Bend area near Mica Dam, and is bounded to the west by the Selkirk and Purcell Mountains and the Revelstoke TSA, to the north by the Robson Valley TSA, to the south by the Invermere TSA, and to the east by the Rocky Mountains and the province of Alberta. Five national parks—Yoho, Banff, Jasper, Kootenay and Glacier—and the Hamber provincial park, border the TSA, and the Cummins Provincial Park lies within its borders. Some of these parks contribute to the management of biodiversity in the TSA, and were included in the total area of 1 185 000 hectares known as the 'Golden analysis area' which coincides with the Golden Resource Management Zone of the Kootenay-Boundary Higher-Level Plan Order (the 'KBHLP Order'). The TSA covers a total area of 902 445 hectares and is administered from the Columbia Forest District office in Revelstoke and a satellite office in Golden.

Environment: A description of the environment of the TSA, including its tree species, biogeoclimatic zones, the vulnerable, endangered, threatened, and regionally significant species present in the area, as well as identified fish, birds and mammals in the Columbia Forest District, is given in the *Golden Timber Supply Area Analysis Report* ('the timber supply analysis report'). In brief, most of the TSA lies within the 'interior wet belt' of the province and the mountainous environment has a varied climate and growing conditions, resulting in diverse forests. In wetter parts of the TSA, lower elevations are mostly occupied with western redcedar, western hemlock and spruce species, with stands of spruce and subalpine fir occupying most of the higher elevations. Some southern portions of the TSA experience a drier climate, with Douglas-fir forests in valley bottoms and lodgepole pine at higher elevations. The diverse forest environments in the area provide habitats for a wide variety of wildlife species, including approximately 274 bird, 63 mammal, 9 amphibian and 8 reptile species. Some of the more well-known large mammal species include black bear, grizzly bear, moose, elk, mule deer, bighorn sheep, mountain goat and mountain caribou. Throughout the TSA, mountain peaks are covered by large areas of alpine tundra, rock and ice. Because of the rugged, mountainous landscape, a relatively small portion of the TSA consists of productive forest land suitable for harvesting timber.

Socio-economics: A description of the profile of the area, with which I am familiar, is provided in the timber supply analysis report. In brief, the TSA is sparsely populated, with 6455 residents in 2001, of which about 62 percent live in the town of Golden. The total population has grown by about 10 percent since 1996, largely in association with the

development of a ski resort near Golden. The Trans-Canada Highway and major railways pass through the south-central part of the TSA providing relatively easy access to an area of outstanding mountain scenery. Tourism, forestry and the public sector are the major local employment sectors, with forestry and related industry providing the highest contribution (27 percent) to basic income. Sixty to seventy percent of the timber harvested in the Golden TSA is processed within the TSA; most of the remainder is processed in the adjacent Revelstoke TSA.

First Nations: The Golden TSA is within the traditional territory of the Ktunaxa Nation and the Shuswap Nation. The Ktunaxa Kinbasket Tribal Council has submitted a comprehensive land claim that covers the southeast corner of the province and includes the Golden TSA. Currently, there are no First Nations reserves or communities within the Golden TSA.

History of the AAC

In 1981, the AAC for the Golden TSA was determined to be 650 000 cubic metres. Effective January 1, 1995, the AAC was reduced by 17 percent to 540 000 cubic metres. Effective January 1, 2000, the AAC was reduced by 10 000 cubic metres to 530 000 cubic metres, to account for issued woodlot licences. The harvestable volume for the area is currently apportioned as follows:

Apportionment	Cubic metres per year	Percentage
Replaceable Forest licences	426 542	80.5
BC Timber Sales	81 912	15.5
Forest Service Reserve	21 546	4.0
Total	**530 000**	**100.0**

New AAC determination

Effective June 1, 2004, the new AAC for the Golden TSA will be 485 000 cubic metres. This volume excludes all volumes allocated to woodlot licences. This AAC will remain in effect until a new AAC is determined, which must take place within five years of the present determination. (Please note the possibility of an earlier redetermination, discussed below in 'Reasons for Decision.').

Information sources used in the AAC determination

The information sources used in this determination include but are not limited to:

- *Golden Timber Supply Area (TSA) Data Package and Information Report*, British Columbia Forest Service (BCFS), May 2002;
- *Golden TSA Analysis Report(s)*, BCFS, August 1998 and August 2003;
- *Golden TSA Public Discussion Paper*, BCFS, August 2003;
- *Golden TSA Rationale for AAC determination effective January 1, 2000*, BCFS;
- *Kootenay-Boundary Higher Level Plan Order*, October 26, 2002;
- Columbia Forest District Forest Development Plan, Known Information Package, 2001-2005;

- Golden TSA Vegetation Resource Inventory (VRI), Ministry of Sustainable Resource Management (MSRM), December 2001;
- Documentation for Inventory Audit Restratified Analysis for the Golden TSA, April 2002;
- Hamber Provincial Park forest cover VRI, December 2001;
- Cummins Provincial Park forest cover VRI, December 2001;
- *Biogeoclimatic Ecosystem Classification*, BCFS Research Branch, update, 1999;
- Caribou habitat map (Higher Level Plan) MSRM, Nelson;
- Revised Caribou habitat map (based on work by Regional Caribou Committee) BCFS Research Branch, Revelstoke, December 2001;
- *Working Paper 36/1998, Site Index Adjustments for Old-Growth Stands based on Veteran Trees,* Nigh, G.D., BCFS Research Branch, 1998;
- *Working Paper 37/1998, Site Index Adjustments for Old-Growth Stands Based on Paired Plots*, Nussbaum, A.F., BCFS Research Branch, 1998;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province;
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources;
- Letter from the Deputy Ministers of Forests and (then) Environment, Lands and Parks, (MELP) dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts on timber supply from biodiversity management;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, April 1995;
- *Forest Practices Code of British Columbia* Guidebooks, BCFS and MELP;
- *Biodiversity Guidebook*, Province of British Columbia (BC), September 1995;
- *Landscape Unit Planning Guide*, Province of BC, 1999;
- *Riparian Management Area Guidebook*, Province of BC, December 1995;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Revelstoke, December 11, 2003.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester, in determining AACs, to consider biophysical, social and economic information. Most of the technical information used in determinations is in the form of a timber supply analysis and its inputs of inventory and growth and yield data. These are concerned primarily with biophysical factors—such as the rate of timber growth and the definition of the land base considered available for timber harvesting—and with management practices.

The computerised analytical models currently used to assess timber supply unavoidably simplify the real world and also involve uncertainty in many of the inputs, due in part to variations in physical, biological and social conditions. While ongoing science-based

improvements in the understanding of ecological dynamics will help reduce some of these uncertainties, technical information and analytical methods alone cannot incorporate all the social, cultural and economic factors relevant to forest management decisions, nor do they necessarily provide complete answers or solutions to the forest management problems addressed in AAC determinations. However, they do provide valuable insight into potential outcomes of different resource-use assumptions and actions—important components of the information that must be considered in AAC determinations.

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

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider a number of specified factors in determining AACs for timber supply areas and tree farm licences. Section 8 is reproduced in full as Appendix 1 of this document.

Guiding principles for AAC determinations

Rapid changes in social values and in the understanding and management of complex forest ecosystems mean there is always uncertainty in the information used in AAC determinations. In making the large number of periodic determinations required for British Columbia's many forest management units, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. In any specific circumstance where I may consider it necessary to deviate from these principles, I will explain my reasoning in detail.

Two important ways of dealing with uncertainty are

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

(ii) redetermining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine these AACs every five years. This principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester 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 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 with respect 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 Code'—which is now in transition to the Province's *Forest and Range Practices Act*.

In many areas the timber supply implications of some legislative provisions, such as those for landscape-level biodiversity, remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

As British Columbia progresses toward the completion of strategic land-use plans, in some cases the eventual timber supply impacts associated with land-use decisions resulting from various regional and sub-regional planning processes remain subject to some uncertainty before formal approval by government. In determining AACs it has been and remains my practice not to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government.

In some cases, even when government has made a formal land-use decision, it is not necessarily possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring for instance the establishment of resource management zones and resource management objectives and strategies for those zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. In such cases the legislated requirement for frequent AAC reviews will ensure that future determinations address ongoing plan-implementation decisions. Wherever specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting biodiversity objectives.

In the Golden TSA, much clarification of land and resource use has been provided by government's KBHLP Order, which guides many aspects of current management as addressed in my considerations in many sections of this document.

Where appropriate, I will consider information on the types and extent of planned and implemented intensive silviculture practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of their timber supply effects.

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

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest 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 decisions in recent years in the Supreme Court of Canada. The AAC that I determine should not be construed as limiting the Crown's obligations under these decisions in any way, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Golden TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

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 Code and under the *Forest and Range Practices Act*.

Because the new regulations of the *Forest and Range Practices Act* are designed to maintain the integrity of British Columbia's forest stewardship under responsible forest practices, it is not expected that the implementation of the legislative changes will significantly affect current timber supply projections made using the Code as a basis for definition of current practice.

The role of the base case

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

For each AAC determination for a TSA a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model (FSSIM version 4.1 for the Golden TSA), a series of timber supply forecasts is produced, reflecting different decline rates, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen in which an attempt is made to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of

timber supply, whose 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 any adjustments to its predictions of timber supply must be made, if necessary, to more properly reflect the current situation.

Such adjustments are made on the basis of informed judgement, using current available information about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, or during the implementation of new policies, procedures, guidelines or plans. Thus it is important to remember that while the timber supply analysis with which I am provided is integral to the considerations leading to the AAC determination, the AAC is not determined by calculation but by a synthesis of judgement and analysis in which numerous risks and uncertainties must be weighed. Depending upon the outcome of these considerations, the resulting AAC may or may not coincide with the base case forecast. Moreover, because some of the risks and uncertainties considered are qualitative in nature, once an AAC has been determined, further computer analysis of the combined considerations may not confirm or add precision to the AAC.

Base case for the Golden TSA

The base case in the current timber supply analysis incorporates a number of changes in input data and methodology from the base case generated for the AAC determination effective January 1, 2000. These differences include:

- the use of new forest cover typing in the Golden Vegetation Resource Inventory, which affects the definitions of the Crown Forest land base, problem forest types and site classifications, and also indicates an increase in the estimates of timber volumes in existing forest stands;
- the use of Biogeoclimatic Ecosystem Mapping updated to 1999;
- a reduction in the area that is considered to be operable;
- differences in the order of deductions made in assessing the timber harvesting land base;
- a 7.6-percent reduction in the derived timber harvesting land base;
- the coming into effect of the KBHLP Order, under which targets for mature and old seral stage forest cover are applied only to areas with a high biodiversity emphasis;
- the modelling of biodiversity emphasis objectives by landscape unit rather than the previous averaging across all landscape units;
- the incorporation in the (TIPSY) growth curves of volume increases attributable to the use of Class A genetically selected seed;
- representation in the analysis model of the partial cutting silviculture regime used for ‘beetle-proofing’ pine stands;

- the use of different methods or criteria for defining problem forest types, environmentally sensitive areas; sites with low productivity, and the area or productivity lost to roads, trails and landings.

Due to these changes, the current and previous base case projections are not directly comparable in some respects. Comprehensive details of the assumptions made in representing current forest management in the Golden TSA in the 2003 base case are provided in Appendix A of the timber supply analysis report and many are referred to in relevant sections of this rationale.

In the 2003 base case projection, the current AAC was maintained for as long as possible consistent with a gradual, controlled decline in harvest levels during the transition from harvesting in existing old stands to harvesting in managed second growth. Short-term harvest levels were not permitted to cause abrupt disruptions in the medium- or long-term supply, and the long-term level was set at the highest possible level sustainable over the long-term, as signified by a stable long-term growing stock.

The resulting projection shows a harvest forecast maintained at the current AAC of 530 000 cubic metres per year for the first decade, followed by a decline of 10 percent. Ten years later, a second decline occurs as the harvest falls by 7.8 percent to stabilize at 440 000 cubic metres per year for nine decades. After the eleventh decade, the harvest forecast rises to the long-term level of 463 000 cubic metres per year, 12.6 percent lower than the current AAC. This long-term level is projected to remain stable and I note that it also exceeds the actual volumes harvested annually in the TSA each year from 1998 to the present.

My examination of the base case forecast and associated inputs and assumptions included reviews of the following: a map of the landscape units analysed; details of the composition of the total Crown forested land base of the TSA and associated parks, and of the land base; the objectives for biodiversity, wildlife, domestic watershed and visual management, base case projections from the 1981, 1993, and 1998 timber supply analyses; the projected schedule of contributions from existing and regenerated managed stands; the average ages of the stands projected to be harvested during the forecast period; the growing stock supporting the harvest projection; the dominant tree species and age classifications on the timber harvesting land base and the age class distribution on the Crown forest land base; and the projected average area harvested annually and the volume so yielded over time.

From my review I see no reason why the base case forecast should not provide a suitable basis of reference for use in my considerations in this determination. Moreover, I note that, from the relatively even distribution of the area projected to be harvested annually over the forecast period, this TSA could be considered for future regulation of the allowable harvest by *area*, rather than by *volume*. This form of administration lends itself readily to assessment of the sustainability of both the timber harvest and the range of other values requiring careful management in the TSA. I have noted below, in 'Implementation,' that if the District Manager and licensees are willing to consider this in the future, then with enabling legislation it could be beneficial to confirming and

demonstrating the sustainability of British Columbia's forest management to include the Golden TSA among the management units considered for area-based harvest regulation.

In addition to the base case forecast, I was provided with a number of sensitivity analyses and projections of alternative harvest flows carried out using the base case as a reference. All of these analyses, and others as noted below, have been helpful in the considerations and reasoning leading to my determination, which are documented as follows.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

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

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area

Land base contributing to timber harvest

- general comments

The total area of the Golden TSA, estimated from data files in 2002 by the BCFS, is 902 445 hectares. About 61 percent of this total land base is either not-treed, is sparsely treed, or is not managed by the Province of BC. The remaining 39 percent is productive Crown forest land and of this, over half, about 56 percent, is unavailable for harvesting, the main reasons for which include being either physically or economically inoperable, being held in riparian areas or in wildlife tree patches for stand-level biodiversity, or being considered 'problem forest' types. The current area estimated to be economically and environmentally suitable for harvesting—the 'timber harvesting land base'—covers 153 870 hectares or 17 percent of the total TSA land base. This area is 7.6 percent smaller than in the previous timber supply analysis, primarily due to a re-evaluation of the inoperable area in the TSA.

Deriving the timber harvesting land base includes making a series of deductions from the productive forest land base to account for factors that effectively reduce the suitability or availability of the productive forest area for economic or ecological reasons. In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors, prior to quantifying appropriate areas to be deducted from the productive forest area to derive the timber harvesting land base. A detailed accounting of the areas deducted is given in the timber supply analysis report, and is summarized in Table 3 of that report. My consideration of these deductions follows next.

- inoperable areas

Those portions of the TSA which are not physically accessible for harvesting, or which are not feasible to harvest economically, are excluded in deriving the timber harvesting land base. In the analysis, a total of 164 952 hectares were removed as inoperable.

In my rationale for the previous AAC determination, I noted the need for a comprehensive review of operability in cooperation with licensees. In 2002, a new operability line was developed by a local forester using a combination of his extensive knowledge both of the area and of past licensee performance, with photos and map reviews. The new operability line was based on current harvesting systems and accounted for the feasibility of developing roads to timber of appropriate quality and quantity, as well as for potential difficulties with regeneration. The process excluded larger areas of marginally economic and uneconomic stands than in the previous determination, leading to the already noted smaller timber harvesting land base.

These operability revisions were also examined by licensees in office-based and aerial reviews, with general agreement except for the inclusion in the timber harvesting land base of 4586 hectares of the 'Sullivan' landscape unit (LU G7) in the north-central part of the TSA. This landscape unit covers 64 023 hectares, of which 14169 are considered Crown forest, and 49 855 are non-productive forest and non-forested land. A major licensee with significant operating experience in the area considered that this area, comprising about 3 percent of the timber harvesting land base, should be excluded as inoperable because it is a very remote area of the TSA with difficult terrain and problem forest types. The licensee recommended that if the area in G7 is to be included, the associated allowable harvest should be specified as attributable to that area only.

The licensee also recommended that separate sustainable allowable harvest levels should be specified for the northern and southern landscape units. This would reflect the different transportation systems whereby timber from northern parts of the TSA flows to Revelstoke and that from southern parts flows to Golden. (However, landscape units G8, G9, G10 and G29 would now be included as southern units, rather than northern as had been agreed in the original data package, a revision also suggested by another licensee.)

BCFS District staff report acceptable harvesting performance in both northern and southern units based on this new definition, but note an ongoing lack of performance in the Sullivan landscape unit. This area has been harvested since the flooding of the Columbia River Valley, and roads—except for bridges—are in place, but the remaining timber is not considered as economically operable due to high operating costs. The 'first pass' of harvesting in this unit accessed good quality timber and has been completed. BCFS staff consider that these harvested areas, when regenerated and mature, should contribute again to the timber supply in the longer term. However, staff agree that the remaining unharvested timber in the area is primarily of a lower quality and in view of the high development costs is probably too uneconomic to consider realistically for harvesting in the shorter term.

From my discussions with BCFS staff regarding the completed harvesting of good timber in the G7 area, and its subsequent successful regeneration, I consider it inappropriate to assume that no portion of this landscape unit will ever again contribute to the harvest in the TSA. On the other hand, I am advised that in view of the lower quality of the remaining unharvested timber in the area, and the high operating costs of harvesting it, neither licensees nor BC Timber Sales anticipate economic operations in the area in the foreseeable future. It is reasonable to expect that harvesting will continue to be directed preferentially toward more economic parts of the TSA, leaving the remainder of the

G7 area undeveloped. When the already harvested, more productive areas have regenerated and matured to a harvestable age at some point in the future, then operations may well resume in the G7 area.

In the base case forecast, a full contribution to the timber supply was assumed from the G7 area. If the corresponding projected harvest levels must now, instead, be realised without this full contribution, this could lead eventually to harvesting pressures in other parts of the TSA—particularly in the south—that could become unmanageable in context of the range of objectives addressed in the land-use plan. If only those areas in G7 are assumed to contribute to the timber supply which are identified as already harvested (defined in the analysis as having volumes now projected by 'TIPSY' growth curves for managed stands) the timber harvesting land base is overestimated by 2816 hectares. I will address this together with the following problem.

BCFS District staff are also concerned that all areas in forest development plans were included in the timber harvesting lands base, even if they were in areas now assessed as inoperable in the new review. BCFS staff and licensees agree from a review of development plans that an estimated 50 percent of the area and volume of timber proposed to be harvested from planned areas that are now identified as inoperable should not contribute to the short-term supply. Considered separately, this indicates an overestimation of about 1117 hectares or 1.9 percent in the timber harvesting land base.

I will address the combined impact of these two overestimations as follows. A sensitivity analysis which examined the consequences of removing landscape units G7 and G12—amounting to about 3.5 percent of the timber harvesting land base—showed that the initial short-term harvest level could still be maintained if a lower mid-term level were acceptable. However, it is likely that this mid-term impact could be avoided if a short-term reduction of a certain magnitude were undertaken.

The total area requiring to be accounted for with respect to development plans and the G7 landscape unit amounts to approximately 3933 hectares or 2.6 percent of the timber harvesting land base, although the figures are clearly subject to some uncertainty; for instance, my decision to remove the contribution from the unharvested portion of G7 is not a land-use decision and does not preclude operations from taking place there in case of a significant change in the economics of operations in that area. For the purpose of this determination, I consider it reasonable to conclude that the timber harvesting land base has been overestimated with respect to these two operability factors, by a rough figure of 2.6 percent. I have considered the implications of this together with other findings from my considerations as discussed in 'Reasons for Decision.'

With respect to the two suggestions for partitioned cuts, first, I see no additional benefit to be gained from establishing a cut level attributable to the relatively small unharvested area in the G7 unit; the potential problem of creating undue harvesting pressures elsewhere in the TSA will already be precluded if the overly optimistic contribution to timber supply is entirely removed. With no expression of interest, and no likelihood of an economic harvest in the G7 area, a partition is unlikely to increase or to facilitate activity there; in any case there is no constraint against commencing harvesting activity in the area if a licensee should so wish.

Secondly, with respect to establishing separate cut levels for the northern and southern portions of the TSA, I am advised by the District Manager that the licensees are ably managing their respective operations in the two distinct areas with their different species profiles and separate product destinations, that operations are unlikely to need to move from north to south or vice versa to maintain even flow harvest levels, and that the timber sales program provides good geographic flexibility in this respect if required. I therefore see no reason to establish specific harvest levels attributable to particular areas in this TSA on either of these accounts at this time.

- *environmentally sensitive areas*

Table A-10 of the timber supply analysis report shows that in deriving the timber harvesting land base for the TSA, a total area of 6238 hectares of the productive forest was excluded to account for environmentally sensitive areas (ESAs). This comprised 6166 hectares for highly sensitive soils (from a 90-percent exclusion of a larger area), 15 hectares for high snow avalanche hazard (100-pecent excluded) and 57 hectares for moderately sensitive soils (which were 10-percent excluded). These figures were taken from forest cover (FC1) files.

The Ministry of Sustainable Resource Management has recommended the integration of terrain stability information with the Vegetation Resources Inventory; this would permit a rigorous (though laborious) data-driven assessment of sensitive areas. District staff note that terrain stability level 'D' mapping (covering 80 to 90 percent of the TSA) was examined but that this overview mapping does not allow for definition of exact areas for exclusion. Staff also note that while unstable areas identified through level 'A' stability assessments are not captured digitally in the inventory, these areas are nonetheless often located—and thus excluded from harvesting—with wildlife trees or other reserves.

A helpful approach in reconciling data would be to examine current trends across map sheets, for comparison with former ESA assessments, with the degree of variation indicating whether more detailed work is needed. For this determination, acknowledging the uncertainties in both present and former methods, I accept the current assessment as the best available information for use in the analysis and in this determination. I will ask staff in both of the agencies to continue to assess whether more accurate of efficient means of estimating this constraint can be agreed upon and used in the next determination for this TSA.

- *sites with low timber productivity*

In the timber supply analysis, 2733 hectares were deducted to account for areas having low timber productivity. Sites were excluded where trees could not achieve an average diameter at breast height of 25 centimetres between 150 and 200 years of age. The cut-off site index averaged about 9 metres at 50 years for all species, which I consider more appropriate than the 4-to-5-metre cut-off used for spruce and balsam in the previous determination.

A detailed review would doubtless identify some areas that are considered to be of low productivity that may nonetheless be economic to harvest, particularly in conjunction

with adjacent more economic stands, and yet other areas of higher productivity that may, on their own, be uneconomic. In my experience, any such over- or underestimations are likely to balance out over the TSA, and I therefore accept the deduction as made with no need to question the reliability of the timber supply projection on this account.

- problem forest types

Problem forest types are non-merchantable stands that are physically operable and exceed the criteria for low-productivity sites, yet are not currently utilized and consequently are excluded from the timber harvesting land base. Examples include hemlock stands with a high proportion of decadent and hence unmerchantable trees; in the previous determination, hemlock stands older than 140 years with a hemlock component greater than 80 percent were excluded. In the current analysis, these stands were excluded where the hemlock component was either greater than or equal to 80 percent, resulting in a larger exclusion. Deciduous stands 25 years and younger were assumed to have coniferous understories and were included. Details of all the inventory type groups, species and ages excluded, amounting to 6828 hectares, are provided in Table A.3.6 of the timber supply analysis report.

One licensee noted in public input and in discussion with BCFS staff that a different utilization of hemlock should be assumed for the G7 landscape unit; however, this issue becomes moot with the removal of that area's presently unharvested stands as discussed above in '*inoperable areas*'.

In my experience many of the old hemlock stands have insufficient potential even for wood pulp in any but the very best of pulp markets. While it is difficult to evaluate the exact exclusion criteria to apply over the business cycle, there appears to be good correlation in what was excluded in the analysis with what licensees are proposing to harvest—a review of forest development plans in the TSA identified only minuscule areas of problem forest types proposed for harvesting. Sensitivity analysis shows that if all stands with more than 50 percent hemlock were excluded, the short-term harvest level could still be maintained if reductions of 2.5 percent in the mid term, and 1.7 percent in the long term, were allowed.

Under these circumstances I accept that the deductions for problem forest types as applied in the base case are a reasonable representation of current practice and that, without a high sensitivity to more constraining merchantability assumptions, they are suitable for use in this determination.

- roads, trails and landings

In the timber supply analysis, separate estimates were made, by methodologies explained in the report, to reflect the losses to productive forest already incurred by existing roads trails and landings, and those to be expected in the future. The resulting deductions from the timber harvesting land base were 3057 hectares for existing roads and 6618 hectares for future roads.

BCFS staff noted that the BCFS Integrated Silviculture Information System (ISIS) indicates that over the past 5 years, 6.1 percent of each treatment area was lost to

permanent roads, a trend that is assumed to continue. Based on professional judgement, another 3-percent loss in productivity (applied to growth curves for analysis purposes) was assumed to account for landings, trails and deactivated roads, on and between cutblocks. In my discussions with BCFS staff it was agreed that uncertainties remain (a) in the extent to which the ISIS figure for permanent loss may already account in part for the 3-percent deduction, and (b) in the extent to which operational adjustment figures applied to the TIPSY growth curves may also partially account for productivity losses to landings and trails. Evaluating overlaps between the productivity loss on blocks due to permanent road structures and the losses from other temporary disturbances that affect productivity is difficult, particularly where repeated access may be required to areas for partial cutting.

For this determination, I accept that the methodology used is a product of reasonable judgement, but I also note the associated uncertainties, and recommend that—resources permitting—attempts be made to refine the approach to defining the various components of these losses for future determinations; I have noted this below, in 'Implementation.'

- *timber licence reversions*

Timber licences (TLs) are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area. Once these areas have been harvested, all future harvesting rights revert to the Crown and future harvests from the area will then contribute to the harvest for the TSA which contains the TL area.

Four TLs remain in the Golden TSA, all of which are scheduled to expire before 2008. In the analysis, areas under cutting permit or in Category A approval were assumed to be harvested, but not to contribute to the timber supply until regenerated. All TL areas were assumed to contribute, upon expiry, to the timber supply and to meeting forest cover objectives. I am satisfied that timber licence areas were adequately accounted for in the base case projection.

- *woodlot licences*

The *Forest Act* requires AACs determined for TSAs to be exclusive of the areas and timber volumes allocated to woodlot licences. When woodlot licences are issued from a TSA, the required volumes are first allocated from an appropriate apportionment under the AAC for the TSA. Then, in the next AAC determination for the TSA, the TSA land base is reduced by the area of Crown land in all the woodlot licences issued since the previous determination, and the total volume in the issued woodlot licences is excluded from contributing to the AAC for the TSA. Since the last AAC determination for the Golden TSA, effective January 1, 2000, no new woodlot licences or top-ups have been issued, although minor boundary changes have occurred.

After the timber supply analysis, however, it was noted that the total area coded for woodlots and removed from the Crown forested land base of the TSA in the analysis is approximately 1300 hectares greater than the area of issued woodlot licences shown in the data in the Forest Tenure Administration System (FTAS). District staff advise that all of the area so affected is operable and within the timber harvesting land base, with some

being subject to ungulate winter range constraints. In view of this I accept that for the base case projection the timber harvesting land base was reduced by too much in respect of woodlots, and must now be increased by approximately 90 percent (in view of the forest cover constraints) of the 1300 hectares; this adds a small but unaccounted contribution to the timber supply which I have taken into consideration in my determination as discussed in Reasons for Decision.

- *areas of archaeological importance*

BCFS staff note that flooding of the Columbia River Valley has undoubtedly resulted in the loss of some areas of archaeological importance. Archaeological overview assessments were completed in the Golden TSA in 1996, and led to archaeological impact assessments on some areas identified as of medium and high potential importance. Archaeological Impact Assessments are currently carried out based on reviews of forest development plans by First Nations or by a consulting archaeologist. To date, few sites have been found, very few plans have required adjustments to cutblocks or road layout, and only minor areas have been sufficiently important to require mitigation. Consequently, no specific provision was made on this account in developing the base projection, and I accept this as satisfactory for the purpose of this determination, recognizing that any emerging new information can be accounted for in future determinations as appropriate.

Existing forest inventory

- *current inventory*

The 2003 timber supply analysis was completed with the use of Phase 1 of the new Vegetation Resources Inventory (VRI-January 2001), with photo interpretation based on photos from 1996-97. (Phase 2 sampling is now underway with Forest Investment Account funding.) Development plans were used to update the inventory to 2001 for disturbances after 1996-97, and the database was projected for growth and ageing to January 2003. The information for the Hamber and Cummins provincial parks was based on the same VRI, and that for the national park forest cover inventory was based on a 1956 FC1 inventory projected to 1996.

- *age-class distribution*

The current distribution of tree ages in the timber harvesting land base includes 30 percent of the area in stands over 140 years of age, primarily of spruce, cedar and hemlock (of which about 40 percent are over 250 years). Just less than half—47 percent—of all stands on the timber harvesting land base are at or above their minimum harvestable age, and a further 20 percent is aged 61 to 100 years and will reach minimum harvestable age within the next 20 years. Eighteen percent of the harvesting land base area is in stands less than 20 years of age and 16 percent is covered by stands aged 21 to 40 years. Although there is only a small area (3 percent) of trees aged 41 to 60 years, I am advised this is not a limiting factor on timber supply in the TSA.

I have also reviewed the age distribution in the Crown forest cover for the whole Golden Analysis Area—the Golden Resource Management Zone of the KBHLP Order. This area shows a proportionally greater coverage (44 percent) of trees aged over 140 years, contributing to the reason why most of the old and mature-plus-old biodiversity requirements in the TSA can be met by stands outside the timber harvesting land base.

- species profile

The forest inventory shows that the timber harvesting land base consists mainly of stands comprised primarily of spruce (about 35 percent of the land base by area), Douglas-fir (about 23 percent), lodgepole pine (17 percent), western redcedar (9 percent) and western hemlock (about 8 percent). The analysis has accounted for these harvestable species.

- volume estimates for existing stands

In the BCFS analysis, estimates of timber volumes in existing natural stands were projected using the new VRI Phase 1 inventory attributes and the Variable Density Yield Prediction (VDYP) model version 6.6.D.

As noted earlier, VRI Phase 2 ground sampling is underway in the TSA but is not yet complete. As an interim measure, in 2002 the data from the 1994 inventory audit were re-stratified, based on the polygons of the new VRI, and the ground data from the audit were then compared to the new VRI data.

This 2002 recompilation of the 1994 audit ground sample examined volumes for various land bases, utilization levels and volume loss factors. The results indicated that when the VRI Phase 1 attributes were used in VDYP (as was the case in the timber supply analysis), the resulting volume estimates were on average from 4 to 10 percent higher than the volumes found on the ground. That is, the recompilation suggests that the volumes used in the analysis may overestimate the actual volumes by from 4 to 10 percent. I am further advised that, based on a qualitative assessment as to the most relevant information for the volume comparison, respecting the different land bases, loss factors and utilization levels, the recompilation appears to place the overestimate in the lower end of the 4-to-10-percent percent range—at roughly 5 or 6 percent.

A finding of this kind would be consistent with ongoing observations by licensees that for many years they have not found on the ground the volumes indicated in the inventory files. In public input, a major licensee noted concern that the volumes for existing stands are overestimated and that the current AAC must therefore decline sooner than projected. However, in the present determination I do not consider it reasonable to place significant weight on anecdotal evidence of a historical concern particularly as the VRI is a new inventory to which only a short history of operational experience has yet been applied**.**

A sensitivity analysis shows that if the volume estimates for existing stands are decreased by 10 percent, the projected initial harvest level drops immediately from 530 000 cubic metres to 419 000 cubic metres per year, a reduction of 20 percent, from which it does not rise again for 13 decades. This new initial level is lower—and remains so for a decade longer—than the mid-term level projected in the base case forecast. Clearly the

possibility of an overestimation of this magnitude in the volume estimates for existing stands would have serious implications for the near-term timber supply.

I have discussed this potentially very significant issue at length with BCFS staff, to gain both a sense of the appropriate degree of confidence to place in the findings and a measure of the caution that should properly be applied in assessing the validity of such a consequential revision to the projected timber supply. I have concluded as follows.

Theoretically, comparing randomly located audit ground sample plots with the VRI inventory should permit a valid statistical assessment of the VRI inventory attributes. However, any such result must be viewed with caution as the intent of the recompilation was to provide only a generalised indication of the reliability of the volume estimates, the methods and procedures used in establishing the audit plots having been less rigorous than those in the current provincial Phase 2 ground sampling procedures. Moreover, when the 1994 samples were stratified, only 35 were in the timber harvesting land base when typically a target of 50 samples is preferred to provide the desired level of confidence. In addition, the original samples were placed in polygons defined by an old inventory. When these audit plots were linked to the new inventory, the fit with the larger number of newly defined polygons introduced data compilation difficulties and potential errors. Also, the standard errors of the estimates are 13.8 percent in the pine data, and 13.5 percent in the data for other species. These error levels introduce uncertainty as to whether the results of the recompilation provide a statistically valid quantification of the differences in mean volumes.

For all of these reasons I must be very cautious before concluding that the volumes at the harvestable profiles in the VRI are overestimated by as much as 10 percent, the maximum overestimate indicated in the audit recompilation. Nonetheless, while the findings are not statistically rigorous, the audit re-compilation does suggest a difference between the VRI Phase 1 inventory and ground measurements, such that that the VRI Phase 1 more likely overestimates than underestimates existing timber volumes.

The sensitivity analysis noted above showed that the potential consequence of an overestimation at the higher end of the indicated range is very significant for the short-term timber supply. In this situation it would be imprudent to dismiss entirely the indicated possibility of an overestimation of up to 10 percent in the volumes projected for existing stands. On the other hand, without further sampling it would also be inappropriate to assume the opposite extreme, that is, that the volumes are in fact overestimated to the maximum value of 10 percent. Rather, acknowledging the uncertainty in the information, it would be more reasonable to accept that there are indications of a possible overestimation, albeit of presently unknown magnitude and consequence, and to account for the associated risk to the timber supply to the extent of a median value in the indicated range of possible overestimation in the volumes, that is, at about a five-percent overestimation, consistent with the value suggested by using the ‘most relevant information’ as noted above.

The sensitivity of the timber supply to even a five-percent overestimation in existing volumes is very high when taken in combination with other factors, as I have discussed in ‘Reasons for Decision,’ with reference to further sensitivity analysis. There I have also

discussed how I have taken this risk into consideration in my determination in combination with other factors. The completion of Phase 2 of the VRI will be very important in helping to resolve the ongoing uncertainty in existing volumes in this TSA.

Expected rate of growth

- site productivity estimates

Inventory data include estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, forest stands between 30 and 150 years of age provide the most accurate measurement of site productivity. Site indices determined from younger stands (i.e., less than 31 years old), and older stands (i.e., over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where old-growth site index (OGSI) studies suggest that actual site indices may be higher than those indicated by existing data from mature forests.

In the 2003 timber supply analysis for the Golden TSA, site productivity estimates were based on the VRI; no OGSI adjustments were applied in the base case. Sensitivity analyses were carried out to show the effects of applying the results of the 'paired-plot' and 'veteran' studies as appropriate to stands older than 140 years. Managed stand volume estimates were recalculated for affected analysis units based on average site productivity; green-up and minimum harvestable ages were also recalculated. This resulted in a projected 2.9-percent increase in the mid-term harvest level, and a 9-percent increase in the long-term level. A second analysis was performed applying just the results of the paired-plot study for pine and spruce. This produced a 2.3-percent increase in the mid term, and a 5.2-percent increase in the long term.

As I have noted in rationale statements for many AAC determinations, in recent years it has been concluded consistently from studies such as the OGSI project that site productivities in British Columbia have generally been underestimated; managed forest stands tend to grow faster than projected by inventory site index estimates. In the present case the OGSI results applied in the sensitivity study were from plots outside the Golden TSA, but in my experience the observed provincial trend is particularly likely to be applicable in a productive TSA such as the Golden.

Given the prevalence of the trend, I am prepared to accept that carrying forward the site indices from old stands into regenerated, managed stands has most probably led to

underestimation in the site productivities in the TSA, and consequently in the mid- and long-term harvest levels, although the use of provincial rather than local data precludes certainty in projecting appropriate adjustments. For this determination, I will accept that the mid- and long-term harvest levels are most probably underestimated in the base case forecast, by up to a maximum of 9 percent in the long term, as discussed further in 'Reasons for Decision.' I encourage the initiation of local field studies to refine estimates of site indices specific to the TSA for direct application in future timber supply analyses.

- *volume estimates for regenerated stands*

In the analysis, the standard Table Interpolation Program for Stand Yields (TIPSY) was used to estimate the timber volumes for all future regenerated stands and for all regenerated, managed, conifer stands under 25 years of age. Volume predictions using 'TIPSY are based on the management of stocking density, full site occupancy and the absence of significant brush competition. The TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition. However, certain operational conditions, such as a less-than-ideal distribution of trees, the presence of small non-productive areas, endemic pests and diseases, or age-dependent factors such as decay, waste and breakage, may cause yields to be reduced over time. Two operational adjustment factors (OAFs) are therefore applied to yields generated using TIPSY, to account for losses of timber volume resulting from these operational conditions. OAF 1 is designed to account for factors affecting the yield curve across all ages, such as small stand openings, and OAF 2, for factors whose impacts tend to increase over time and whose influence on a stand may be reduced through management practices—such as decay, waste and breakage. In the Golden TSA analysis, the standard provincial modelling reductions of 15 percent for OAF1 and 5 percent for OAF2 were applied, although the appropriateness of applying these reductions in the TSA has not been tested.

District staff noted in both the previous and present determinations that root disease is a concern in the TSA, and that it is difficult to determine if the provincial OAF reductions are adequate for the TSA. Licensees have also expressed uncertainty in this respect, and both BCFS staff and licensees agree that the OAF adjustments may not fully account for the root disease problem. In this case, potential losses in managed stands may have been underestimated in the analysis, although I have no direct evidence indicating the need for an adjustment of a specific magnitude. Sensitivity analysis showed that when managed stand yields were reduced by 10 percent, the initial harvest level could still be maintained, but the mid- and long-term levels were notably reduced. From this, while I am satisfied that with respect to regenerated volumes the initial harvest level in the base case is a suitable basis for my considerations, in my determination, as noted in 'Reasons for Decision,' I have recognized the possibility of some decline in fir stands over time as a potential unquantified overestimation in the mid- and long-term timber supply.

- *genetic worth*

In the timber supply analysis, the volume gains to be expected at or near harvest age from the use of Class A selected seed were accounted for by modifying the TIPSY growth

curves for all stands regenerating to spruce and currently less than 25 years old. However, Class A spruce seed has been introduced only during the past five years. The application of the volume gains to stands planted before this introduction, i.e., without Class A seed, constitutes an overestimation in the projected volumes for those stands, which amount to 17 percent of the timber harvesting land base. On the other hand, this overestimation may be offset by the introduction of greater amounts of select orchard seed in future years. The sensitivity analysis showed that the short-term level can still be maintained with as much as a 10-percent reduction in volume yields for managed stands, although mid- and longer-term levels were affected. Since the timber supply analysis showed no short-term sensitivity to changing green-up periods by five years, and little sensitivity in the mid term, I am satisfied that this matter affects the longer term only, and for the purpose of this determination I have taken note of a small, unquantified overestimation in the long-term harvest level, as discussed in 'Reasons for Decision.'

- *minimum harvestable ages*

A minimum harvestable age is an estimate of the earliest age at which a forest stand has grown to a harvestable condition. The minimum harvestable age assumption mainly affects when second growth stands will be available for harvest. This in turn affects how quickly existing stands may be harvested such that a stable flow of timber harvest may be maintained. In practice, many forest stands will be harvested at much older ages than the minimum harvestable age, due to economic considerations and constraints on harvesting that arise from managing for such values as visual quality, wildlife and water quality.

In response to uncertainties in the previous determination, BCFS district staff reviewed the criteria for minimum harvestable ages, and report that the volumes and diameters remain suitable for projecting timber supply in the TSA. The criteria used were the years required (a) to reach a minimum volume per hectare (at least 200 cubic metres/hectare for predominately cedar and hemlock stands and at least 150 cubic metres/hectare for other species groups) (b) to reach a minimum 25-centimetre diameter at breast height, and (c) to reach 95 percent of the culmination age (a slight change from the 90 percent used in the previous analysis). The actual ages used in the timber supply analysis for both existing natural stands and regenerated managed stands are provided in Appendix A of the timber supply analysis report, and range from 60 to 150 years for unmanaged stands and 60 to 135 years for managed stands.

Sensitivity analysis shows that if all minimum harvestable ages are decreased by 10 years the harvest level increases by 3.2 percent after two decades but the long-term level decreases by 1.9 percent. Conversely, if the minimum ages are increased by 10 years, the initial harvest level decreases by 7.5 percent, the mid-term level decreases by 2.5 percent, and rise to the long-term level is delayed by 3 decades. Thus the timber supply in this TSA is fairly sensitive to such changes.

In view of the many associated variables, it is often difficult to assess future minimum harvestable ages with precision. However, I am satisfied that staff have carefully reviewed the procedures for establishing the criteria used for the species, growing sites and market conditions in the TSA, and, in the absence of conflicting information, I accept

the minimum harvestable ages used in the analysis as a reasonable reflection of current practice.

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

Regeneration delay and impediments to prompt regeneration

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the timber supply analysis, based on a review of data from the Integrated Silviculture Information System (ISIS), a regeneration delay of two years was assumed for all forest stands. District BCFS staff advise that major licensees are generally planting promptly after harvesting, with regeneration delays of less than two years in some cases, while in a few limited areas planting may be delayed until all logging is complete. From this I am satisfied that, on average, the 2-year delay assumed in the analysis adequately reflects current practice. Staff also report that while regeneration is sometimes impeded in a limited way by voles and browsing ungulates, there are no significant impediments to successful regeneration in the TSA.

Not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are those where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Areas where the standard regeneration delay has not yet elapsed since harvesting are considered 'current' NSR and fluctuate with the amount of logging currently taking place. Where a site was harvested prior to 1987 and a suitable stand has not yet been regenerated, a classification of 'backlog' NSR is applied.

In projecting the base case timber supply forecast, a figure of 3763 hectares of backlog NSR was applied, using ISIS data. The ISIS data has since been reconciled with the vegetation resources inventory, and much of what was formerly thought to be backlog NSR in stands of predominantly montane spruce and spruce, is now officially classified as satisfactorily restocked. Following other small adjustments to account for fires and for areas that may not be salvage harvested, the VRI shows that overall, 1400 hectares of the timber harvesting land base are better stocked, more productive, and subject to shorter regeneration delays than assumed in the base case forecast. The VRI has verified that the affected areas do support established stands that will be available sooner than projected, resulting in a slight increase in the timber supply projected for the mid term to long term, and I have recognized this in my 'Reasons for Decision.' I also note that some areas in the TSA, that have been recently disturbed by fire but carry no obligation for regeneration, do nonetheless provide an opportunity for regeneration which, if carried out, could add a further slight increase in the mid-term timber supply.

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

Silvicultural systems

For the previous timber supply analysis, district staff estimated that partial cutting systems were used on approximately 10 percent of the area harvested in the TSA. The ISIS data now indicate that, for the past five years, although the majority of the area has still been harvested by clearcutting systems, including clearcutting with wildlife tree reserves, about 44 percent of the total area harvested in the TSA has been by alternative or partial cutting systems. District staff consider that this figure may be underestimated to some extent due to the difficulty of accessing complete information for partially cutblocks for the whole TSA.

The partial cutting occurs mostly on about 17 000 hectares of the southern portion of the TSA and is generally intended for 'beetle-proofing' forest stands and for meeting visual quality objectives. (In certain situations volume losses caused by a beetle infestation may be reduced if a stand is partially cut according to a 'beetle proofing' regime.) Partial cutting also allows for some harvesting (if less than 30 percent of the basal area is removed) in areas where seral stage targets for mature forest cover are in deficit.

To represent the partial cutting regime in the analysis, it was assumed that, for the first 20 years, approximately 35 percent of the total area harvested will be by partial cutting, with 50 percent of the volume in each partially-cut stand being removed in the first cut. The remaining 50 percent of the volume in the stand was assumed to grow as represented by VDYP growth curves for unmanaged stands, and was assumed to be harvested twenty or more years later by a clearcut. Any regeneration on the site at the time of this second harvest was projected to be of an average age of five years, and this regenerated growth was expected to continue on and be managed for eventual harvest by clearcut. It was assumed that after the first 20 years few stands identified for partial cutting would remain, and the area harvested by partial cuts would decline, eventually to zero.

Subsequent to the analysis, a number of points were discussed in consideration of possible revisions to these assumptions.

- A licensee suggested that about 30 percent of the areas currently being partially cut could be assumed to go into a continuous regime of clearcutting and partial cutting, rather than just clearcuts. District staff see the future of the partially cut stands beyond 20 years as somewhat uncertain, since some may not be harvested again if further damage from beetles occurs in combination with adverse economic conditions, and some of the stands may be harvested by clearcutting with larger reserves.
- While fir stands may continue to add volume in the 20 years after the partial cut, some mature pine types may not do so.
- The age of the regeneration at the time of the first clearcut after the partial cut could more reasonably be assumed to be zero, or, with a regular regeneration delay even 'minus two' years, rather than the five years modelled, since the very young regenerating trees would not be protected during the harvesting.

- While the analysis model allowed partially cut stands to contribute to old and mature forest cover targets, a 50-percent removal would exceed the 30-percent removal contemplated in the biodiversity guidebook; studies are therefore needed to establish prescriptions that allow partial cutting systems that adequately address biodiversity objectives respecting old and old-plus-mature forest cover.

With respect to the representation of partial cutting in the analysis generally, I believe that in the absence of a complex stand model for partial cutting, the analyst was correct in attempting to model the stands so treated differently from the modelling for clear-cut stands. In so doing, a reasonable constraint was applied in the analysis that corresponds to where it is being applied operationally; this process has provided a helpful approximation in projecting the timber supply, despite several unavoidable uncertainties.

Some of these uncertainties may significantly affect the appropriateness of the way the timber supply was projected in response to the use of this silvicultural system. For instance, the adequacy of the modelling in describing forest management as practiced operationally through partial cutting cannot be assessed conclusively without knowing the specific objectives for which the residual stands are being managed. I am advised that in some cases, while second-entry stands may have theoretical harvesting priority, in practice some residual stands could be held for considerably longer than 20 years. In such cases the VDYP curve may adequately describe the stand's growth, but will not necessarily indicate the quality of the remaining stand, with uncertain implications for the validity of the projected timber supply.

Before it is possible to verify the appropriateness of assuming that either partial cutting or another system will continue into the future, and before the timber supply can be more accurately modelled, the forest management objectives in specific areas must be clarified. Complicating this are the difficulties of predicting both the capacity of the residual stand to remain stable as a structure, and its capacity to continue to develop into a healthy, multilayered stand that includes some degree of regeneration. Accurate timber supply projection requires clear statements about the operational motives of forest management, to clarify whether the objective of a harvest entry is for instance to achieve beetle-proofing, to meet visual objectives, to initiate a shelterwood system, to carry out commercial thinning, to meet biodiversity objectives and so on, and to clearly describe the structure of a residual stand consistent with the desired objective**.**

Definitions of this kind are required to assess the productivity of residual stands, a proper assumed age for the regeneration at the time of the second harvest, and the likelihood of a stand continuing into the future under either a partial-cut or clear-cut harvesting system.

Much study has been done on these issues, and stand-level models are available to help refine operational strategies to ensure that management objectives provide both for access to short-term timber volumes and for the integrity and the foreseeable purposes and uses of residual stands. While I accept the representation of partial cutting as it has been incorporated in the base case as the best currently available information for the current determination, I also emphasize the need for a higher level of scrutiny in the next analysis, to reduce potentially significant uncertainties in future timber supply projections.

To achieve this, as noted below in 'Implementation,' I encourage licensees to specify and clarify as far as possible in all cases the operational objectives for each stand identified for harvesting by partial cutting. This will permit a much greater level of certainty in capturing the associated implications for the projected timber supply.

Incremental silviculture

In general, incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning, fertilization, and genetic improvement, that are not part of the basic silviculture activities required to establish a free-growing forest stand.

Commercial thinning is not currently carried out in, or planned for, the Golden TSA, and none was assumed in the analysis. Since 1998, 37 hectares of pruning and 634 hectares of juvenile spacing have been carried out in the TSA. This limited activity does not significantly affect the timber supply at the TSA level, and was not specifically represented in the analysis. Incremental silviculture activity levels are very dependent on funding and are difficult to project into the future. If the amount or kind of incremental silviculture actually practiced differs significantly from that assumed in the analysis, this will lead to a change in the forest that can be captured in the inventory updates used to support future AAC determinations. For the purposes of this determination I am satisfied with the treatment of this factor in the analysis.

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

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. In the timber supply analysis, the utilization standards assumed for most species were a minimum 17.5-centimetre diameter at breast height (dbh) with a 30-centimetre maximum stump height and 10-centimetre minimum top inside bark. For pine stands, the standard for minimum dbh is 12.5 centimetres.

BCFS district staff indicate that, with one minor exception, these standards reflect current utilization standards, licence requirements and current performance in the TSA. The minor exception is that for older cedar stands (greater than 140 years of age) the minimum top diameter inside bark is actually 15 centimetres—not 10 centimetres as assumed in the analysis. This practice represents only an insignificant overestimation in the projected timber supply. The forthcoming optional utilization of grades 5 and 6 logs will not affect timber supply projections for AAC purposes as any volumes left standing will in any case be accounted for. I therefore accept the assumptions employed in the base case as an adequate accounting of utilization standards.

Decay, waste and breakage

The VDYP model used to project volumes for existing unmanaged stands incorporated 1976 estimates of volumes of wood lost to decay, waste and breakage, based on field

samples from the province's forest inventory zones (FIZ). Newer versions of VDYP incorporate loss factors compiled based on the biogeoclimatic classification system; this results in projected losses that are generally somewhat lower than the FIZ-based estimates for the Golden TSA.

I have discussed earlier the significant uncertainty attached to the volume estimates for existing unmanaged stands. The completion of Phase 2 of the Vegetation Resources Inventory, which includes sample plots and destructive sampling, will help to resolve this uncertainty in the inventory. Until this is complete, in the absence of information indicating a bias in the existing loss estimates, it would be inappropriate to attempt to draw definitive conclusions respecting the implications for timber supply specific to uncertainty in loss factors. For the present determination I have accounted for the overall uncertainty in existing stand volumes as discussed in 'Reasons for Decision.'

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

Integrated Resource management objectives

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

- cutblock adjacency, forest cover and green-up

To manage for resources such as water quality, wildlife and aesthetics, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements help to achieve objectives for water quality, wildlife habitat, soil stability and aesthetics. Adjacency, green-up and forest cover objectives guide harvesting practices to provide for a distribution of harvested areas and retained forest cover in a variety of age classes across the landscape.

In the 2003 timber supply analysis for the Golden TSA, in order to represent the desired conditions necessary to meet the various objectives in different areas of the TSA, the timber harvesting land base was categorized into five broad zones of forest management emphasis, as follows: Integrated resource management zone—52 percent; wildlife habitat—36 percent; visual quality objectives—13 percent; domestic watersheds—just less than 4 percent. Areas of overlap (resulting in the greater than 100 percent total) were accounted for as explained in the analysis report. Within these broad zones, specific requirements were applied to represent particular management objectives, as discussed in the following sections.

- *integrated resource management (IRM) zone*

In the KBHLP Order it is assumed that, with specified exceptions for scenic areas, domestic watersheds, and Enhanced Resource Development Zones for Timber (ERDZ-T), green-up conditions are attained when young stands have reached a height of 2.5 metres. In the base case analysis, a general constraint was applied whereby no more than 25 percent of the area in the IRM zone was permitted to be covered at one time by forest stands lower than 2.5 metres in height. While the accuracy of this assumption in representing operational reality in this TSA is difficult to assess with precision, the requirement is within the range experienced in other management units. The height requirement reflects the provisions of the KBHLP Order, and in my judgement, based on experience with successive timber supply assessments and AAC determinations in many areas of the province, the imposition of a 25-percent maximum area constraint constitutes a very reasonable attempt to approximate the cover requirements needed to meet hydrological and other objectives.

I am advised that at this time the specific cover requirements provided for in 'ERDZ-T's have not yet been implemented to the point where they may be considered as current practice. Any indication of an associated possible increase in the overall timber supply that may arise for the TSA can be taken into account in the next analysis and AAC determination; for the current determination, in context of other uncertainties discussed in 'Reasons for Decision,' I have made no attempt to predict any such adjustment.

No further forest cover objectives were applied to the IRM zone other than those noted below under *landscape-level biodiversity*.

- *visually sensitive areas*

Careful management of scenic areas along travel corridors and near recreational sites is an important IRM objective requiring that visible evidence of harvesting be kept within acceptable limits in specified areas. The Code and FRPA provide for scenic areas to be identified and made known, and for visual quality objectives (VQOs) to be established to limit the amount of visible disturbance permitted in sensitive areas. Visual landscape inventories are carried out to identify, classify and record those areas of the province that are visually sensitive, and appropriate visual quality classes (VQCs) are recommended—for example 'Preservation,' 'Retention,' 'Partial retention,' 'Modification', or 'Maximum Modification'—to identify levels of alteration appropriate to particular areas. Guidelines to meet the VQOs include setting a maximum percentage of a specified area or 'viewshed' that is allowed to be harvested at any one time, and setting a 'visually effective green-up' or 'VEG' height at which a stand of reforested timber is perceived by the public to be satisfactorily greened-up.

In the 2003 timber supply analysis for the Golden TSA, the percentages of the timber harvesting land base covered by VQCs were respectively: 'Retention'—1.1 percent; 'Partial retention'—9.4 percent; and 'Modification'—2.5 percent, with respective maximum allowable disturbances of 5 percent, 15 percent and 25 percent.

The visual landscape units and associated visual management objectives as applied in the analysis reflect Objective 9 of the KBHLP Order. District staff advise that licensees are harvesting timber from within the constrained scenic areas and also note that, due to visual rehabilitation work and beetle management, in some cases the indicated constraints have been exceeded operationally. Given the very small percentage of the timber harvesting land base on which any associated discrepancy in the projected timber supply would occur, I am satisfied that the constraints applied in the base case respecting visually sensitive areas are an adequate reflection of the current management objectives provided by the KBHLP Order for the Golden analysis area including the Golden TSA.

- *recreation values*

In the 2003 timber supply analysis, no specific reductions were made to the timber harvesting land base to meet recreation objectives, as it was assumed that these are adequately accounted for by the forest cover constraints applied in respect of other resource values such as visually sensitive areas, wildlife habitat and riparian areas.

District staff advise that some changes have been made to road and block layouts in harvesting plans to address recreation trails, that some trail-side buffers have been requested and put in place, and that user agreements for trails for snowmobiles, bikes and Nordic skiing are being drafted and implemented. Staff note there may be some potential for future conflict among users, but also note that any losses to the timber harvesting land base have been and continue to be very minor, and that even these could be reduced by cooperative planning and negotiations between stakeholders.

From my discussion with district staff I am satisfied that, with adequate planning, recreation values can continue to be managed during the effective period of this AAC with only negligible—if any—constraint on the timber harvesting land base. In the event that user conflicts should later arise, with consequent reductions to the timber harvesting land base, these can be accounted for in future analyses and determinations. For the present, I am satisfied that the base case timber supply projection appropriately reflects current management of recreation values.

- *identified wildlife*

Identified Wildlife are those wildlife species and plant communities that have been approved by the Ministry of Water, Land and Air Protection as requiring special management. On February 19, 1999, the province announced its Identified Wildlife Management Strategy (IWMS) for dealing with endangered, threatened, vulnerable, and regionally significant species that have not been accounted for by existing management strategies for biodiversity, riparian management or ungulate winter range, or through the application of other forest cover constraints.

Government has not established specific wildlife habitat areas (WHAs) for particular identified wildlife species in the TSA, and no WHAs are officially proposed. Habitat areas have been suggested for mountain goat and northern goshawk, but these two species are no longer identified as ‘at risk’ in the 2003 edition of *Managing Identified Wildlife*. Other than species considered for higher level plans, few identified wildlife species with

significant implications for the timber harvesting land base have known distributions within the Golden TSA.

In the base case timber supply analysis, no specific accounting was made for WHAs, or for management or policy considerations respecting the IWMS or any species at risk, as it was assumed that these species are being managed to levels accepted by government under riparian and other provisions of the Kootenay-Boundary Land Use Plan. In this respect, provisions for caribou are considered separately below. Regional staff estimate that the statistical impact attributed to the Golden TSA for identified wildlife species other than fisher, bull trout, and grizzly bear is less than 10 hectares.

In many management units where specific measures have not yet been taken to identify and provide for species at risk, my customary approach is to account for future land base exclusions and other strategies through an assumed corresponding one-percent overestimation in the timber supply throughout the forecast period. However, in the case of the Golden TSA, where the noted species have recently been removed from the list of species at risk, and where government-approved management strategies for other species are already in place (as discussed in the following sections) I will defer to the established provisions of the Kootenay-Boundary Land Use Plan as an adequate accounting of anticipated requirements for identified wildlife. If requirements for new, unanticipated habitat areas become identified, these can be taken into account in the next analysis and AAC determination.

- ungulate winter range

For the analysis, 35 237 hectares (23 percent) of the timber harvesting land base and 48 830 hectares (30 percent) of the Crown forest land base were identified in the ungulate winter range management zone, mostly in lower elevations in the southern part of the TSA. The forest cover and cutblock adjacency guidelines applied in this zone permit no more than 25 percent of the ungulate winter range area in each landscape unit to be covered by forest stands less than 2.5 metres tall, and require a minimum of 40 percent of the operable area in each landscape unit to be covered by forests older than 100 years of age.

The areas mapped and the guidelines as applied and modelled in the base case analysis reflect the current requirements of forest development plans; however, new ungulate winter range mapping and guidelines are proposed for this year. A review by BCFS district staff indicated that the new guidelines as they are currently proposed—although they are being refined and may be subject to change—would probably constrain the timber supply somewhat less than the guidelines accounted for in the base case analysis. A sensitivity analysis, carried out to examine the implications for timber supply, showed that the currently proposed new requirements for ungulate winter range could increase the timber supply by 3 percent in the mid term and by 2 percent in the long term.

In reviewing the situation with district staff, I note that the current requirements were legally established under the Forest Practices Code from requirements defined in the 1990s by the (then) Ministry of Environment, Lands and Parks. Until these guidelines are officially renewed and any formal change is implemented, the base case accurately

reflects the current, legally sanctioned constraints as applied on the ground respecting ungulate winter range. Therefore, and since the indicated potential changes to timber supply were confined to the mid- and long-terms, for the present determination I have made no adjustment to my assessment of the short-term timber supply on this account. If the ongoing work to refine the guidelines leads to any significant change, this can be adequately accounted for in the next analysis and determination.

- Columbia Wetland Management Area

The Columbia Wetland Management Area includes marshes and wetlands adjacent to the Columbia River between Donald Station and Invermere, much of which will not be available for harvesting due to 50-metre riparian reserves for S1 streams. In the analysis, forest cover constraints identical to those for ungulate winter range were applied, and about 47 hectares of the timber harvesting land base were excluded. I am satisfied that although minor amounts of harvesting have taken place in the area modelled as excluded, this is not sufficient to affect the base case projection of the overall timber supply in the TSA.

- grizzly bear habitat

The KBHLP Order requires that important habitat for grizzly bears, including trees adjacent to avalanche paths, be provided for under the application of guidelines for landscape-level biodiversity. This requirement cannot be implemented explicitly until a higher-level plan map, showing particular locations of important grizzly bear habitats, is completed. In the meantime, in current practice, generally only one side of an avalanche track that contains high value grizzly bear habitat is harvested at one time, with harvesting on the other side being delayed for about 60 years until sufficient hiding and thermal cover has been re-established.

On a preliminary assessment, the absence of a map of specific grizzly bear habitat areas might appear to introduce uncertainty into the projected timber supply. However, the base case projection already includes landscape-unit based modelling of landscape-level biodiversity objectives respecting seral stage targets (see below) and, under the KBHLP Order, grizzly bear habitat requirements are to be managed within those forest cover targets. Thus, when the map is produced, wherever the specific habitats are shown to be located, they must all be included within the retained forest cover budget for landscape-level biodiversity objectives, which has already been accounted for in the timber supply projection. I therefore conclude that while the base case does not explicitly account for the individual impacts of a specific distribution of known areas of important grizzly bear habitat, or for specific associated harvesting delays, nonetheless the overall projection does account adequately for government direction respecting the overall habitat requirements as provided under the approved land-use plan.

- caribou habitat

The northern part of the Golden TSA overlaps the range of one of only three viable populations of mountain caribou in western Canada. The importance of this species—which is now considered ‘red-listed,’ or endangered—has generated ongoing work in the

scientific community to refine caribou management guidelines and habitat maps, prompting considerable debate over the nature of suitable guidelines and appropriate areas for their application.

In the base-case projection, forest cover requirements for seasonal caribou habitats were modelled consistent with Objective 3 of the KBHLP Order, based on the Higher Level Plan (HLP) map that was last updated in April 1997. This map identifies 20 731 hectares or 13.5 percent of the timber harvesting land base of the Golden TSA as caribou habitat. Caribou habitat areas are divided in components based on the interior cedar hemlock and Engelmann spruce-sub-alpine-fir biogeoclimatic zones in order to distribute the harvest and provide habitat in both zones. For caribou habitat below the 1994 operability line, at least 40 percent of the area must be covered by stands older than 140 years, at least 10 percent of this same area must be covered by stands older than 250 years, and no more than 25 percent of the area may be covered at one time by stands less than 2.5 metres tall. For caribou habitat above the 1994 operability line, at least 70 percent of a habitat area must be covered by stands older than 140 years and no more than 25 percent of the area may be covered by stands less than 2.5 metres tall. Only terrain with a slope of less than 80 percent is considered suitable for meeting forest cover objectives for caribou habitat.

Since April 1997, revisions have been made to the HLP caribou map and consideration is now being given to amending the KBHLP Order to include a revised map that would affect an additional 3059 hectares of the timber harvesting land base in the TSA. Also, a Recovery Action Plan for the North Kootenay Mountain Caribou Populations is currently being drafted to address the requirements of the federal *Species at Risk Act*; I am advised that this plan, which incorporates precautionary principles, should be completed within a year or so. Another well-documented and recommended measure is the application of a mature-plus-old seral stage forest cover target of 60 percent for caribou habitat instead of the 40 percent requirement applied in the base case. In short, a number of changes are currently contemplated which have the potential to appreciably affect the size and location of caribou habitat, as well as the nature of the forest cover requirements necessary to ensure its suitability.

BCFS staff carried out a sensitivity analysis to examine the effects on timber supply of using the revised caribou map which affects an additional 3059 hectares or 2 percent of the timber harvesting land base. The results showed a relatively low sensitivity, in that the projected short-term harvest levels could remain unaffected, with a slight decrease in the mid-term level and a reduction of 0.6 percent in the long term. However, when the old-plus-mature seral stage forest cover retention target was increased from the 40 percent modelled in the base case to 60 percent (but still using the original HLP map) the projected initial harvest level fell by 19 percent to 428 000 cubic metres per year—lower by 2.7 percent than even the mid-term level projected in the base case—where it remained until decade 10, when it rose to a long-term level that was reduced permanently by 2.8 percent from that projected in the base case. This analysis clearly showed a very high level of sensitivity in the short-term timber supply to currently contemplated changes in forest cover requirements for caribou habitat. The effects were projected to last throughout the forecast period, and indicate the need for significant caution on this account in assessing the available timber supply.

District BCFS staff have reviewed with me in some detail the proposed differences between the original HLP version of the caribou habitat map and the proposed revised version, and have indicated that MSRM will likely be amending the KBHLP order to reflect the new map in the near future.

My response to all this information is as follows. While the caribou habitat requirements currently indicated by the KBHLP Order appear to have been carefully and correctly modelled in the base case projection, reliable indications exist to show that these requirements are likely to change in a manner that will further constrain the timber supply, potentially very significantly, if and when the KBHLP Order is amended to reflect the revised caribou habitat map and new forest cover requirements. However, such an amendment can only be formalized through a provincial government decision. As noted in my guiding principles for AAC determinations, set out earlier in this document, I consider it inappropriate to speculate on and account for potential timber supply implications of land use or forest management changes that may arise from government decisions that have not yet been taken. For this reason, in the present AAC determination I have not expressly accounted for a specific impact that the contemplated changes to caribou habitat management may have on the projected timber supply.

Nonetheless, I remain aware of and concerned about the very high sensitivity of the timber supply to such changes. I have therefore asked to be provided with a sensitivity analysis indicating the projected combined impact on timber supply that may be expected from the changes to the caribou habitat land base indicated in the revised map together with the increase from 40 percent to 60 percent in the old-plus-mature seral stage retained forest cover requirement. With the help of this information—adjusted appropriately if necessary to reflect any specific land base or management changes—in the event of a future formal amendment to the KBHLP Order I will consider making an expedited redetermination of this AAC before the statutorily required period. Meanwhile, as noted in 'Reasons for Decision,' in my determination I have remained mindful of the potential implications for the stability of the timber supply that may arise if the contemplated changes do materialize.

- riparian habitat

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones that exclude timber harvesting, and riparian management zones that restrict timber harvesting, in order to protect riparian and aquatic habitats. Stream classes described in the *Riparian Management Area Guidebook* are determined, to estimate the area needed in riparian reserves and riparian management zones.

In the 2003 timber supply analysis for the Golden TSA, a total area of 8537 hectares was excluded from the timber harvesting land base to account for riparian management, about 1370 hectares more than in the 1998 analysis. This total area was generated by multiplying riparian management zone percentage retention requirements by the riparian management zone widths, adding the riparian reserve zone width, and multiplying this by lineal distances obtained for streams assigned to stream classes using watershed atlas information transferred to Terrain Resources Information Mapping (TRIM) data.

District staff note that while the results are based on local data, no field-derived information was used, and the limited scope of the project precluded detail for some wetlands, lakes and smaller streams, necessitating weighted averages in some cases.

I acknowledge the difficulty of reaching precision in accounting for the complex distribution of streams of various classes. In this respect the watershed atlas is the best currently available source of information, and I consider its use in combination with the TRIM data to be an improvement over the previous method of depending on a generalized ratio to approximate the distribution of stream classes. The current method relies more on localized data, and employs a more repeatable methodology, which, as district staff readily agree, could nevertheless benefit further from the correlation of its findings with field observations, if time were to permit.

Therefore, while I acknowledge that this method still leaves some uncertainty in the accuracy of the stream class distribution and in the degree to which all small streams are accounted for, I am satisfied that it provides the best and most accurate currently available means of representing streamside management requirements in the timber supply analysis. On this basis I am prepared to accept the current assessment as a reasonable and adequate accounting for riparian habitat, and as satisfactory for use in this determination.

- *community and domestic watersheds*

The TSA includes no community watersheds as defined by the Code, but does include domestic watersheds covering 5951.1 hectares (3.9 percent) of the timber harvesting land base and 1758.2 hectares (5 percent) of the Crown forest land base. The guideline applied in the analysis to reflect hydrologic objectives permitted no more than 25 percent of the area in each domestic watershed to be covered by stands less than 6 metres in height. This is not a requirement of the KBHLP Order, but district staff advise that all of these watersheds are adjacent to private land or woodlots and that in these areas licensees operate in a sensitive and considerate manner such that the requirement as applied is a reasonable representation of current practice.

The KBHLP Order does require the leaving of 30-metre streamside management zones on each side of S5 and S6 streams to safeguard water that is licenced for human consumption, but without knowing where all the water intakes are located it was not possible to model this requirement.

In my estimation, to the extent that the forest cover requirement as modelled for domestic watersheds may represent a slightly higher level of constraint than the KBHLP Order, this will in any case act to compensate, to some degree, the inability to model the 30-metre buffers. Since district staff consider the forest cover requirement to reflect current practice, I am satisfied that the applied constraint is appropriate and that on the relatively limited area concerned, no discernible error has been introduced to the base case projection on this account.

- *stand-level biodiversity*

Biological diversity, or biodiversity, is defined as 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. Historically, under the Forest Practices Code, biodiversity in a given management unit has been assessed and managed at the stand and landscape levels. Stand-level biodiversity is managed in part by retaining reserves of mature timber or wildlife tree patches within cutblocks to provide structural diversity and wildlife habitat. These important objectives are continued, albeit in a different framework, under the new *Forest and Range Practices Act*.

In the 2003 Golden timber supply analysis report, to reflect the required retention of wildlife tree patches, a percentage was assumed to be removed from the area of each forest stand in the timber harvesting land base, for total exclusion of 8982 hectares.

Based on information in the *Landscape Unit Planning Guide* and assuming that 50 percent of the wildlife tree requirements will be met from the non-contributing forest areas, it is considered necessary to retain an average of 6.2 percent of the forest cover within cutblocks as wildlife tree patches. These requirements were calculated for each landscape unit/subzone and then weighted for each biogeoclimatic subzone in the Golden Timber Supply Area.

The calculated requirements are reflected in forest development plans, although BCFS staff acknowledge that no ground surveys have been carried out to determine the size and location of the patches actually retained. Many of the patches are planned to be greater than two hectares in size, and so are able to contribute to the mature and mature-plus-old seral stage forest cover requirements for biodiversity management at the landscape level.

Although no ground surveys have been carried out in the Golden TSA to verify amounts of retained forest cover in wildlife tree patches, audits in other parts of the province have demonstrated that in almost all cases at least as much forest cover as required, and often more, is being retained. The average assumed retained cover from wildlife tree patches in this TSA was calculated by the approved method, which is also incorporated under the *Forest and Range Practices Act*. Only minor changes could be expected if the calculations were applied to the new VRI inventory instead of the old inventory, as was done, and I am therefore satisfied that the requirements for stand-level biodiversity provided by wildlife tree patches are adequately accounted for in the base case analysis.

Another stand-level biodiversity component, coarse woody debris, was not specifically addressed in the analysis. District staff are confident that, due to the age and nature of most stands in the TSA, objectives for coarse woody debris are likely to be readily achieved through normal utilization practices. In the absence of any clear evidence to the contrary, I consider this to be a reasonable assessment for use in this determination.

- landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that this—together with the historical provisions in the Forest Practices Code, most of which remain as important objectives under the new *Forest and Range Practices Act*, such as riparian management, maintenance of wildlife trees, and other forest cover

objectives as discussed throughout this document—will provide for the habitat needs of most forest and range organisms.

- biodiversity emphasis options

The Forest Practices Code publication *Higher Level Plans: Policy and Procedures* outlines three biodiversity emphasis options (BEOs)—lower, intermediate and higher—for application in establishing biodiversity management objectives for landscape units. Each option is designed to provide a different level of natural biodiversity, and a different risk to the maintenance of elements of natural biodiversity, when establishing an appropriate integration of objectives for biodiversity and timber supply.

In the 2003 timber supply analysis for the Golden TSA, BEOs were generally assigned in accordance with Map 1.1 of the KBHLP Order. However, for technical reasons involving several landscape units with more than one BEO, and involving the use in the timber supply analysis of a more recent version of the Biogeoclimatic Ecosystem Classification system than that on which Map 1.1 was based, in the analysis a total of 4 percent of the Crown forest land base was placed into higher BEOs than were indicated in the Order. This resulted in the application in the base case of a somewhat higher level of constraint on timber supply on this account than was intended in the land-use plan, as noted in the 'summary' below.

- seral stage cover requirements

A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of forest cover at various ages or 'seral stages', including old-growth forest, for species that depend on or are strongly associated with these forests. Although some general forest management practices can broadly accommodate the forest cover needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved. Natural disturbance types (NDTs) vary from frequent wildfires in the dry interior regions to rare stand-initiating events (from wind, fire, and landslides) in the wetter coastal regions.

In accounting for seral stage cover requirements in the 2003 timber supply analysis, the requirements for old- and mature-plus-old seral stages were modelled consistent with Objective 2 of the KBHLP Order, assuming that the full requirement for old forest would be met in areas with low BEO by the end of the third rotation, although the model did not preferentially locate old and mature forests in connectivity corridors as indicated in Objective 5 of the Order. In the modelling, it was found that, in many cases, in the connectivity corridors in valley bottoms the remaining old and mature cover is insufficient to allow for both harvesting and current levels of required retention. A sensitivity analysis was carried out, based on 2002 forest development plan timber availability figures, to examine the effect of restricting harvesting in the connectivity corridors if the seral targets could not be met after 20 more years of ageing. Imposing this limit had no effect on the base case harvest levels, a result that was not expected to be affected by the minor corrections required to the placement of connectivity corridors in some landscape units in the base case.

Another sensitivity analysis was performed in which full old-seral targets for lower BEO areas were applied immediately, instead of being phasing it in over three rotations, and the recommendations in the *Landscape Unit Planning Guide (LUPG)* for mature seral forest cover were applied in all landscape units, instead of applying the mature seral targets as set out in the higher level plan (October 2002). This showed little change in the timber supply, with no impact in the short term, a mid-term harvest level decreased by 2 percent, and a long-term harvest level decreased by 0.4 percent.

Some draft old growth management areas (OGMAs) that were proposed prior to the 2000 AAC determination are not consistent with the KBHLP Order, and therefore were not accounted for in the 2003 analysis. New draft OGMAs are in the process of being proposed and once finalized, these will assist in future modelling of the complex relationships between biodiversity management and timber supply.

One potentially significant issue for landscape-level diversity in the TSA is caused by recent increases in mountain pine beetle infestations, which have necessitated the harvesting of considerable timber volumes, both to control the spread of the infestations and to harvest damaged timber. Most of this activity is located in the southern portions of the TSA where deficits already occur in meeting seral stage forest cover requirements. It should therefore be noted that managing pine stands under these conditions could have implications for the feasibility of some aspects of the KBHLP Order.

- disturbances in stands outside the timber harvesting land base

In the productive forest outside the timber harvesting land base, 52 percent of the stands are currently over 140 years of age, and 12 percent are older than 250 years. These stands contribute much of the old-forest area needed to meet habitat and landscape-level biodiversity requirements.

Some earlier analyses did not account for inevitable disturbances and renewal in these forest stands that will periodically affect their contribution to forest cover. In the 2003 timber supply analysis, based on 7 years of fire history provided by Protection Branch, it was assumed that, on average, 370 hectares of timber in the inoperable land base were burned by wildfire every year. In 2003, the burning of about 965 hectares increased this average to 395 hectares per year (averaged over a 9-year period). To examine the implications for timber supply, a sensitivity analysis was done in which the area disturbed annually in stands outside the timber harvesting land base was doubled. This significant change produced only small projected reductions of 2 and 2.4 percent in the mid- and long-term harvest levels, and no change in the short-term timber supply.

(The rate of disturbance of 370 hectares per year was shown to produce over time an even distribution of age classes outside the timber harvesting land base, although even by year 250 a large area of stands of 400 years and older remained, due to the assumption that some trees will age to over 700 years.)

- forest cover contributed by parks

Although stands outside the timber harvesting land base do not contribute to any harvest schedule or harvest target, they can contribute to old seral stage forest cover targets for biodiversity and wildlife habitat and therefore may affect the pattern and extent of harvesting within the Golden TSA. Older forest requirements for landscape biodiversity are assessed on areas that straddle TSA and park boundaries, and the TSA together with its neighbouring parks—the Golden analysis area—is the complete land base used for assessing landscape-level biodiversity. Most of the landscape-level biodiversity objectives provided for by old- and mature-plus-old seral stage forest cover in this area can be met by stands outside the timber harvesting land base.

In particular, the Cummins Lake and Hamber provincial parks, and the Glacier, Yoho, Kootenay, Banff and Jasper national parks border the TSA (with the Cummins located inside the TSA boundary). Those parks which contribute to the management of biodiversity in the TSA (i.e., all but Banff and Jasper, which lie outside the Golden RMZ of the KBHLP Order) add 283 000 hectares, of which 79 165 hectares are crown forest land, to the land base used for assessing biodiversity in the timber supply analysis. Proportionately more (44 percent) of the total Golden analysis area is occupied by stands older than 140 years of age than on the timber harvesting land base (30 percent).

To examine the effect of excluding any contribution from the neighbouring parks to the management of biodiversity in the TSA, a sensitivity analysis was performed in which landscape-level biodiversity targets were applied to only the TSA portions of landscape units. The results showed no effect on the short-term timber supply, but the mid-term harvest level decreased slightly and the long-term harvest level decreased by 1.3 percent.

Changes currently contemplated for park management are likely to lead to increased levels of disturbance that more closely resemble historical patterns but, as noted above, the recently observed disturbance rate could be doubled with only minor impacts on the timber supply.

- summary of landscape-level biodiversity

The KBHLP Order has removed some of the uncertainty around maintaining biodiversity by identifying biodiversity emphasis options and corresponding old and mature forest targets for the landscapes making up the Golden TSA. My discussions above have considered several remaining uncertainties:

1. In the analysis more area was placed into the higher BEOs than was indicated in the KBHLP Order, overly constraining the timber supply to a small extent;
2. Conflicts exist between harvesting and cover retention in valley bottoms due to connectivity areas, but excluding harvesting for 20 years in these areas is possible without impacting the short-term supply;
3. Beetle-related harvesting may affect the ability to meet seral targets in the KBHLP;
4. Changes in management may decrease seral contributions from parks, but double the recent historical disturbance rate was modelled with no short-term impact;

5. Entirely removing the parks contribution is manageable without short-term impact.

In a general sense, these identified uncertainties work in mutually offsetting ways with respect to the timber supply, with no apparent trend in either direction, and their potential impacts are bounded by the results of analyses showing fairly low levels of sensitivity.

Final approval of spatially located OGMAs will add precision to future modelling of the complex relationships between biodiversity management and timber supply. For the present AAC determination, I am satisfied that a reasonable level of correlation exists between what was modelled and the intent of the KBLUP Order, and I accept that landscape-level biodiversity requirements in the Golden analysis area are adequately represented and accounted for in the base case projection, to the extent of current capability.

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

Harvest sequencing

In timber supply analysis, the order in which eligible stands are assumed to be harvested can affect the projected timber supply in a number of ways, and any difference between the modelling assumptions made and the order in which stands are actually harvested in operational practice must be examined and accounted for. In the base case of the 2003 Golden TSA timber supply analysis, forest stands were assigned a priority in the schedule for harvesting based on the following order: first, stands proposed for harvesting in forest development plans; next, stands within the partial cutting zone; next, spruce and cedar stands to the north and fir and pine stands to the south; next, any remaining stands. In each case the 'relative oldest first' rule was applied, whereby stands with the greatest number of years above the minimum harvestable age were assumed to be harvested first.

Sensitivity analyses were carried out to determine the effects of applying the following harvest rules to each of the above-noted priorities: (1) 'oldest first'—harvesting the absolute oldest stands above minimum harvestable age first (irrespective of species); (2) 'random'—the random harvest of any stand above the minimum harvestable age; and (3) 'youngest first'—the harvest of those stands first with the least number of years above the minimum harvestable age. The results showed no difference in the short term between the 'relative oldest first' (base case), the 'random' and the 'oldest first' options, although some mid- and long-term effects were observed—notably a 7.1-percent reduction in the long-term level with the 'random' option. The 'youngest first' rule resulted in an immediate reduction of 20 percent from the base case and may be discounted from practical options.

Given the low short-term sensitivity between the 'relative oldest' option used in the base case and the 'random' option which might best describe temporary operational practice in the midst of a beetle epidemic, I am satisfied that the harvest scheduling assumption used in the base case is an appropriate reflection of average operational practice over time.

Actual harvest level

The current AAC for the Golden TSA, effective since 2000, is 530 000 cubic metres. However, from 1998 to 2002, the average annual harvest in the TSA has been about 400 000 cubic metres, or 130 000 cubic metres per year less than the AAC. I am advised by district BCFS staff that although one licensee with the largest apportionment currently has the largest share of this undercut, the undercut situation applies generally to all licensees in the TSA. I have been mindful of these facts in making my determination, as noted in 'Reasons for Decision.'

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

Alternative harvest flows

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large volumes of older forests often permits harvesting 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 impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

The base case harvest forecast for the Golden TSA was developed subject to several assumptions; for example, the initial harvest level was set at the current allowable annual cut. In addition to the base case harvest forecast, there are many possible alternative forecasts with different starting harvest levels, different rates of decline, and different trade-offs between short- and long-term harvest levels. The analysis report provided two alternative forecasts (using the same forest management assumptions), one with a starting harvest level of 575 000 cubic metres per year for one decade, which necessitated a lower mid-term level than in the base case, and one showing a maximum non-declining forecast beginning at 449 000 cubic metres, rising to 463 000 cubic metres after 11 decades.

These forecasts, and their consequences for the total amounts of timber harvested over time, are described in more detail in the 2003 analysis report. In making my AAC determination I have considered both of these forecasts, in addition to the base case forecast and the many sensitivity analyses provided in the analysis report, as well as recent and current actual harvest levels in the TSA.

I have also considered two further forecasts provided in the timber supply analysis as indications of the results of combining a number of changes in inputs and assumptions in the model. These forecasts and their role in this determination are discussed in 'Reasons for Decision.'

Community dependence on the forest industry

Forestry provides 27 percent of basic income in the TSA, the highest percentage of all sectors, and 26 percent of the basic employment—about 655 (including 465 direct and 190 indirect and induced) jobs. Tourism provides the highest percentage of employment in the TSA, but provides a smaller proportion (12 percent) of basic income.

In considering potential socio-economic impacts in the area resulting from changes in harvest level, it is notable that under the base-case forecast, the sum total of harvest level reductions projected to be imposed by year 21 of the forecast is about 17 percent, or 90 000 cubic metres per year below the current AAC, that is, a harvest level of about 440 000 cubic metres per year. That projected harvest should still be able to support a higher level of economic activity than is now produced by the average annual harvest of 400 000 cubic metres per year under the current AAC.

From the foregoing, I conclude that if the sum total of currently identified risks to the timber supply indicates a need for some level of reduction in the AAC at this time, this should be achievable without compromising anticipated levels of forestry-related economic activity in the TSA.

Public input to the AAC determination process included a suggestion by a major licensee to lower the AAC somewhat now, in order to reduce the socio-economic impacts in subsequent periods.

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

This section of the *Forest Act* has been repealed [2003-31-2 (B.C. Reg. 401/2003)]

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

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).

This letter and memorandum provide a government view on forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that 'any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.' He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs. I have reviewed the opportunities for commercial thinning, and, as noted under *incremental silviculture,* commercial thinning is not

currently carried out in, or planned for, the Golden TSA, and none was assumed in the analysis. I have reviewed the potential benefits of partitioned cuts and, as noted in *inoperable areas*, I see no helpful reason to establish specific harvest levels attributable to particular areas, species, or terrains in this TSA at this time, and for the foreseeable future the prospect of harvesting in previously uneconomic areas is not viable in the TSA.

The Minister's memorandum addressed the effects of visual resource management on timber supply, asking that the constraints applied to timber supply to meet VQOs not be allowed to unreasonably restrict timber supply. As noted in *visually sensitive areas*, I am satisfied that the constraints applied in the base case for visually sensitive areas reflect government's management objectives for the area as provided by the KBHLP Order.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. The BCFS took a number of steps to provide opportunities for public review through the timber supply review process for the Golden TSA, including public opportunities to review the data package and the timber supply review analysis, and to respond to a public discussion paper. Three submissions were received and wherever possible I have attempted in this rationale to respond briefly to the views expressed; consideration of this input has been helpful in this determination. Other input, reflecting concern that new legislation will reduce the quality of road building and lead to more erosion and siltation in creeks and rivers, pertains to compliance and enforcement aspects of forest management rather than to my assessment of the timber supply under Section 8 of the *Forest Act*.

The KBHLP Order provides higher level plan direction for the Golden TSA, from which the applicable local objectives have been represented and taken into account in the timber supply analysis and in this determination, to as close an approximation as possible, as discussed throughout this document. The Golden Backcountry Recreation Access Plan has been approved by government, and I am advised it is not expected to affect forestry operations.

Work remains to be done to establish landscape unit objectives and sustainable resource management plans, which will improve information and direction for future timber supply analyses and AAC determinations.

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

Unsalvaged losses

Unsalvaged losses are timber volumes destroyed or damaged by such agents as fire or disease, that are not recovered through salvage operations. In regenerated forests, a number of parasites, fungi or plants can kill trees or degrade the quality and value of logs.

Estimates for unsalvaged losses account for epidemic (abnormal) infestations and for factors that result in losses that are not recovered through salvage harvest programs and are not recognized in yield estimates. Timber volume losses due to insects and diseases that normally affect stands (endemic losses) are accounted for in inventory sampling for existing timber yield estimation or though other methods. Endemic losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted under *volume estimates for regenerated stands*.

In order to estimate non-recoverable losses in the Golden TSA, actual quantified losses were assessed from licensees' annual reports, the protection fire reporting system, the Ministry of Forests' Integrated Silviculture Information System (ISIS) and Major Licensee Silviculture Information System (MLSIS), and the Forest Insect and Disease Survey.

The total annual loss from all causes was estimated to be 29.5 hectares or about 7627 cubic metres. For most damage agents, the unsalvaged loss was a 6-year average. Losses to wildfire were based on fires that burned between 1995 and 2001 (a 7-year period). The total unsalvaged loss was about 40 percent less than in the previous AAC determination, due mainly to reductions in wildfire and in fringe damage from prescribed burns, few of which are now carried out. If the unusual major one-year event in the 2002/2003 fire season were included, the additional loss of 43 200 cubic metres would raise the figures for average annual unsalvaged losses to fires between 1995 and 2003 by 3696 cubic metres from 5102 cubic metres to 8798 cubic metres and per year, and from 19 to 33 hectares per year.

About 4300 hectares in the TSA are currently identified as 'red-attacked' by mountain pine beetles—this number was 620 hectares in 2000—while infestations by the Douglas-fir bark beetle have declined in recent years to just 2 hectares today.

District staff consider that unsalvaged losses may decline over time as access is improved and as operations move from older into younger, healthier stands, but feel the estimated losses are generally a reasonable representation of events and responses in the TSA.

In the timber supply analysis the total estimated unsalvaged volume losses (ignoring the effect of the 2002/2003 fire losses) were deducted from the projected timber supply throughout the forecast period.

Having reviewed the approach taken by BCFS staff in accounting for losses in the analysis, I conclude it is based on reasonable methodology and makes appropriate use of available data, and I find the estimates reasonable for consideration in this determination with the following cautions. I acknowledge the possibility that estimated losses may decrease in future as harvesting shifts from older to younger stands. This may be accounted for in future determinations, remembering that uncertainty about future losses does not affect the projected short-term timber supply. On the other hand, the 7-year data collection period for average fire losses is rather short for identifying trends conclusively, and may not adequately account for catastrophic fire years. It is conceivable that, in respect of the peak fire years that occurred in 1985 and 2002/2003, the average loss to wildfires used in the analysis may underestimate losses to some degree, although a 20-year average could result in a somewhat lower figure than the relatively high hectare

and volume figures that would result if an average were calculated for the 9 years from 1995 to 2003. For the purpose of this determination, on this account I have assumed a small, unquantified overestimation in the timber supply throughout the forecast period, as noted in 'Reasons for Decision.'

Reasons for Decision

In reaching my AAC determination for the Golden TSA I have made all of the considerations documented above and have reasoned from them as follows.

The 2003 timber supply analysis base case projected an initial harvest level maintained at the current AAC of 530 000 cubic metres per year for the first decade, followed by a decline of 10 percent, then a second decline, ten years later, to a mid-term level of 440 000 cubic metres per year, which would be stable for nine decades. After the eleventh decade, the projected harvest level would then rise to the long-term level of 463 000 cubic metres per year, 12.6 percent lower than the current AAC.

In determining AACs, my considerations typically identify factors which, considered separately, indicate reasons why the timber supply may be either greater or less than the harvest levels projected for various periods in the base case. Some of these factors can be quantified and their implications assessed with reliability. Others may influence the assessment of the timber supply by introducing an element of risk or uncertainty, but cannot be quantified reliably at the time of the determination and must be accounted for in more general terms.

In my considerations, the following factors have been identified as reasons why the timber supply as projected in the base case may have been underestimated to a degree that may be quantified:

- *Woodlots*: In the analysis a greater area was excluded from the TSA for woodlots than is shown by the FTAS system to have been issued, indicating an underestimation in the projected timber supply corresponding to an area of almost 1300 hectares, or about 0.8 percent of the timber harvesting land base throughout the forecast period.
- *Not-satisfactorily-restocked land*: Reconciling data from the new VRI and ISIS shows better stocking, higher productivity, and shorter expected regeneration delays for some areas than was assumed in the analysis, indicating an underestimation in the projected timber supply corresponding to an area of roughly 1400 hectares, or 0.9 percent of the timber harvesting land base, effective in the mid-to-long term. This underestimation could be slightly larger if some burned areas without regeneration obligation do in fact become satisfactorily reforested.

The following factor has been identified as indicative of a potential underestimation in the timber supply to a degree that currently cannot be quantified with accuracy:

- *Site productivity*: Consistent with the prevalent provincial trend, the carrying forward of site indices from old stands into more productive, regenerated, managed stands indicates the likelihood of underestimations in site productivities, in this case leading to probable underestimations in the projected mid- and long-term harvest levels by unquantified amounts up to a maximum of about 9 percent in the long term.

The following factor has been identified as a reason why the timber supply projected in the base case may have been overestimated to a quantifiable degree:

- *Inoperable areas*: The assumption in the analysis of harvesting in the remaining portions of the Sullivan landscape unit (LUG7), and in certain areas in forest development plans, that are now considered to be inoperable, has led to an overestimation of roughly 3933 hectares, or 2.6 percent, in the timber harvesting land base, with corresponding timber supply impacts over all time frames.

The following factors have been identified as indicative of potential overestimations in the timber supply to degrees that currently cannot be quantified with accuracy:

- *Volume estimates for existing mature unmanaged stands*: A cautious view should be taken with respect to a possible overestimation in the volume estimates projected for existing stands. The true magnitude of any underestimation in existing volumes and the consequent implications for projected harvest levels remain uncertain, pending completion of Phase 2 of the VRI in the TSA. However, for reasons introduced in *volume estimates for existing mature unmanaged stands* and discussed further below, I consider it appropriate to account for this uncertainty in existing volumes.
- *Volume estimates for regenerated stands-genetic worth*: The use in the analysis of modified TIPSY growth curves for all regenerating spruce stands less than 25 years old, when only those planted in the past five years would have included Class A seed, has caused a small, unquantified overestimation in the long-term harvest level.
- *Volume estimates for regenerated stands-root disease*: Uncertainty in whether provincial OAF volume reductions account adequately for losses to root diseases in managed—particularly fir—stands in the TSA, which is a region-wide issue, indicates the possibility of unquantified overestimations in the timber supply in the mid and long terms.
- *Unsalvaged losses*: The 7-year time period used in the analysis to estimate average wildfire losses is likely too short to capture the implications of longer-term and larger periodic fires. Hence, the harvestable timber supply, which incorporated an estimate of unsalvageable losses, is most likely overestimated throughout the forecast period. While figures are available for catastrophic losses experienced in 2002/03, simply averaging them together with the 7-year losses used in the base case would most likely result in an overestimate of average long-term losses. A 20-year average could be used, and would be lower than the 9-year average which includes the 2003/03 losses; however, fire management has changed substantially over the last 20 years, so the average over that period may not be applicable to the future. While I am confident that wildfire losses will average higher than the amount used in the base case, given all of the uncertainties, the degree of overestimation cannot be confidently quantified at this time.

The above list of factors identifies eight areas of uncertainty in the base case projection that must be considered in this determination. In addition, in my considerations with respect to the management of caribou habitat, I noted that I consider it inappropriate to speculate on and account for potential timber supply implications of land use or forest

management changes that may arise from government decisions that have not yet been taken. My reason for this, as noted in 'Guiding Principles,' is that the legislated requirement for frequent AAC reviews will ensure that ongoing plan-implementation decisions will be addressed in future determinations. Nonetheless, as I also noted there, I have an obligation, based in responsible stewardship, to remain mindful in current determinations of any significant implications for, or risks to, the timber supply that could reasonably flow from such decisions. For that reason, while I am not expressly accounting in the present AAC determination for a particular anticipated impact that currently contemplated changes to caribou habitat management might have on the projected timber supply, I am nevertheless remaining mindful of the very high sensitivity of the timber supply to some of those changes. As stated earlier, if the management regime for caribou changes, I will revisit this decision sooner than required by statute, if necessary.

Ignoring for the moment the larger uncertainties associated with the noted possible overestimation in mature volumes in existing stands, and the changes to caribou management, and ignoring also for the moment those factors which affect the timber supply in the mid or long term only, the directly accountable over- and underestimations in the list above that affect the assessment of the current growing stock in the TSA in the short term resolve essentially into the 2.6-percent overestimation for operability plus a nominal approximately 0.5 percent for unsalvaged losses, against a 0.8-percent underestimation for woodlots, for a net overestimation of roughly 2.3 percent.

This overestimation must be added to the overall context of two much larger elements of significant risk. The uncertainties in (a) the estimates of harvestable volumes in existing mature unmanaged stands, and in (b) caribou management—particularly with respect to the potential increase in caribou habitat and forest cover requirements—necessitate a wider and longer-term perspective in assessing an appropriate harvest level at this juncture in the transition of the timber supply toward dependence on regenerated stands.

The base case projected a falldown in harvest levels, beginning in ten years time. Yet each of the two major uncertainties in the preceding paragraph, taken individually at its maximum implication, would indicate the possibility of a 19-to-20-percent overestimation in the short-term harvest level. Both the likelihoods and magnitudes of the impacts are in each case uncertain at this time, as documented in some detail in my considerations, but both have the potential to present a very considerable risk to the projected supply in the near term. In this situation, evaluating an appropriate response to the complex risk environment becomes central in determining a harvest level that will adequately account for a range of outcomes that may reasonably be expected to occur.

One certainty is that the timber supply in the TSA is projected to decline in any case, eventually to a long-term level currently projected at 12.6 percent below the current AAC (or, if supported by local site index data, perhaps a few percentage points higher than the projection). Before this level is reached, an unavoidable, lower, medium-term level of 440 000 cubic metres per year (plus or minus the identified uncertainties) is projected. The AAC now under determination will inevitably define the overall climate of risk that will be carried forward throughout the subsequent series of determinations that will schedule the transition to these projected levels.

In many earlier determinations I have avoided reducing AACs on the basis of risk alone, preferring to rely on proven overestimations based on statistically reliable data, and on already completed implementation decisions for land-use plans. In the current situation in this TSA, however, a unique combination of circumstances necessitates prudent consideration of an alternative approach—one that satisfies all the requirements of Section 8, responds to provincial objectives with respect to AAC determinations, and also safeguards stewardship and management options to an acceptable degree, against foreseeable risk. These unique circumstances are as follows.

First, while the recently recompiled audit data do not provide certainty regarding the existence of an overestimation or its magnitude, the data do indicate a downward tendency in volumes relative to those used in the analysis. The constraint on short-term timber supply from this possible overestimation is increased by the needed adjustment for operability, and compounded by the noted likely changes to caribou habitat management, to which I will again refer in a few paragraphs.

Second, after a long and difficult history, forestry operations in the Golden area are now providing a source of stable jobs and ongoing economic activity, and weathering adverse conditions while the industry in other areas of the province undergoes significant fluctuations. This applies even in the north end of the TSA where, after 20 years of uncertain operations in old cedar-hemlock stands, a good residual operation is reliably underway and generating enough economic activity to keep logs flowing to market.

Third, complementing this noted stability in the forestry-based economic activity in the TSA, 31 000 cubic metres per year remain unallocated in the forest licence allocation, 21 000 cubic metres per year remain unsold in the Forest Service Reserve, and an ongoing 130 000-cubic-metre undercut persists in issued licences. All of this supports the conclusion that the currently stable forestry operations in the TSA have reached an optimum level relative to various ongoing logistical and economic conditions in the area.

Maintaining stability of this kind in a context of environmentally responsible stewardship is central to AAC determination. Section 8 of the *Forest Act* requires consideration of the short and long term implications of alternative rates of timber harvesting as well as the social and economic objectives of the government. The Minister's letter of July 28, 1994 emphasizes in relation to AAC determinations 'the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.' The letter also emphasizes the need to 'avoid compromising long-run sustainability.'

In my judgement, where suitable options permit, it is appropriate to respond to the legislative and policy environment for AAC determination not only by ensuring the determination does not compromise long-run sustainability, but also by ensuring it does not work to undermine the kind of socio-economic stability that is now established with respect to forestry operations in this TSA.

An option to make such a determination exists in this TSA at this time. It is important to remember that the continuing difference between recent harvest levels and the AAC could be interpreted as providing an apparent opportunity to increase the level of forest operations in the TSA. In my judgement, exercising such an option, which under

different circumstances could be advantageous, could well lead instead, under the present circumstances of risk and declining forecasts, to both biophysical and socio-economic instability, if the newly increased level of operations were later required to be reduced again, due to the materializing of problems from currently identified risks.

The current indications of future risks to timber supply in the TSA appear sufficiently compelling for me to consider reducing the AAC in this determination in order to preclude over-committing the commercial timber harvest and creating otherwise avoidable socio-economic disruption. I have already noted that in response to the likelihood of imminent changes to management of caribou habitat I will return if necessary to redetermine this AAC sooner than required by statute, if the changes so warrant. If this were to happen shortly after the level of operations had been increased, this would invoke just those difficulties with instability which I have described.

Reducing the AAC to some extent now would achieve several objectives simultaneously. It would remove the possibility of creating a short-lived increase in the economic pressure on the land base, avoiding the noted instabilities and reducing the likelihood of an economic 'boom-and-bust' in the inevitable transition to lower, longer-term harvest levels. It would ensure that additional mature volumes are retained in the TSA, to reduce management problems in case either—or both—of the potential major risks partially or fully materializes, giving needed flexibility in meeting objectives for the range of other values, and compensating risks of overestimation in the future timber supply, for instance due to potentially needed adjustments to OAFs.

In assessing the appropriate size of possible AAC reductions in these circumstances, I have reasoned as follows. As discussed in Alternative Harvest Flows I have reviewed two forecasts using the same assumptions as in the base case but with alternative harvest flow constraints applied. As noted there I have also considered two further forecasts described in detail in the analysis report in which two different harvest flows were applied to a projection in which the following changes were made to those in the base case: Existing stand volumes were reduced by 5 percent (a median reflection of the range of possible overestimation suggested by the restratified audit; a reduction of 3197 hectares was applied to the timber harvesting land base (which corresponds roughly to the net operability overestimation of 3933 hectares noted above); and a 50-percent reduction was made to the OAF for unclassified trails and landings (the advisability of which is uncertain, pending the further work I have recommend in 'Implementation' below, but which in any case does not affect the short-term timber supply).

In one of the harvest flows in the two projections incorporating these assumptions the mid-term level was allowed to drop by 4.3 percent below that in the base case in order to project an initial harvest level at the current AAC. In the second projection the mid-term level was allowed to drop by only 2 percent from the base case to reflect the 3197-hectare operability reduction—this required the initial harvest level to be reduced by 19 percent to 431 000 cubic metres. In each case a long-term level reduction of about 1 percent was projected.

These analyses, and the sensitivity analysis discussed in *volume estimates for existing managed stands* clearly show the high sensitivity of the short-term timber supply to

reductions in existing volumes. As I noted in my considerations, in this situation it would be imprudent to entirely dismiss the indicated possibility of an overestimation of up to 10 percent in the volumes projected for existing stands. On the other hand, without further sampling it would also be inappropriate to assume the opposite extreme, that is, the maximum overestimation of ten percent. Rather, acknowledging the uncertainty in the information, it is reasonable to accept the indications of a possible overestimation, albeit of presently unknown magnitude and consequence, and to account for the associated risk to the timber supply to the extent of a median-value overestimation in the volumes, of roughly five percent.

While both of the forecasts discussed immediately above address such an overestimation in concert with an appropriate operability change and with the OAF adjustment, neither forecast indicates exactly what to do to account for the uncertainties identified in this determination. However, they both provide a helpful indication of at least some of the range of possible choices under the circumstances, ignoring any accounting for the compounding of uncertainties by possible changes in caribou management.

Remembering that the mid-term level in the base case is 440 000 cubic metres per year (subject to the identified uncertainties), that the current Forest Licence allocation is 426 542 cubic metres per year, that the current AAC is 530 000 cubic metres per year, and that from 1998 to 2002 the average annual harvest in the TSA has been about 400 000 cubic metres or 130 000 cubic metres per year less than the AAC, my conclusion from all of the foregoing information is as follows.

The responsible decision in the face of the significant identified risks to the short-term timber supply is to reduce the AAC by an amount that will provide management flexibility in the face of the identified risks, without compromising current and anticipated levels of economic activity in the TSA. In my judgement, a workable margin of safety can best be achieved by reducing the AAC now to a level in the mid-range of the starting levels of the two scenarios noted above, which may also help to avoid their respective projected mid-term reductions below the base case level. A determination at this level, a reduction of about 45 000 cubic metres, will achieve a transition to roughly halfway toward the mid-term level. It will also leave adequate volume in the Forest Service Reserve for any reasonable additional allocation needed for salvage operations from beetle damage or from unforeseeable events, as well as leaving some volume for further sales by BCTS. Importantly, it will leave currently allocated volumes untouched. It will also reduce the apparent availability of timber volumes for new licences when the declining timber supply and attendant risks indicate the need for caution in avoiding instability through fluctuations in forestry operations.

Having made this determination, I remain mindful of the potential compounding of the risk to the short-term supply that may arise from forthcoming expected changes to caribou management. Accordingly I re-iterate my commitment to return if necessary in response to approved changes to by government, to redetermine this AAC before the statutorily required period is complete.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years and that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the TSA by establishing an AAC of 485 000 cubic metres.

This determination is effective June 1, 2004, and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff and licensees to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects is dependent on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the TSA.

- *Area-based management*: The relatively even distribution of the area projected to be harvested annually over the forecast period indicates that this TSA could be considered for future regulation of the allowable harvest by area, rather than by volume. If the District Manager and licensees are willing to consider this in the future, then with enabling legislation, the management units considered for management by area could beneficially include the Golden TSA.
- *Roads, trails and landing*: In view of the associated uncertainties I recommend that, resources permitting, attempts be made to refine the approach to defining the various components of these land base and productivity losses, for future determinations.
- *Environmentally sensitive areas*: A helpful approach in reconciling uncertainties in this data would be to examine current trends across map sheets, for comparison with former ESA assessments. The degree of variation would indicate whether more detailed work is needed.
- *Site index*: In view of the potential benefits to timber supply projections, as identified in other parts of the province, I encourage licensees to apply for Forest Investment Account funding to carry out local field studies to refine estimates of site indices specific to the TSA for direct application in future timber supply analyses, rather than relying on the provincial OGSI or veteran figures. It is possible that underestimated OAFs could be offset by underestimated site indices.

- *Caribou habitat management*: I have asked to be provided with a sensitivity analysis indicating the projected combined impact on timber supply that may be expected from the changes to the caribou habitat land base indicated in the proposed revised map together with the increase from 40 percent to 60 percent in the old-plus-mature seral stage retained forest cover requirement.
- *Partial cutting system objectives*: To improve assessments of the effectiveness and desirability of continuing applications of partial cutting systems into the future, as well as to improve the accuracy of incorporating associated implications in timber supply analysis, it is important for BCFS staff, in cooperation with licensees, to obtain clear statements about the forest management objectives and motives in all applications of these systems. This means clarifying whether the objective of a harvest entry is to achieve beetle-proofing, to meet visual objectives, to initiate a shelterwood system, to carry out commercial thinning, to meet biodiversity objectives and so on, and clearly describing the structure and assessing the merchantability of a residual stand that will meet the desired objective. Studies are also needed to establish prescriptions that allow partial cutting systems to adequately address biodiversity objectives respecting old and old-plus-mature forest cover.
- *Existing volumes*: Completing Phase 2 of the Vegetation Resources Inventory is very important with respect to confirming appropriate volume assignments to the inventory figures for existing mature stands.

Larry Pedersen
Chief Forester

May 19, 2004

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut 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, community forest areas and woodlot licence areas, and
(b) each tree farm licence area.

(2) If the minister

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

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

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

(3) If

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

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

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

(5) In determining an allowable annual cut under subsection (1) 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, and
(b) different types of timber and terrain in different parts of private land within a tree farm licence area.
(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and
(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,
(ii) the expected time that it will take the forest to become re-established on the area following denudation,
(iii) silviculture treatments to be applied to the area,
(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

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

(c) [Repealed 2003-31-02.]

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

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

1998-29-2;1999-10-1; 2000-6-2; 2002-25-21;

2003-30-01; 2003-31-02

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

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

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in British Columbia;
(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;
(c) plan the use of the forest and range resources of the government, 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 co-ordinated and integrated, in consultation and co-operation with other ministries and agencies of the government and with the private sector;
(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and
(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

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

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

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: The Crown's Economic And Social Objectives Regarding Visual Resources

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis.*

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests