BRITISH COLUMBIA
MINISTRY OF FORESTS

Tree Farm Licence 3

Issued to Slocan Forest Products Limited

Rationale for Allowable Annual Cut (AAC) Determination

effective July 1, 1998

Larry Pedersen
Chief Forester

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Objective of this Document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the Forest Act, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 3. This document also identifies where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 3 is located in the West Kootenay region of the south central interior of B.C. The TFL is a single continuous unit which borders on Valhalla Provincial Park near the village of Slocan, about 40 kilometres north of Castlegar and south west of Slocan Lake. The TFL is held by Slocan Forest Products Limited and is administered by the Arrow Forest District which is part of the Nelson Forest Region.

The total land base used in the analysis for TFL 3 is 79 796 hectares of which 50 817 hectares (64 percent) are considered productive forest. The remaining 28 979 hectares (36 percent) are composed largely of alpine areas, rock, lakes, swamp, non-typed areas and existing roads. The forests of TFL 3 are distributed primarily among the Interior Cedar-Hemlock (ICH) and Engelmann Spruce Sub-alpine Fir (ESSF) biogeoclimatic zones. Because of the varied topography and climate, the licence area consists of a variety of commercial tree species including spruce, balsam (true firs), Douglas-fir, hemlock, and larch, as well as minor components of lodgepole pine and western redcedar.

Forestry, mining, tourism and agriculture are the principal forms of economic activity in the region.

History of the AAC

TFL 3, originally known as Forest Management Licence 3, was first awarded to Passmore Lumber Co. Ltd. in 1950. During the term of Management Plan (MP) No. 1, the timber harvesting land base of the TFL was 30 446 hectares and the company was authorized to harvest 50 970 cubic metres per year from a total licence area of 79 652 hectares.

In 1963, the TFL 3 was assigned to Pacific Logging Ltd, which constructed a new sawmill at the village of Slocan. The TFL was assigned to Pacific Pine Company Ltd. in 1970 whose name was later changed to Triangle Pacific Forest Products Ltd. Between 1969 and 1971 the AAC increased from 65 129 cubic metres to 126 693 cubic metres. This increase was largely attributable to the change from intermediate utilization to close utilization standards.

In 1978 the TFL was assigned to Slocan Forest Products Ltd. (“Slocan” or “the licensee”). MP No. 6 was approved in 1979, and the company was authorized to harvest 119 618 cubic metres per year from a slightly increased licence area of 79 687 hectares. An increase in the timber harvesting land base—to 37 539 hectares by 1979—was mainly

the result of improved inventory techniques resulting in the re-classification of the TFL land base.

The most recent Management Plan, MP No. 8, was approved for the period June 30, 1993 to December 31, 1997, and an AAC of 65 000 cubic metres was determined. The significant decrease in AAC was largely attributable to forest cover considerations assumed at the time of the associated timber supply analysis. The Nelson Region Habitat Guidelines—now superseded by the Code—were particularly constraining, and together with the spatial distribution of stands at the time of the 1993 determination, proved to be very restrictive on short term supply.

Under MP No. 8, a volume of 5400 cubic metres was administered under the Small Business Forest Enterprise Program (SBFEP). Slocan was granted a six month extension for MP No. 8 to June 30, 1998 to accommodate delays in completing the associated timber supply analysis for TFL 3.

Since 1978, Slocan has acquired and developed additional licences and production facilities in B.C. The company has a significant presence in the provincial forestry sector with mills and timber rights throughout the northern, central and southern regions of the province.

New AAC determination

Effective July 1, 1998, the new AAC for TFL 3 will be 80 000 cubic metres, an overall increase of 23 percent from the current level of 65 000 cubic metres. This AAC includes 4000 cubic metres which is partitioned to the alternative harvest areas, and 5400 cubic metres administered under the SBFEP.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for TFL 3 includes the following:

- Statement of Management Objectives, Options and Procedures (SMOOP) for Management Plan No. 9, TFL No. 3, submitted July 1996;
- TFL No. 3, Draft Management Plan No. 9, Slocan Forest Products Ltd., submitted March 1998;
- Timber Supply Analysis Information Package: TFL 3, Management Plan No. 9, Slocan Forest Products Ltd. (prepared by Sterling Wood Group, Inc., Consultants), accepted May 20, 1998;
- Timber Supply Analysis Report: TFL 3, Management Plan No. 9, Slocan Forest Products Ltd. (prepared by Sterling Wood Group, Inc., Consultants), accepted May 20, 1998;
- Twenty-Year Harvest Plan for TFL 3, 1998 to 2017, submitted March 1998;

- Public input solicited by the licensee regarding the contents of Management Plan No. 9;
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the Chief Forester, dated February 26, 1996, stating the Crown's economic and social objectives regarding visual resources;
- Letter from the Deputy Ministers of Forests, and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts of biodiversity management on timber supply;
- Technical information provided through correspondence and communication among staff from the British Columbia Forest Service (BCFS) and the Ministry of Environment, Lands and Parks (MELP);
- Existing stand yield tables for TFL 3, approved by BCFS Resources Inventory Branch, April 1, 1998;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Victoria on April 16, 1998;
- Managed stand yield tables and site index curves, approved by BCFS Research Branch, April 21, 1997
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Act Regulations*, April 1995;
- *Forest Practices Code of British Columbia* Guidebooks, BCFS and MELP;
- *Forest Practices Code, Timber Supply Analysis,* BCFS and MELP;
- May 4, 1998 letter from Ms. Kathy Howard, R.P.F. (Slocan Forest Products Ltd.) to Mr. C. Klasen, R.P.F. (Ministry of Forests) clarifying the management of minor deciduous volumes on TFL 3;
- Kootenay/Boundary Land Use Plan (KBLUP) Implementation Strategy, Kootenay Inter-Agency Management Committee, dated June 1997;
- 1998 Memorandum of Understanding (MOU) between Ministry of Forests and Ministry of Environment, Lands and Parks Regarding Instruction for the Preparation of the 1998 Forest Development Plans, dated November 14, 1997;
- Formal Establishment of Landscape Units and Biodiversity Emphasis Objectives for the Arrow Forest District, dated April 8, 1998; and,
- Letter from the Arrow Forest District Manager to Slocan Forest Products Ltd. clarifying the nature of the licensee's obligations regarding scenic area management within the Arrow Forest District, dated February 3, 1998.

Role and limitations of the technical information used

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

However, the analytical techniques used to assess timber supply are simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

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

In making the AAC determination for TFL 3, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

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

Guiding principles for AAC determinations

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

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

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

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

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

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

As B.C. progresses toward completion of strategic land use plans, the eventual timber supply impacts associated with the land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for sub-regional plans, the Protected Areas Strategy or the Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will eventually result from land-use decisions that have not yet been taken by government. Thus I do not consider the possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made land-use decisions—such as the March 1995 Kootenay Boundary Land Use Decisions—it may not always be possible to analyze the full timber supply impact in an AAC determination. In most cases, government's land-use decision must be followed by detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Although the

government has issued an implementation strategy for the *Kootenay-Boundary Land-Use Plan* (KBLUP), the actual impact of these decisions is not yet fully evident. Nonetheless, for this determination, I have accepted certain commitments in the KBLUP Implementation Strategy as statements of the Crown's social and economic objectives for the region and for the TSA. The legislated requirement for five–year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

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

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine all the AACs in the province between 1992 and 1996, many of which were outdated. 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 recent court decisions including those in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting those obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 3. 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 (MOF) as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the base case

In considering the factors required under Section 8 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 TFLs, the analysis work is carried out by licensees.

For each AAC determination 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, timber supply forecasts are produced. These include sensitivity analyses to assess the timber supply effects of uncertainties or changes in various assumptions around a baseline option, normally referred to as the "base case" forecast.

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

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

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

Timber Supply Analysis

The timber supply analysis for TFL 3 was conducted by Sterling Wood Group Inc. on behalf of Slocan Forest Products Ltd. Sterling Wood Group Inc. used a proprietary computer simulation forest estate model called TREEFARM. Based on previous experience in examining results from this model, I am satisfied that it is capable of providing a reasonable projection of timber supply.

The timber supply analysis examined harvest forecast options using three different assumptions for land base. These included a "gross productive land base", a "current land base" and an "expanded operability land base" option. The current land base option closely models current harvesting practices on areas accessible using conventional harvesting technologies on TFL 3 and therefore represents the base case (as discussed above under "The role of the base case").

For TFL 3, the base case projected an even flow harvest rate of 75 779 cubic metres per year. This represents the highest non-declining even flow harvest level and an increase of 17 percent over the current AAC of 65 000 cubic metres. The increase is largely attributable to the manner in which forest cover considerations were applied in the previous timber supply analysis, specifically the 20-year plan. At the time of the last analysis, the Nelson Region Habitat Guidelines—now superseded by the Code—stipulated that before harvesting any areas with 300 metres of a recently harvested block, the harvested block must reach a height of three metres. Also, only stands greater than 120 years old were normally selected for harvest. The combination of these two assumptions and the spatial distribution of stands at the time of the last analysis proved to be very constraining on short term supply.

In the current timber supply analysis, sensitivity analyses were provided in the timber supply analysis to assess the risk to timber supply resulting from uncertainty in data assumptions and estimates, and these have assisted me in considering the factors leading to my determination.

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

Section 8 (7)

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

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

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

Land base contributing to timber harvest

- *general comments*

The total area of TFL 3 as reported in the timber supply analysis is 79 796 hectares. The productive forested areas, excluding non-forest and non-productive areas, and existing roads, account for 50 817 hectares, or approximately 64 percent of the total TFL area.

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

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

- *non-forest and non-productive areas*

Included in non-forest areas are alpine areas, rock and lakes. In total, 27 207 hectares were deducted from the total TFL 3 land base. Standard procedures were followed in the analysis in excluding these areas.

- *non-commercial cover*

In the analysis, 191 hectares of non-commercial cover (brush) were identified as inoperable and deducted from the net productive land base. However, over the next eight years, the licensee expects to convert 80 hectares of non-commercial cover in high elevation areas to Engelmann spruce plantations so that in the future this area may contribute to the timber harvesting land base.

- *economic and physical operability*

The size of the timber harvesting land base in TFL 3 identified by the licensee is limited by physical and economic constraints. Slocan initiated an update of the TFL 3 operability inventory in 1994 to reflect advances in harvesting and silviculture technology. The update was accepted by the BCFS Arrow District Manager in 1996. In the timber supply analysis for TFL 3, Slocan deducted 17 118 hectares (34 percent) from the productive forest land base to account for areas classified as physically inoperable by conventional harvesting methods. In addition, the licensee removed 282 hectares of areas with slopes greater than 70 percent from the productive forest land because of especially difficult operating conditions.

The *conventionally* operable areas included those areas of productive forest on slopes less than or equal to 70 percent that were *within* the maximum possible distance of existing and proposed roads using ground-based and cable yarding equipment. Areas identified for *alternative* harvesting systems comprising 1860 hectares were not included in the base case. These are areas of productive forest *beyond* the maximum possible yarding distance of existing and proposed roads and include slopes up to 90 percent. They are accessible using low pressure ground systems, aerial and long-line cable systems.

The licensee provided an additional harvest forecast which included the alternative harvest areas and proposed that a partitioned harvest be established for these areas. Although the licensee has yet to demonstrate significant operations on such areas, BCFS district staff acknowledge Slocan's current forest development plan indicates a substantial amount of harvesting will occur in the alternative harvest areas in the near future. I also note that the alternative harvesting areas represent a relatively small addition to the timber harvesting land base. I will discuss this further under Partitioned component of the harvest.

I accept the assumptions and procedures used to derive economic and physical operability for the conventional land base, and am satisfied this factor has been modelled appropriately.

- *environmentally sensitive areas (ESAs)*

Some areas are environmentally sensitive or significantly valuable for resources other than timber. Based on the licensee's various resource inventories, 1548 hectares of ESAs were removed from the productive forest land base in the analysis. These deductions account for the protection of: sensitive soils and avalanche areas; difficult-to-regenerate areas; wildlife habitat (including areas for deer, elk, and mountain goat); and recreation areas.

Details of specific sensitive site categories are considered later in the section entitled, Integrated Resource Management Objectives.

- *low productivity sites, alpine areas and non typed land*

In the timber supply analysis, 2449 hectares of low productivity sites were removed from the timber harvesting land base. An additional 166 hectares of alpine areas were also deducted. These areas include marginal stands or non-forested areas which are not expected to produce a merchantable timber crop.

Approximately 516 hectares of non-typed land was also identified in the TFL 3 inventory. The correct classification was unknown and for the purposes of the analysis, the licensee appropriately deducted the area from the timber harvesting land base.

I accept the methodology and assumptions used to derive the above estimates for the purposes of this determination. I expect the licensee to clarify the classification of the 516 hectares of non-typed land before the next analysis.

- *deciduous forest types*

In the analysis, only the coniferous component of the forest was considered to be commercially valuable. Accordingly, 566 hectares of deciduous-leading stands were deducted from the productive forest land base.

Deciduous trees also occur as a minor component of coniferous-leading stands. However, yields attributable to deciduous species were not deducted when projecting existing stand yield volumes.

I note that in MP No. 9, Slocan has committed to utilizing the deciduous component of coniferous-leading stands. As a result, I accept the assumptions used for the purposes of this timber supply analysis.

- *non-merchantable stands*

In the analysis, 1091 hectares were deducted from the productive forest land base to account for areas occupied by timber stands of low volume and quality which are uneconomical to harvest. In the timber supply analysis, the licensee used the definitions from the 1994 timber supply analysis of the neighbouring Arrow TSA to identify non-merchantable stands. Reduction factors were applied primarily to the older hemlock and balsam stands. The licensee maintains the factors applied are likely more constraining than necessary for TFL 3 but was unable to provide revised factors.

Although the Arrow TSA is an adjacent management unit with similar forest conditions, it is uncertain if the assumptions applied in that analysis adequately reflect merchantability conditions on TFL 3. However, in the absence of better information, I am prepared to accept the assumptions used. Thus, for the purposes of this determination, I accept the information as modelled but expect the licensee to either confirm the appropriateness of applying the Arrow TSA factors or provide information specifically representative of conditions on TFL 3 for the next determination.

- *estimates for roads, trails and landings*

To account for *existing* roads, trails and landings, the licensee deducted 1191 hectares from contributing to the timber harvesting land base. This area amounts to 4.5 percent of the timber harvesting land base. To estimate the deduction, the licensee multiplied the length of each road type (i.e., main road, branch, spur or trail) by the corresponding average road clearing width, which was based on a survey of existing road types in the TFL. The resulting area was subtracted from the land base as an area-weighted deduction to each analysis unit across all age classes. District staff concur with the overall area deducted. I note the licensee deducted the estimate for roads from the entire area that would otherwise contribute to timber harvesting, rather than more appropriately from the portion of the TFL currently developed with roads.

It is possible that less area of mature forest has been roaded than implied by the method used to determine existing roads. However, I am not certain if there is a significant inaccuracy, and if there is one, I am uncertain of its magnitude. Given concurrence on the overall area deducted, I am prepared to accept the method used for the purposes of this determination.

For *future* roads, trails and landings, the licensee divided the area of stands older than 40 years by the timber harvesting land base and multiplied the resultant by the 4.5 percent derived for existing roads, arriving at 3.5 percent. The licensee then applied the 3.5 percent to the area older than age 40 and arrived at a land base reduction of 740 hectares. I do not find this method suitable because the percentages derived for existing roads would have been higher had the existing road area been expressed as a percentage of the land base that is currently developed, rather than in terms of the entire timber harvesting land base. This higher percentage applied to the area that will be accessed in the future (e.g., the area over 40 years) would more accurately reflect the area that will be

required for roads in the future. Based on a review of recent annual reports submitted by the licensee, BCFS District staff suggest that a six percent reduction is more representative. I agree with their assessment and in addition find a six percent deduction for future roads, trails and landings to be consistent with my experience with similar units elsewhere in the province.

In conclusion, I find the assumptions applied in the timber supply analysis for *existing* roads, trails and landings are acceptable. However, in reviewing the concerns raised regarding *future* roads reductions, I conclude that the long term timber harvesting land base is overestimated by less than 2.5 percent. On the basis of the sensitivity analysis of the land base contributing to timber harvest (discussed under *general comments*), I conclude that the corresponding impact on timber supply is approximately equivalent, and have taken this into account as discussed below under "Reasons for decision".

Existing forest inventory

- *age of the inventory*

The original inventory of TFL 3 was completed in 1966. A re-inventory of TFL 3 was conducted during 1992 and 1993 and completed to BCFS standards. The inventory information used in the analysis was updated for depletions to January 1, 1997, and for growth to January 1, 1995. I note that the inventory has been kept up-to-date and I accept the inventory data as the best available information and, as such, suitable for the purposes of this determination.

- *age-class distribution*

Approximately 9 percent of the timber harvesting land base is covered by stands more than 250 years old, 29 percent by stands between 100 and 250 years old, approximately 41 percent by stands between 60 and 100 years old and 21 percent by stands less than 60 years old. Stands between 60 and 70 years old represent the most abundant age class of TFL 3, comprising approximately 21 percent of the timber harvesting land base.

- *species profile*

The TFL 3 timber harvesting land base consists of stands comprised primarily of Douglas-fir, larch, spruce, hemlock and pine. Less common are stands dominated by western redcedar and balsam.

Approximately 37 percent of the timber harvesting land base is covered by the Douglas-fir inventory type group. This group includes Douglas-fir-, larch- and yellow pine-leading stands. Spruce-, hemlock- and pine-leading stands comprise a further 31 percent, 16 percent and 10 percent of the timber harvesting land base respectively. The pine stands include those dominated by either lodgepole or white pine.

- *volume estimates for existing stands*

Volume estimates for existing stands were derived using the Variable Density Yield Projection (VDYP) model. VDYP is based on information gathered from a large number of sample plots throughout the province, and is generally accepted in B.C. as an adequate model for projecting volumes in existing natural stands. As a general rule in making AAC determinations, and in the absence of statistically valid contradictory evidence for a particular area, I rely on VDYP estimates for existing natural stands. For TFL 3, existing stand yield projection methods used in the timber supply analysis followed accepted procedures.

BCFS staff completed an audit of the TFL 3 inventory in 1997. The audit reported a significant volume overestimate for existing stands over 60 years old in the total productive land base. Statistical analysis and interpretation of the audit results by BCFS staff indicated that most of the overestimate was attributable to problems with the inventory attributes, notably over-estimated tree heights.

BCFS Resources Inventory Branch staff compared the average volume per hectare of the inventory of stands older than age 60 to the average volume per hectare derived from the audit for the operable land base from the previous timber supply analysis for TFL 3. This comparison indicated that the average volume of the stands used in the analysis is approximately 10 percent higher than the audit estimate, but nonetheless is within the 95 percent confidence limits of the audit mean. Another statistical test suggested that the possibility of up to a 10 percent overestimate of existing stand volumes should be considered in the timber supply analysis. The licensee agreed with this assessment and provided a sensitivity analysis to demonstrate the impact of a 10 percent volume overestimate on the base-case harvest flow. When existing mature stand volumes were reduced by 10 percent, the even-flow harvest forecast was reduced by 4.3 percent.

I accept the information provided by the inventory audit of TFL 3. I am mindful that the results of the audit suggest a moderate downward impact on the TFL 3 timber supply. However, the audit results do not provide a firm quantification of this impact and I have taken this factor into account in my “Reasons for decision”.

Expected rate of growth

- *site productivity estimates*

Inventory data includes estimates of site productivity for each stand, expressed in terms of a site index. A site index is based on the height, as a function of the age, of a particular stand of trees. The productivity of a site largely determines how quickly trees will grow, and therefore affects the volumes of timber that will grow in regenerated stands and time required for these stands to reach a merchantable size or minimum harvestable age. In addition, site productivity influences the time seedlings will take to reach green-up conditions, and the age at which stands will satisfy mature forest cover requirements

Generally, stands between 30 and 150 years of age provide the most accurate measurement of site productivity. Site indices determined from both young stands (less than 30 years old), and old stands (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.

For TFL 3 the licensee used current BCFS site curves to assign site indices for stands older than 30 years. Polygons with the same leading species were then grouped and assigned to one of five productivity classes. Areas in the lowest two productivity classes were designated as low site and deducted from the land base (see *low productivity sites, alpine areas and non typed land*).

For stands less than 30 years old, productivity classes were assigned based on the distribution of productivity class by area of stands older than 30 years of age. The licensee then derived area-weighted site index values for each analysis unit using VDYP. Where the licensee intends to regenerate portions of some analysis units to different species, standard BCFS site index conversion equations were applied. Research Branch staff reviewed the site index values and approved them on March 11, 1998.

In other areas of the province, studies suggest that site indices may be higher than indicated by existing data from mature forests. Although no local information specific to TFL 3 was available, the licensee provided a sensitivity analysis to show the impact of adjusting old growth site index using the interim “Old-growth Site Index Adjustment Equations and Application Guidelines” published by BCFS Research Branch. The sensitivity analysis showed that an even flow harvest forecast could be increased by six percent over the base case harvest level.

While further provincial field studies may suggest that adjustments to old growth site index in TFL 3 are warranted, there is presently no specific information that applies to this unit. Until definitive information is available for TFL 3, I will accept the site index assumptions in the base case. I recognize that general trends observed elsewhere in the province do suggest that a potentially favorable impact on timber supply in the order of magnitude shown in the sensitivity analysis may be expected. The licensee has employed inventory information and recent provincial studies to examine the likely range of the timber supply given the uncertainty in site productivity. Based on the above discussion, I have considered the likelihood that site productivity may be underestimated in my "Reasons for Decision".

- *aggregation procedures*

For the timber supply analysis, the inventory for TFL 3 was aggregated into 27 analysis units based on inventory type group (leading species), second species, productivity class, biogeoclimatic zone and elevation. The inventory is further categorized by landscape unit, biogeoclimatic variant and management zone to enable the application of forest cover requirements.

I have reviewed the approach used and consider the licensee's analysis unit definitions and aggregation procedures to be acceptable for use in this determination.

- *volume estimates for regenerated stands*

Volume estimates for regenerated stands were derived using the Table Interpolation Program for Stand Yields (WinTIPSY version 1.3) growth and yield model. This computer program was developed by the BCFS and is generally accepted in B.C. as an appropriate model for projecting yields from managed stands. In the analysis, all existing natural stands less than 20 years old, existing planted stands less than 60 years old as well as future regenerated stands are assumed to be managed.

When regenerated species are different from the existing species, site index was adjusted using available site index conversion equations developed by BCFS Research Branch. All yield tables were reviewed and approved by Research Branch staff for use in the analysis.

I am satisfied that the assumptions and methods used in the base case to estimate regenerated stand volumes appropriately represent past and likely future management and are based on suitable growth models. I therefore find them acceptable for use in this determination.

- *operational adjustment factors (OAFs)*

To account for the loss of timber volume due to operational conditions, Operational Adjustment Factors (OAFs) were applied to the yield projections for regenerated stands used in the timber supply analysis. OAF 1 was applied for unmappable, non-productive land, irregular tree spacing, and losses from endemic pests and disease. OAF 2 was applied to account for decay and for waste and breakage factors during harvest.

Standard factors of 15 percent and 5 percent were used for OAF 1 and OAF 2 respectively, except in spruce leading stands where Slocan increased OAF 2 to 10 percent to account for unusual losses from the spruce weevil. BCFS Research Branch staff reviewed the assumptions and consider the OAF 2 appropriate for stands exposed to a low level of attack. I note this is consistent with the licensee's intention of avoiding spruce plantation establishment on sites with a high risk of weevil infestation. I therefore accept the licensee's assumptions regarding operational adjustment factors as appropriate for use in this determination.

- *minimum harvestable ages*

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

In the TFL 3 timber supply analysis, minimum harvestable ages were intended to be assigned based on the age at which a stand attains a volume of 150 cubic metres per hectare. The analysis model TREEFARM requires that both volume and age requirements be met before a stand can be harvested. For example, those analysis units assigned a minimum harvest age lower than was required to attain 150 cubic metres per hectare would be harvested at 150 cubic metres per hectares since both criteria must be satisfied in TREEFARM. During the preparation of the information to be used in the analysis, the licensee submitted yield tables to BCFS Research Branch staff for review and approval. However, prior to approval these yield tables were modified by the licensee but the corresponding minimum harvestable ages were not corrected. As a result, the minimum harvest ages used in the analysis were generally overestimated.

The licensee performed a sensitivity analysis to show the impact on timber supply of varying minimum harvestable age. The results showed that changing the minimum harvestable age does not significantly alter the stability of the harvest flow. Increasing the minimum harvestable age increases timber supply because stands are harvested closer to the age of culmination of mean annual increment. Conversely, decreasing the minimum harvestable age decreases the harvest flow as stands are harvested further away from culmination. Harvesting stands on the basis of 150 cubic metres per hectare appears

to decrease timber supply relative to the condition when minimum harvest age is assigned based on the age of maximum average productivity.

I note that predicting the age at which stands may be harvested in the future is difficult and subject to considerable uncertainty. However, having considered the age and volume criteria which were applied in the analysis, I accept the minimum harvestable ages modelled in the base case as satisfactory for use in this analysis. However, I remain mindful of the uncertainty regarding the choice of minimum harvestable ages and the effects of the assumptions made in the analysis, and have considered this in my determination. I expect the licensee to continue to review the assumptions of minimum harvestable age at the time of each reanalysis and to update or revise them as operating experience or further considerations might dictate.

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

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. The timber supply analysis assumed an average two-year regeneration delay for all stands, except high elevation spruce-balsam stands where a four-year delay was assigned.

In the analysis, the regeneration delays were appropriately applied to yield tables for regenerated stands. For existing stands, a regeneration delay was incorporated by generating yield tables in ten-year increments starting at age three and assigning the yield to the midpoint of each age class. I note that accepted procedure is not to adjust existing stand yields for regeneration delay. In effect, yields for existing stands of a given age on TFL 3 were assigned the yield of stands that were two years younger. Although this will reduce the yields at harvest to a minimal extent, it introduces no risk to this determination.

I note the regeneration delay periods are supported by field data provided by Slocan and acknowledge the licensee's intent to regenerate all harvested areas promptly. I also acknowledge that the application of a regeneration delay to existing stands will reduce yields at harvest to a minor extent. Given the small magnitude of the differences, I have made no adjustments to account for this factor.

Not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are areas of productive forest land that have been denuded and have failed, partially or completely, to regenerate either naturally or by planting or seeding to the specified or desired free growing standards for the site.

For TFL 3 there are 944 hectares of NSR area on the timber harvesting land base. I acknowledge the licensee's commitment to continue to rehabilitate all NSR areas to a fully stocked condition. Forty hectares is presently classified as backlog NSR (NSR area where harvesting occurred before 1987), and the balance is considered current NSR. In the analysis, the NSR area was distributed to each analysis unit in proportion to the area currently harvested by the licensee. BCFS District staff accept these assumptions as reflecting current practice and I find them reasonable for use in this determination.

Impediments to prompt regeneration

The licensee's ESA inventory identified 816 hectares of areas where stand regeneration would be difficult to re-establish. These areas occur primarily on high elevation cold sites and were appropriately removed from the timber harvesting land base. I have no reason to disagree with the assumptions provided, and accept that this factor has been accounted for appropriately.

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

Silvicultural systems

The predominant silvicultural system currently used on TFL 3 is clearcutting (with retention of wildlife trees), accounting for over 95 percent of the area harvested annually. The remaining area is harvested using patch cut, shelterwood, single tree and group selection systems when and where the silvicultural characteristics of the stand, or management for non-timber resources are best served by their application.

The licensee has indicated that in the future, it expects to increase the frequency of reserves in areas scheduled for clearcutting. The reserves are intended to contribute to wildlife, water, visual and biological diversity values. The licensee projects that approximately 57 percent of the area will be harvested using the clearcutting with reserves system, a further 33 percent will be clearcut and the remaining 10 percent will be harvested using patch cuts. Where appropriate, a minor component of harvesting will be conducted using the seed tree and shelterwood systems.

In the timber supply analysis, the entire area was modelled as being clearcut with no specific accounting made for the small area that is currently harvested using other silvicultural systems. I acknowledge that, while methods to more accurately reflect partial cutting systems in growth and yield models and timber supply analyses are

currently being developed, there is still considerable uncertainty with the methods used to model these systems. Due to the relatively small area that is currently harvested using systems other than clearcutting, I am satisfied that this factor does not introduce significant risk into my decision. I therefore accept the information as modelled for use in this determination.

Silvicultural treatments

Basic silviculture on TFL 3 includes site preparation, planting of suitable species, and treatments to ensure that regenerated areas achieve free-growing status within a specified time. In the timber supply analysis, harvested areas are assumed to be regenerated with a mix of various coniferous species through planting and natural regeneration. Initial densities were modelled at 4000 stems per hectare for natural regeneration, 1300 stems per hectare for planted species and 1200 stems per hectare for spaced stands. The regeneration assumptions applied reflect current practice and I accept them for use in this analysis.

Intensive silviculture

Intensive silviculture activities include commercial thinning, juvenile spacing, pruning, fertilization, and genetic improvement. I will discuss these treatments below under their appropriate sections.

Intensive silviculture activities are only practiced to a limited extent on TFL 3. I acknowledge the licensee's interest in exploring the potential for increasing timber supply by applying more intensive silvicultural treatments. While these activities may provide an opportunity to increase timber supply, without a comprehensive strategy or proven application of these activities in the TFL, I cannot account for any potential increase in timber supply in this determination. If and when these potential treatments become current practice, their implications will be assessed in future AAC determinations.

- *genetic improvement*

Genetically-improved planting stock for many commercial tree species is currently being used across the province. The aim of tree improvement is to breed trees with increased growth rates, improved wood properties and greater resistance to insect pests and diseases. On TFL 3 the licensee acquires a significant amount of improved interior spruce seed for reforestation and has committed to increasing the use of improved seed in future reforestation plans. However the licensee did not provide any modelling of the potential timber supply impacts of improved seed.

I acknowledge the licensee's commitment, recognizing that the use of improved seed will likely increase yields and enhance future timber supplies. However, for this determination, the impact of tree improvement on the TFL 3 timber supply remains unquantified and I have taken this into consideration in my determination, as discussed

under “Reasons for Decision.” I request the licensee to provide more explicit modelling of tree improvement activities for the next AAC determination.

- *fertilization*

No fertilization was assumed in the timber supply analysis. The licensee has committed to establish trials to investigate the benefits of fertilization, but no treatments have yet been applied on TFL 3. If and when any fertilization plans are implemented operationally, I will consider any impacts in future determinations.

- *juvenile spacing*

In the timber supply analysis, 331 hectares of stands were assumed to be regenerated as juvenile spaced stands. The majority of this area—241 hectares—has been treated since 1992. I am satisfied that the spacing assumptions used in the model reflect current practice, and therefore accept them for use in this determination.

- *commercial thinning*

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

The licensee has developed a commercial thinning policy to identify potential stands for treatments. The licensee has also committed to implementing a field trial with associated growth and yield plots. However, no commercial thinning is currently being undertaken on TFL 3 and it was correctly not modelled in the timber supply analysis. I acknowledge that the timber supply analysis reflects current operational practice and thus have made no associated adjustment to the base case projection for this determination.

(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:

<u>Utilization standards</u>

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. These standards were incorporated into the timber supply analysis for TFL 3 to estimate minimum merchantable stand volume. For lodgepole pine and whitebark pine, the utilization standards used were a 12.5 centimetre minimum diameter at breast height (dbh) with a 30-centimetre stump height and 10-centimetre top diameter inside bark. For all other species a 17.5-centimetre minimum dbh with a 30-centimetre stump and 10-centimetre top diameter inside bark were used.

The utilization standards used in the analysis are consistent both with current operational practice and provincial standards, and I find them reasonable for use in this determination.

Decay, waste and breakage

To account for decay, waste and breakage, the licensee applied data specific to the licence area (Special Cruise #303) to the VDYP model used for estimating volumes in existing stands. This approach was reviewed and accepted for use in this timber supply analysis by staff of the BCFS Resources Inventory Branch.

I consider the estimates for decay, waste and breakage used in the timber supply analysis to be appropriate and reflective of the best available information.

(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.

- *non-timber resource inventories and assessments*

The inventory of environmentally sensitive areas (ESAs) was updated during 1993 and 1994 during the re-inventory of TFL 3. A 1995 inventory report summarizing the results of the re-inventory, identified weaknesses in the available information for wildlife, fisheries, landscape, and cultural heritage resources and suggested additional information be collected. To date, inventories for riparian resources, landscape and cultural resources have subsequently been improved. These inventories were used in developing data assumptions for the timber supply analysis as further discussed below under the appropriate sections.

- *sensitive soils*

Areas with environmentally sensitive soils were identified during the 1993 re-inventory of TFL 3 as either extremely fragile and unstable (Es1), or moderately fragile and unstable (Es2). Depending on the degree of sensitivity, a proportion of these areas was deducted from the land base. Overall, 9258 hectares were deducted from the total productive forest to account for soils ESAs. These deductions were reviewed by BCFS district staff and found to appropriately reflect soil conditions and current practices.

More recently, the licensee completed a "Level D" intensity *(Mapping and Assessing Terrain Stability Guidebook*) terrain stability survey for the TFL that identified the Airy/Tindale watersheds as requiring more detailed terrain classification. A "Level B" intensity survey was subsequently completed for this area. Although this classification was not used in the timber supply analysis, the information is used to guide Slocan's operations in the Airy/Tindale watersheds. The licensee intends to eventually replace soils ESAs for the entire TFL with further, more detailed terrain assessments which should be incorporated into future analyses.

For this determination, I find the reductions for sensitive soils used in the current analysis to represent the best available information and to suitably reflect current practices.

- *avalanche considerations*

The mountainous terrain of TFL 3 includes areas prone to avalanches. Avalanche ESAs are applied where the removal of forest cover from steep slopes can create potentially destructive snow movements. In the base case analysis, 90 percent of each area identified in the ESA inventory as sensitive to the occurrence of avalanches (218 hectares) was deducted when determining the timber harvesting land base.

I find the reductions to reasonably reflect existing information and practice and have made no further adjustments. Avalanche tracks and adjacent areas are also important Grizzly bear habitat (see *wildlife habitat* below).

- *archaeological sites*

An Archaeological Overview Assessment was conducted for the Arrow Forest District in March 1996. The assessment identified areas on the TFL that have a high, medium or low probability of containing archaeological sites, or may require more detailed Archaeological Impact Assessments (AIAs). AIAs conducted recently on the Lower and Upper Little Slocan Lakes identified three significant archaeological sites located outside the timber harvesting land base. In addition, a culturally modified tree and a possible burial site were discovered. These two sites had a negligible impact on the timber harvesting land base.

At this time I have no information to suggest whether or to what extent the timber supply in TFL 3 may be affected by archaeological or historical values. To date, no archaeological sites found have significantly impacted the timber harvesting land base. However, I expect additional assessments will be completed before the next timber supply analysis. If the results of these assessments indicate the need for exclusion of additional archaeological sites from the timber harvesting land base, the impact on timber supply will be considered in future AAC determinations.

- *recreation*

TFL 3 provides various recreational opportunities including boating, camping, hiking and fishing. Within TFL 3 there are several areas of high recreation use including a canoe launch on Little Slocan Lake, a BCFS campsite at Grizzly Creek, a high elevation lodge near McKean Lakes, as well as access to Valhalla Park and campsites at Drinnon Lake.

The current recreation inventory consists of ESA information acquired from BCFS recreation data. Four hundred eighty-five hectares of recreation areas were identified and 364 hectares were removed from the timber harvesting land base. BCFS District staff advise that the deductions reflect current practices that reserve most ESAs from harvesting.

Using BCFS recreation standards, the licensee completed a more detailed recreation inventory in August, 1997 to assist future forest management planning. The information was not compiled and available in time for use in this timber supply analysis, however it will be available for subsequent analyses. For the purposes of this determination I am satisfied that the licensee has adequately accounted for recreation concerns.

- *wildlife habitat*

TFL 3 supports a diversity of large mammal species including elk, white-tailed deer, mule deer, black bear, grizzly bear and mountain goat. Ungulate winter range areas initially identified for the CORE process were applied during development of the KBLUP. The ungulate winter range areas within TFL 3 also overlap with the areas proposed by the KBLUP Implementation Strategy for regional connectivity corridors. Connectivity corridors are land and water areas with characteristics that make them suitable for providing linkages among later successional ecosystems. Maintenance of connectivity corridors is considered important for maintaining biodiversity.

Slocan has initiated a multi-year project to better define ungulate winter range areas. However, in the analysis, the licensee did not provide any explicit modelling of ungulate winter range requirements. Visual Quality Objectives (described below under *visually sensitive areas*) were modelled and overlap most of the areas identified as ungulate winter range. I note the constraints applied in the analysis for visual quality will maintain the forest in a condition similar to that required for winter range. While I am satisfied that the provisions of winter range have been adequately accounted for, I expect the licensee to explicitly model ungulate winter range in the next timber supply analysis.

Wildlife ESAs for TFL 3 including information on goat and deer, were updated during the reinventory in 1995. The licensee deducted 622 hectares from the productive forest land base to account for goat and deer habitat requirements. MELP staff are concerned that the winter range habitat needs of goats were not explicitly modelled. However, no additional information on goat habitat requirements was available at the time of the analysis. Having reviewed this issue, I find the licensee used the best information available at the time of the analysis and this provides an acceptable approximation of the impacts of goat and deer winter range on timber supply for use in this determination. I expect this uncertainty to be further clarified for the next determination.

Grizzly bear habitat was also not explicitly modelled in the TFL 3 analysis. Some grizzly bear habitat was addressed indirectly through the avalanche ESA land base reductions described earlier (see *avalanche considerations*). It was assumed that seral stage targets for landscape-level biodiversity, modelled in a manner that reflects the KBLUP Implementation Strategy, will adequately account for grizzly bear habitat.

The biodiversity and riparian provisions of the *Forest Practices Code* are intended to provide for the needs of most wildlife species. However, some wildlife species at risk require special management practices. The Identified Wildlife Management Strategy, now released for public review, will provide direction for managing critical habitat for identified wildlife species. One identified wildlife occurrence (a goshawk nest) was noted, but not considered in the analysis. It is unclear if the nest is located within the timber harvesting land base and therefore I am unable to assess the potential impact on timber supply at this time. If in the future the site is established as a wildlife habitat area, it will be factored into the next AAC determination.

While I anticipate additional areas for identified wildlife may be required as inventories continue to be updated, and the location and habitat requirements of species at risk are determined, I also expect that mitigation strategies will be developed to minimize the timber supply impacts. For the purposes of this determination, I am satisfied the licensee used the best wildlife habitat inventory data available at the time the information package was prepared for the timber supply analysis.

In conclusion, the extensive overlap of the ungulate winter range with the VQO management zone on TFL 3 indicates that the uncertainty associated with ungulate winter range generates little risk to short term timber supply. The information used in the analysis for other wildlife species is the best available. At this time it is impossible to quantify the extent of any further area that may be required to protect wildlife habitat on TFL 3, but I note that government has made a commitment to limit the impacts of managing identified wildlife species to one percent of the provincial timber supply. Taking these considerations into account, I conclude that identified wildlife habitat requirements present a downward but as yet unquantified pressure on timber supply over the forecast harvest period, and have considered this in my “Reasons for decision”. I request that the licensee be prepared to provide more detailed information on identified wildlife habitat for the next timber supply analysis.

- *riparian habitat*

The timber supply analysis for TFL 3 includes assumptions that account for the protection of riparian resources. Riparian habitats occur along streams and around lakes and wetlands. The *Forest Practices Code* requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting in order to protect riparian and aquatic habitats. Stream riparian classes are designated S1 to S6 depending on the presence of fish, stream channel width, and presence of community watersheds.

For approximately 90 percent of the operable area within TFL 3, the licensee identified and classified rivers and tributaries greater than three metres wide and some streams less than three metres wide using both aerial photography and field reconnaissance. These streams, lakes and wetlands were then incorporated into the licensee's GIS database.

As described in the *Riparian Management Area Guidebook*, riparian buffers were created adjacent to the streams, lakes and wetlands to approximate the land base reductions to be applied for riparian areas. Within RMZs, the guidebook recommends maximum overall levels of basal area retention for each class of stream, wetland or lake. These are 50 percent for S1 to S3 streams, 25 percent for S4 and S5 streams, and five percent for S6 streams. However, in the timber supply analysis for TFL 3, the licensee assumed that on average, 50 percent of the basal area would be retained along all of the classified streams including S4 to S6 streams. As a result, the deducted area attributed to the RMZ areas for classified S4 to S6 streams may be overestimated.

As noted above, the figures stated in the guidebook are intended to reflect the recommended *maximum* average level of retention by stream class. Further operational experience on TFL 3 is needed to determine the *actual* retention levels required to adequately protect riparian values, and these levels may prove to be less than those used in the analysis. Any new information specific to TFL 3 concerning appropriate basal area retention levels can be applied in future analyses.

An additional 1240 kilometres of streams, comprising 72 percent of the total length of streams identified in the inventory, were also identified on TFL 3 but these were not classified. No area for riparian reserves or management zones was deducted for the unclassified streams. MELP staff expressed a concern that some S4 streams may not be fully accounted for in the inventory.

Information provided by the licensee indicates that 77 kilometres, or 6.2 percent of the total length of unclassified streams are located within the physically operable land base on slopes that are less than 20 percent (S4 streams are more likely to occur on these gentler slopes). Some of these streams occur upslope of steeper areas and are more likely non-fish-bearing S6 streams. Other unclassified streams flow through areas of the TFL that do not contribute to timber harvesting but are located within the physically operable land base. As a result, the 77 kilometre estimate should be considered an upper

maximum for S4 streams. I also note that if the entire 77 kilometres were comprised of S4 streams, the additional land base deduction would amount to only 115 ha.

I have considered all of the above factors, and note that both the methodology used and incomplete stream classification, work to both increase and decrease the timber supply respectively. While I am uncertain about the exact degree to which these influences may offset one another, in the absence of better information, I am prepared to accept the estimates of riparian habitat as defined in the analysis, and will make no adjustments for this determination.

I note that regardless of the assumptions made for the analysis, the licensee will still be required to meet the standards of the *Forest Practices Code*. Notwithstanding this requirement, I expect the licensee to refine the riparian inventory and classification for use in the next timber supply analysis and determination.

- *green-up and adjacency*

Green-up time refers to the period following harvesting necessary for a regenerating stand to attain a specified height and stocking. Current harvesting practices limit the size and shape of cutblocks, and prescribe minimum green-up conditions as a means of moderating the effect of additional harvesting in adjacent stands. Adjacency and green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

In the TFL 3 base case analysis, the licensee used a green-up height of three metres in the integrated resource management zone. The licensee assumed that at any time, at least 67 percent of stands in the timber harvesting land base of this zone must be covered by trees greater than three metres tall. The methodology used is typical of many timber supply analyses but I note that the KBLUP Implementation Strategy permits the use of a two-metre green-up age, not the three-metre green-up age applied in the analysis. Based on discussions with BCFS District staff, I have determined that the two-metre green-up height is currently being applied on TFL 3 and, while this was not the case when the information package was being developed, it would now be appropriate to model a two-metre green-up.

Sensitivity analyses provided by the licensee demonstrated that the timber supply in TFL 3 is not greatly affected by changes in green-up requirements. Decreasing the green-up height in all zones by two metres increased the base case harvest forecast by less than three percent.

The licensee also provide a sensitivity analysis to demonstrate the effect of changing the disturbance allowed by forest cover requirements for all zones by 10 percent of the base case assumptions. The analysis showed that increasing and decreasing the allowable disturbance requirement decreased and increased timber supply by 2.3 and 1.1 percent respectively. In the analysis, I note the use of a three-metre rather than a two-metre green-up height may provide a small upward pressure on timber supply and have discussed this below under "Reasons for decision".

- *watershed considerations*

There are no community watersheds within the boundaries of TFL 3. However, there are several domestic watersheds, primarily in the Airy creek watershed, which supply drinking water and irrigation for nearby households and farms. The watershed management zone—one of four zones delineated to account for different management objectives—comprises these domestic watersheds and includes 4080 hectares of the timber harvesting land base. The licensee has committed to implementing the domestic watershed guidelines identified in the KBLUP Implementation Strategy through a memorandum of understanding with the BCFS.

In the analysis, the licensee applied the most restrictive combination of forest cover conditions to the watershed management zone to account for water resources. Maximum disturbance levels were derived by area weighting the allowable disturbance percentages for VQO and IRM concerns which overlap the watershed zone. In addition, the licensee assumed a nine-metre minimum green-up period to achieve hydrological recovery. I note forest cover assumptions used to model watershed considerations correlate well with the results of a watershed assessment performed on the Airy creek drainage.

For the purposes of this analysis, I find the methods used by the licensee adequately represent watershed considerations on TFL 3 and are therefore suitable for use in this determination. I acknowledge Slocan's stated Management Plan objective to ensure that water resources are not compromised, and its commitment to follow the domestic watershed guidelines identified in the KBLUP Implementation Strategy. I also request that the licensee provide more explicit modelling of water resources for the next analysis.

- *visually sensitive areas*

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

quality objectives (VQO) for these visually sensitive areas. The objectives limit the amount of visible disturbance that is acceptable in these areas.

To meet these objectives, constraints must be placed on timber harvesting, road building and other forest practices in the sensitive areas. The constraints are based on research and experience and on public preferences and acceptance of degrees of alteration of visual landscapes. The constraints are normally expressed in terms of forest cover requirements that relate to the maximum allowable percentage of a viewshed that can be harvested at any one time, and to "visually effective green-up"—that is, the stage at which regeneration has been shown to be visually satisfactory to the public.

During the term of MP No. 8, the licensee completed a visual landscape inventory along the Little Slocan Lakes and the Highway 6 corridor to the east of the TFL. The inventory covers areas where visual quality is of potential significance. From this data the licensee has delineated a VQO management zone covering 3446 hectares, or 13 percent of the timber harvesting land base.

In the analysis, the licensee applied an area-weighted average forest cover constraint expressed in terms of allowable alteration percent and green-up age in the VQO zone. Visually effective green-up was assumed to be the age when regeneration achieved a five-metre top height.

Although visually sensitive areas for TFL 3 have been broadly identified, specific VQOs have not yet been established for most of the TFL. I note that the KBLUP Implementation Strategy does provide direction for visual management to only a small part of the TFL (Frog Peak area). As a result, the assumptions used in the analysis do not, for the most part, reflect current management. However, much of the VQO zone overlaps with the ungulate winter range area and has helped provide me with a perspective of the impact of ungulate winter range requirements on timber supply. As discussed under *wildlife habitat*, the constraints applied in the analysis for visual quality by circumstance maintain the forest in a condition similar to that required for ungulate winter range.

In summary, I find the accounting used to model visually sensitive areas as adequate for use in this determination. Any uncertainty about the extent to which visually sensitive areas were modelled will be absorbed by the more constraining requirements of ungulate winter range. As VQOs are further clarified and established on TFL 3, the information can be incorporated into future analyses.

- *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. Under the *Forest Practices Code,* biodiversity in a given management unit is assessed and managed at the stand and landscape levels.

- *stand-level biodiversity*

Provisions for stand level biodiversity ensure the maintenance of structural diversity and habitat through the retention of wildlife tree patches, leave trees and coarse woody debris.

In the timber supply analysis, the licensee used the *Biodiversity Guidebook* to estimate the proportion of cutblock area required for stand-level biodiversity. A three-percent reduction to stand yields was applied to account for wildlife tree patches. I note the three percent reduction did not consider that in accordance with the guidebook, up to 50 per cent of the requirement may be met in riparian and other constrained areas. However, the licensee's method broadly reflects the intent of the *Forest Practices Code* and is consistent with the limits identified in the *Biodiversity Guidebook,* and I therefore accept the assumptions used to account for stand-level biodiversity as modelled.

- *landscape-level biodiversity*

Landscape-level biodiversity objectives involve maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures across a variety of ecosystems and landscapes. The *Biodiversity Guidebook* is based in part on the principle that maintaining such attributes and structures, together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions, will provide for the habitat needs of most forest and range organisms.

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

Although some general forest management practices can broadly accommodate the needs of most species, more often a variety of practices is needed to represent the different natural disturbance patterns under which specific ecosystems have evolved. Natural disturbance patterns vary from frequent wildfires in the dry interior regions to rare stand disturbance events in the wetter coastal regions.

The delineation and formal designation of "landscape units" is a key component of a subregional biodiversity management strategy. A range of biodiversity emphasis options may be employed when establishing biodiversity management objectives for a landscape unit. The *Biodiversity Guidebook* outlines three biodiversity emphasis options—lower, intermediate and higher. Each option is designed to provide a different level of natural

biodiversity and different risks to the maintenance of natural biodiversity when compromises between biodiversity and timber supply are considered in setting objectives for a landscape unit.

The KBLUP Implementation Strategy delineated draft landscape unit boundaries with respective biodiversity emphasis options for areas within the Nelson Forest Region, including TFL 3. In the timber supply analysis, these draft landscape units were used as the basis for modelling management of landscape-level biodiversity. These units, along with the biodiversity emphasis options, were declared by the BCFS Arrow District Manager on April 8, 1998, and as a result represent current management. In the timber supply analysis, the mature-plus-old and old forest seral stage requirements were modelled at the landscape unit and biogeoclimatic variant levels. The adjacent Valhalla Provincial Park was correctly assumed to contribute to the landscape-level biodiversity requirements on TFL 3.

In some landscape units insufficient old growth was available to meet old seral requirements because of past harvesting patterns. However, the model projects that over time, the proportions of old-growth recommended in the *Biodiversity Guidebook* are attainable. MELP staff have expressed concern that old growth areas were neither identified nor explicitly modelled in the analysis. I acknowledge this concern, however, while information on the specific locations of such areas was not available, the analysis does account for meeting the landscape-level biodiversity objectives, and specific old growth areas can be mapped over time. I expect that once determined, these areas will be located in areas currently contributing to old seral requirements. I note the licensee has committed to continued development of a biodiversity strategy including the identification and management of old growth management areas and am satisfied the existing information used to account for landscape-level biodiversity does not introduce significant risk to short term timber supply on TFL 3. Any new information will be considered in future determinations.

Concern was also raised that some site series are not well represented in the non-contributing land base and therefore a proportion of the old seral stage requirements should be maintained in the timber harvesting land base and not be harvested. District staff refer to this as proportional representation. I note that neither the Code nor the KBLUP Implementation Strategy specifically require seral stage representation by biogeoclimatic site series. I have also reviewed additional data and information which shows there is sufficient flexibility in the TFL land base to accommodate adequate seral stage representation without risk of decreasing short term timber supply. I am mindful that policy and direction on setting landscape unit objectives is currently under development and I expect the Arrow District Manager's to consider both this direction and the intent of the KBLUP when finalizing and implementing landscape unit objectives.

For the purposes of this determination, I accept the assumptions used and am satisfied that based on the information available, landscape-level biodiversity has been adequately modelled.

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

Kootenay-Boundary Land Use Plan (KBLUP)

In addition to the *Ministry of Forests Act* and the *Forest Practices Code of B.C. Act*, the *Kootenay-Boundary Land Use Plan (KBLUP)* provides regional planning guidance to the management of forest and range resources in the Nelson Forest Region. In March 1995, the KBLUP was approved and addressed historic land use uncertainty in the region. The decision also identified 16 new protected areas for the Kootenay-Boundary region to improve representation of protected ecosystems in the region. None of these protected areas affects TFL 3.

Subsequent work to develop more specific resource management objectives, strategies and guidelines culminated in the KBLUP Implementation Strategy, approved in July, 1997. The KBLUP is designed to integrate opportunities for sustainable resource use with sensitive management of environmental values while ensuring social and community values are respected. The strategy outlines resource management guidelines and objectives for the planning area which includes TFL 3. A Memorandum of Understanding (MOU) between the BCFS and MELP also provides guidance and instruction for the preparation of forest development plans, and includes interpretation around the Code and the KBLUP Implementation Strategy that are known government direction.

The KBLUP also proposes that general green-up height (outside of scenic areas and community watersheds) may be changed from three metres to two metres if deemed appropriate by the BCFS District Manager. As described in *green-up and adjacency*, the Arrow District Manager has approved the use of a two-metre general green-up height, and I have considered this in my determination.

In addition, the implementation strategy sets out regional guidelines for managing domestic watersheds and the licensee has provided acceptable analyses of these watersheds on TFL 3. The strategy also provides guidelines for the management of biodiversity and regional connectivity. In making my determination I have been mindful of the guidelines affecting TFL 3 and acknowledge that future determinations for TFL 3 will reflect the ongoing implementation of the plan.

Twenty-year plan

The purpose of the 20-year plan is to show whether or not the harvest volume projected in the base case over the next 20 years can be appropriately configured in specific areas on the landscape. The licensee tested two spatial forest estate models—ATLAS version 2.91 and Forest Simulation Optimizing System (FSOS)—to model 200 year harvest forecasts for TFL 3. Although the approach was not fully consistent with the assumptions used in the base case timber supply analysis, the results did provide a useful perspective of the potential harvest pattern over the long term.

Slocan also applied the FSOS model to provide a map of the 20-year harvest plan. The plan indicates that there is sufficient flexibility in the distribution of cutblocks to support the harvest level projected in the base case over a 20-year period. District staff reviewed the plan and concur with the results.

I find the 20-year plan appropriate for use in this determination, and acknowledge the licensee's initiative in applying this new technology.

Partitioned component of the harvest

The *Forest Act* provides for portions of an AAC to be specified as attributable to different types of timber and terrain in different parts of a TFL or TSA. Partitioning an AAC ensures that harvesting is appropriately distributed in forest types, operability classes, or distinct areas.

During the classification of operable areas, an additional 1860 hectares were identified as alternative harvest areas outside of the initial timber harvesting land base of 26 156 hectares. Inclusion of these areas increases the timber harvest land base by seven percent to 28 016 hectares. In the analysis, the licensee provided a sensitivity analysis which included the additional 1860 hectares of alternative harvest areas. The licensee demonstrated that an even flow harvest forecast of 80 000 cubic metres per year was attainable.

Slocan has yet to demonstrate significant performance in the alternative harvesting areas. However, as mentioned in *economic and physical operability*, I note that over 42 000 cubic metres have been identified in the current forest development plan and are scheduled for harvest in the near future. BCFS District staff have reviewed this plan and are satisfied this objective is indeed achievable.

In order to encourage alternative harvesting techniques and technical innovation, I have decided at this time to set a partition of 4000 cubic metres annually for alternative harvest areas. Given the licensee's commitments identified in the forest development plan, and the relatively small proportion of area involved I am satisfied this presents no significant risk to the TFL 3 timber supply.

I expect the distribution of performance to be monitored and reported by the licensee on an annual basis and at the time of the next timber supply analysis. Should it become apparent that operations have not been adequately distributed within the partitioned area, I may need to re-consider the size and/or conditions of this partition.

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

Alternative harvest flows

An alternative harvest forecast for TFL 3 applying the same land base, growth and yield and management assumptions used in the base case shows an initial harvest level of 116 055 cubic metres per year for two decades declining by 10 percent per decade for five decades to a long term harvest level of 68 529 cubic metres per year. This alternative harvest forecast indicates there is considerable flexibility to increase short term harvest levels by more than 50 percent above the base case harvest forecast, while maintaining a reasonable level of decline during the medium term. Alternatively, the analysis demonstrates the unit's ability to absorb significant downward pressures on timber supply, while still maintaining the harvest level projected in the base case.

The licensee also provided a similar "expanded operability option" beginning at 122 005 cubic metres per year for two decades, followed by a 10 percent decline per decade for five decades to a long term harvest level of 73 238 cubic metres per year.

I have been mindful of the results of these alternative harvest rates and the associated flexibility they illustrate in making my determination.

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

Timber processing facilities

Logs harvested from TFL 3 are directed to the licensee's sawmill in nearby Slocan. Established in 1968, today the mill currently processes over 400 000 cubic metres annually and has been upgraded regularly to efficiently use the available wood supply and species profile. The mill produces high quality dimension lumber for North American, Asian and European markets. The licensee's Slocan Division, which includes the operations of TFL 3 as well as two forest licences, contributes over 60 percent of the mill's fibre requirements. The balance is purchased from private operators in the region.

I note the contribution of the TFL 3 timber harvest to the licensee's local operations is significant, and have considered this in my determination.

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

Minister's letters and memorandum

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

The Minister stated in his letter 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 discussed under *commercial thinning*, the licensee currently has no plans to include this in its operations. I have also reviewed opportunities for harvesting in previously uneconomical areas, and have concluded that it is appropriate at this time to include in my determination a partition for alternative harvest areas, as discussed above under Partitioned component of the harvest.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. I have discussed this above under "*visually sensitive areas*," where I considered the VQOs on TFL 3 and have made no further adjustments to the timber supply estimate from that projected in the base case.

Local objectives

The Minister's letter of July 28, 1994, states that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives.

The licensee took a number of steps to provide opportunities for public review of the draft statement of management objectives, options, and procedures (SMOOP); draft MP No. 9; 20-year harvest plan and timber supply analysis by:

- advertising open houses in local newspapers;
- making the documents available for public viewing; and,
- posting of public review opportunities at the local mill site in Slocan.

Although no public response was received, I have considered the general employment and community stability implications of TFL 3 in my AAC determination.

First Nations

No specific concerns have been raised with respect to TFL 3. As discussed under *archaeological sites*, an Archaeological Overview Assessment (AOA) and Archaeological Impact Assessments (AIAs) have been completed by the Arrow Forest District which encompasses the TFL 3 area. No significant timber supply impacts have been discovered to date. The results of further studies can be reflected in future determinations to the extent that they may affect timber supply.

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

Unsalvaged losses

Unsalvaged losses are timber volumes destroyed or damaged by natural causes such as fire and disease, but not recovered through salvage operations.

In the analysis, losses to wind were derived by prorating the estimates applied in the adjacent Arrow TSA timber supply analysis (1994) to the TFL 3 area as no data specific to the TFL was available. Using this approach, losses to wind are estimated to be 400 cubic metres per year, or approximately 0.6 percent of the AAC under MP No. 8 (65 000 cubic metres per year). In the analysis the licensee modelled this impact as a one percent reduction to the timber harvesting land base, applying the reduction to each analysis unit and age class. No separate allowances were made for fire, insects, or disease, as the licensee indicates there are no significant losses on TFL 3.

BCFS staff have reviewed and accept the approach and assumptions used in the base case. Although the licensee has used the best available information, I note there is considerable uncertainty in the estimates. BCFS staff indicate that root rot is a concern in the area, however the licensee did not account for it explicitly. I note that provincial studies are presently underway to develop timber yield tables applicable to stands subject to root rot. I request that the licensee work to compile information more specific to this TFL, particularly in regard to root rots for which there is particular uncertainty province wide. I will consider this in future analyses.

For this determination, in the absence of better information, I accept the accounting for unsalvaged losses as modelled.

Reasons for Decision

In reaching my decision on an AAC for TFL 3, I have considered all of the factors presented above and have reasoned as follows:

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

In determining AACs, my considerations typically identify factors which, considered separately, indicate that the timber supply may be either greater or less than that projected in the base case. Some of these factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at the time of the determination. These latter factors are accounted for in determinations in more general terms.

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

- *roads trails and landings:* although I find the reductions for *existing* roads, trails and landings to be reasonable, I am concerned the methodology used in the analysis likely underestimates the area lost to *future* roads, trails and landings. I note the estimates used do not correlate well with figures derived for similar units in the Nelson Forest Region. Based on comparisons with the more standard methodologies employed by the BCFS, and a review of current performance, I conclude the long-term timber supply is overestimated in the base case by up to 2.5 percent.

Another factor was identified as contributing to a potential overestimation of the timber supply to a degree that currently cannot be quantified with accuracy.

- *inventory audit:* I note that the statistical analysis and interpretation of the audit results were intended to broadly assess the accuracy of the inventory and am mindful of the limitations of the methods used. The results of this analysis suggest that existing mature stand volumes may be overestimated by up to 10 percent. Sensitivity analysis showed that when existing mature stand volumes were reduced by 10 percent, the base case even-flow harvest forecast was reduced by approximately 4.3 percent.

Counteracting the above downward pressures, two factors were identified that exert a potential upward influence on the base case timber supply projection, to a degree that currently cannot be quantified with accuracy. They are described as follows:

- *site productivity:* BCFS Research Branch staff and the licensee consider the site productivity of some older stands to be underestimated. To the extent that site productivity is higher than estimated for the base case, volumes in some regenerated

stands will be higher and green-up and minimum harvestable ages will be lower. On TFL 3 this will increase timber supply and provide additional flexibility to accommodate other resource values.

- *green-up:* the KBLUP Implementation Strategy provides for the use of a two-metre green-up age on the general IRM zone, whereas a three-metre green-up age was used in the analysis. I have confirmed that a two-metre green-up age is currently being applied on TFL 3, and based on the sensitivity analyses provided in the timber supply analysis, I estimate an upward influence on timber supply of approximately one percent.

In assessing the above factors it is evident that those indicating *over*estimation (inventory audit, roads trails and landings) and those indicating *under*estimation (site productivity and green-up) work to approximately offset one another. Although the data I have reviewed do not allow firm quantification, a general assessment of the various factors suggests that their combined influences on timber supply result approximately in a mutual offset, with little or no significant net risk to the viability of the base case projection.

The analysis did identify two additional factors that also influenced the base case harvest forecast. I am unable to quantify these since no information specific to TFL 3 is available at this time.

- *identified wildlife habitat*: the licensee was unable to account for areas of significant wildlife habitat in the base case harvest projection. Due to a lack of specific habitat mapping for red- and blue-listed species, it is likely that their habitat requirements have been inadequately addressed, suggesting a small underestimation in timber supply.

- *genetic improvement:* I have noted that the base case included no accounting for genetically improved stock, although its use is current practice on TFL 3. I believe that the use of improved stock will increase average yield gains with a resulting, but presently unquantifiable enhancement to timber supply.

Reviewing the two unquantified factors described above, I have considered as follows. As discussed earlier under *wildlife habitat*, there was concern that identified wildlife habitat requirements were not explicitly modelled. I acknowledge that additional areas may be identified as inventories are improved in the future. However, I observe there may be significant overlap with other resource considerations such as riparian zones, wildlife tree patches as well as visually sensitive areas and ungulate winter range. I have also considered government's commitment to limit impacts from identified wildlife to one percent of the provincial timber supply. From these considerations and others discussed below, I have concluded that wildlife habitat requirements can be accommodated within the harvest level projected in the base case during the period of this AAC.

The other unquantified influence on timber supply was the use of genetically improved stock. Although experience in other parts of the province suggests potential volume gains of up to five percent, the specific gains resulting from the use of improved stock on TFL 3 timber supply are uncertain at this time. However, the use of genetically improved seed is clearly an upward pressure on timber supply and does work to offset the downward influence of wildlife habitat mentioned above.

In the analysis, several options for alternative harvest flows were provided. The timber supply analysis demonstrated the feasibility of a short-term harvest level of 116 055 cubic metres per year for two decades, declining by 10 percent per decade for five decades to a long term harvest level of 68 529 cubic metres per year. This demonstrates significant flexibility available in the short-term to offset any of the above uncertainties, should new information show anything more than the modest influences I have noted.

Although at this time I see no advantage to increasing the AAC for TFL 3 if it would most likely involve a future decline, the analysis does provide me with confidence that none of the uncertainties revealed by the analysis will disrupt the base case harvest flow over the next five years. In the long term, I consider this forecast to be particularly stable. Even if the maximum estimated limits of all the downward influences noted above are realized, I expect no impact on timber supply for many decades, and it is unlikely that long term productivity would be reduced.

Regarding the Kootenay Boundary Land Use Plan, I believe the licensee has reflected the known components of the plan as well as possible at this time. The KBLUP Implementation Strategy continues to develop and I anticipate over the coming years, more information will be gathered regarding the impact of the KBLUP on forest practices and this information will be reflected in future determinations.

As noted under Partitioned component of the harvest, and supported by the timber supply analysis, the licensee has proposed a partition for alternative harvest areas. BCFS District staff have reviewed this proposal and are satisfied this objective is achievable. To encourage alternative harvesting techniques and technical innovation, I have decided at this time to set a partition of 4000 cubic metres per year to the areas identified as being suitable for alternative harvest methods. Given the licensee's commitments identified in the forest development plan, and the modest proportion of area involved, I am satisfied this presents no significant risk to the TFL 3 timber supply or other forest values.

Having considered and reviewed all the factors documented above, and taking into account the risk and uncertainty associated with the information provided, it is my conclusion that the base case projected harvest level of 80 000 cubic metres per year—including a partition of 4000 cubic metres per year for alternative harvest areas—represents a suitable harvest level for TFL 3 at this time.

Determination

It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects the socio-economic objectives of the Crown for the area, that ensures longer-term IRM objectives can be met, that reflects current management practices, can best be achieved in TFL 3 at this time by establishing an AAC of 80 000 cubic metres, with a partition of 4 000 cubic metres attributable to alternative harvest areas.

Implementation

This determination comes into effect on July 1, 1998 and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination. In the period following this determination and leading to the subsequent determination, I expect the licensee to perform the following:

- develop information specific to TFL 3 regarding the location, amount and merchantability of problem forest types;
- clarify the objectives for minimum harvestable ages;
- provide more explicit modelling of the use of genetically improved stock and the associated impacts on timber supply;
- in cooperation with BCFS and MELP staff, complete the mapping of, and provide management objectives for ungulate winter range, and incorporate the results of that work into the next timber supply analysis;
- in cooperation with BCFS and MELP staff, improve the inventory and classification of riparian areas; and,
- compile more information specific to the TFL on unsalvaged losses particularly regarding the occurrence of root rots.

Larry Pedersen
Chief Forester

June 25, 1998

Appendix 1: Section 8 of the *Forest Act*

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

Allowable annual cut

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

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

(b) each tree farm licence area.

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

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

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

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

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

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

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

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area,

(b) different types of timber and terrain in different parts of private land within a tree farm licence area, and

(c) gains in timber production on Crown land that are attributable to silviculture treatments funded by the government of British Columbia, the federal government, or both.

(6) The regional manager or district manager must determine a volume of timber to be harvested from each woodlot licence area during each year or other period of the term of the woodlot licence, according to the licence.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Purposes and functions of ministry

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

(a) encourage maximum productivity of the forest and range resources in the Province;

(b) manage, protect and conserve the forest and range resources of the Crown, having regard to the immediate and long term economic and social benefits they may confer on the Province;

(c) plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Crown and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and

(e) assert the financial interest of the Crown in its forest and range resources in a systematic and equitable manner.

Documents attached:

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

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