BRITISH COLUMBIA
MINISTRY OF FORESTS

Tree Farm Licence 41

Issued to West Fraser Mills Ltd.
Skeena Sawmills Division

Rationale for Allowable Annual Cut (AAC) Determination

Effective June 11, 1999

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Deputy 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 in making my determination, under section 8 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 41. This document also identifies where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 41 is situated on the north coast of British Columbia in the Kitimat area. The TFL extends south of Terrace in the Kitimat valley and includes many of the main valleys tributary to the Douglas Channel and the Gardner Canal. The TFL is held by West Fraser Mills Ltd. ("the licensee") and is administered by the Kalum Forest District office in Terrace which is part of the Prince Rupert Forest Region.

The TFL area is characterized by a mixed topography of rugged shorelines, steep mountainous terrain and round-topped ridges resulting from glaciation. Marine weather systems carry moist Pacific air onshore, causing high levels of precipitation in the region during much of the year.

The productive forest lies predominately within the Coastal Western Hemlock (CWH) biogeoclimatic zone (wet submaritime and very wet submaritime subzones) with a smaller portion of the land base situated in the Mountain Hemlock (MH), Engelmann Spruce Subalpine Fir (ESSF), and Alpine Tundra (AT) biogeoclimatic zones. The licence area supports a variety of commercial tree species including western and mountain hemlock, western redcedar, yellow-cedar, lodgepole pine, Sitka spruce, Douglas-fir, and subalpine fir (balsam).

The TFL includes a northern portion that is largely accessible by road from the communities of Terrace and Kitimat, and a southern portion that encompasses ocean waterways and the village of Kemano that is accessible only by air or water. In TFL 41, areas that are accessible by road are termed "onshore" and areas accessible only by water or air are termed "offshore." The entire southern portion is considered offshore, while the northern portion has both onshore and offshore components.

The total area used in the timber supply analysis for TFL 41 is 703 744 hectares of which 332 924 hectares (47 percent) are considered productive forest. The remaining 370 820 hectares (53 percent) are composed largely of saltwater, alpine tundra, non-productive brush and other areas which do not support commercial forest.

Since the early 1990s, the coast of B.C. including the area of TFL 41, has received international attention due to the presence of large areas of undeveloped, coastal temperate rainforests. The future of these forests is an important issue in land-use planning processes.

Forestry-related activity including harvesting, processing and manufacturing is an important industrial sector in the region. TFL 41 plays a significant role in the local economy with logs from the license area processed at the licensee's Skeena Sawmill Division in Terrace.

History of the AAC

The TFL was first issued to Eurocan Pulp and Paper Co. Ltd. in 1966. During the term of Management Plan (MP) No. 1, the company was authorized to harvest 382 320 cubic metres per year from a total licence area of 1 020 144 hectares. The AAC increased significantly during subsequent years to 883 584 cubic metres in 1973. In 1975, due to uncertainty in the inventory for the southern half of the TFL and further uncertainty arising from the need for an environmental protection forest study for the entire TFL, the AAC was reduced to 566 340 cubic metres.

In January 1980, a TFL replacement document was issued to Eurocan Pulp and Paper Co. Ltd. for a 21-year term. At the same time the AAC was increased to 628 960 cubic metres. In 1985, Eurocan Pulp and Paper Company Ltd. changed its name to Enso Forest Products Ltd., and formed a joint venture with West Fraser Mills Ltd. The AAC at that time was 629 000 cubic metres. On January 1, 1986 the AAC was reduced to 430 000 cubic metres based on a review of MP No. 4.

On January 1, 1990, to allow for harvesting of the right-of-way for the Kemano-Kitimat transmission line, the AAC was temporarily increased by 70 000 cubic metres to 500 000 cubic metres. This level was maintained for three years until January 1, 1993, when the AAC was re-established at 430 000 cubic metres. Later that year, West Fraser Mills Ltd. acquired the majority share of Eurocan Pulp and Paper Company Ltd. and the TFL was assigned to West Fraser Mills Ltd. In 1994, the AAC was reduced to 400 000 cubic metres, largely as a result of removing the Kitlope Heritage Conservancy protected area from contributing to timber supply. The 1994 AAC was partitioned into 180 000 cubic metres for the onshore portion and 220 000 cubic metres for the offshore portion.

New AAC determination

Effective June 11, 1999, the new AAC for TFL 41 is 400 000 cubic metres, unchanged from the current AAC. This AAC includes 180 000 cubic metres which are partitioned to the onshore portion of the TFL defined as planning cells 1 to 11 and 14 to 19 in MP No. 6. The balance of the AAC (220 000 cubic metres) is attributable to the remainder of the TFL (the offshore portion). In addition, 34 000 cubic metres are partitioned to areas identified as being accessible using non-conventional harvest methods, without specification to the onshore or offshore portions. This new AAC includes 21 500 cubic metres administered under the Small Business Forest Enterprise Program (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 41 includes the following:

- Statement of Management Objectives, Options and Procedures (SMOOP) for Draft MP No. 6, TFL No. 41, accepted November 12, 1997;
- Existing stand yield tables for TFL 41, accepted by British Columbia Forest Service (BCFS) Resources Inventory Branch, May 18, 1999;
- Managed stand yield tables and site index curves, accepted by BCFS Research Branch, May 14, 1999;
- Timber Supply Analysis Information Package: TFL 41, Management Plan No. 6, West Fraser Mills Ltd., accepted June 1, 1999;
- Timber Supply Analysis Report: TFL 41, MP No. 6, West Fraser Mills Ltd., accepted August 20, 1999;
- TFL 41, proposed MP No. 6, West Fraser Ltd., submitted September 20, 1999;
- TFL 41, Twenty-Year Plan, West Fraser Mills Ltd., dated April 29, 1999, accepted October, 26 1999;
- Summary of public input solicited by the licensee regarding the contents of Management Plan No. 6;
- 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;
- Memorandum 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 BCFS and the Ministry of Environment, Lands and Parks (MELP);

- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Victoria on August 18, 1999;

- Review of TFL timber supply analysis and operating conditions through discussions between West Fraser Mills Ltd. staff and the Deputy Chief Forester on August 12, 1999;

- *Forest Practices Code of British Columbia Act* (as amended);

- *Forest Practices Code of British Columbia Act Regulations* (as amended);

- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP;

- *Forest Practices Code, Timber Supply Analysis*, BCFS and MELP.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the 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 41, 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 TSAs and TFLs. Section 8 is reproduced in full as Appendix 1.

In accordance with Section 23(3) of the *Interpretation Act*, the deputy chief forester is expressly authorized to carry out the functions of the chief forester which include those required under Section 8 of the *Forest Act*. Consistent with this provision, in a memo dated November 24, 1998, the chief forester requested that I make AAC determinations for a number of TFLs.

In this memo the chief forester expressed the importance of consistency of judgement in making AAC determinations. I also recognize the need for consistency of approach. I have observed the chief forester during a number of previous AAC determinations and am familiar with the guiding principles that the chief forester has employed in making AAC determinations. I find these principles to be reasonable and appropriate and I have employed them as described below in making my AAC determination for TFL 41.

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. When a large number of determinations are made for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make his approach in these matters explicit, the chief forester has compiled a set of guiding principles for AAC determinations, which I have reviewed, adopted and applied as deputy chief forester in AAC determinations for TFLs. These principles are set out below. If in some specific circumstance it may be necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

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 the chief forester to take into account in determining AACs, I intend 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 has been fully implemented since 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 the chief forester takes this uncertainty into account to the extent possible in the context of the best available information. In making my determination for TFL 41, as deputy chief forester, I intend to follow the same approach.

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 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 the position of the chief forester that in determining AACs it would be inappropriate 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. Like the chief forester, I will therefore not consider the possible impacts of existing or anticipated recommendations made by such planning processes, nor attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impact in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five–year AAC reviews will

ensure that future determinations address ongoing plan implementation decisions. However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

Forest Renewal BC funds a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. As with all components of an AAC determination, like the chief forester, 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 improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, the chief forester should immediately reduce some AACs in the interest of caution. However, any AAC determination made by the chief forester or myself must be the result of applying our individual judgment 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 41.

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

Overall, in making this AAC determination, as the deputy chief forester, I am mindful of the chief forester's obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of his responsibilities under the *Forest Practices Code of British Columbia Act*.

Errata

The following section was inadvertently omitted from page 10 immediately before the section entitled 'Timber Supply Analysis'.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in this AAC determination, I am assisted by timber supply forecasts and associated harvest projections provided to me by the licensee as part of the BCFS Timber Supply Review program.

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, a series of timber supply forecasts is 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 reliability 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 judgment, 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 judgment 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. Judgments 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 41 was prepared by Sterling Wood Group Inc. ("the consultant") on behalf of the licensee. The consultant used its proprietary computer simulation model TREEFARM (Version 6.6) to conduct the analysis. Based on my staff's experience examining results from this model, I am satisfied that it is capable of providing a reasonable projection of timber supply for TFL 41.

In the timber supply analysis, the licensee presented three harvest forecast options which applied different assumptions to estimate site productivity as well as alternative descriptions of the land base.

In the "planned management" harvest forecast option the licensee applied Old Growth Site Index (OGSI) adjustments to all stands older than age 140. The land base assumed in this option included areas identified as accessible using 'conventional' and 'non-conventional' harvesting systems, as described below under *physical operability*.

In the 'conventional' harvest forecast option West Fraser also applied OGSI adjustments to all stands older than age 140. All areas identified as accessible using 'non-conventional' harvesting systems were excluded from contributing to timber supply.

In a third option, the "constrained conventional" harvest forecast option, the licensee only applied OGSI adjustments to hemlock-leading stands older than age 140. BCFS Research Branch staff approved their use for hemlock-leading stands within the CWH biogeoclimatic zone but the licensee also applied the adjustments to stands in the MH zone. However, I note that most of the area in the timber harvesting land base is located within the CWH biogeoclimatic zone with only a small area located in the MH biogeoclimatic zone.

Having reviewed the above factors and associated uncertainties, I accept that the 'constrained conventional' option best represents the base case (as described above under "The role of the base case") and provides an adequate basis from which to assess the effects of uncertainty on timber supply. I will assess the implications of the potential contribution of the non-conventional harvest area and the application of OGSI adjustments in the MH biogeoclimatic zone under the appropriate factors.

The 'constrained conventional' option (i.e., the 'base case') projects an initial harvest level of 400 000 cubic metres per year for two decades, followed by a decline of ten percent per decade for three decades to a harvest level of 291 058 cubic metres per year in decade five. In decade nine the projected harvest flow further decreases to 222 112 cubic metres per year and then increases beginning in decade ten. A long-term harvest level of 448 000 cubic metres per year is achieved in decade 11.

In addition to the base case, the licensee also provided a number of sensitivity analyses and alternative harvest flow projections to assess the risk to timber supply resulting from uncertainty in data assumptions and estimates. These analyses 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 41 has changed significantly since the previous determination. Creation of the Kitlope Heritage Conservancy protected area as well as the expansion of the Kitamaat Indian Reserve have reduced the gross area of the TFL. Area was also added to the TFL when timber licence T0991 and a municipal park lease at Claque Mountain Park Reserve expired. The net reduction in the total TFL area since the previous timber supply analysis is 315 996 hectares.

The total area of TFL 41 as reported in the current timber supply analysis is 703 744 hectares of which 906 hectares is private (schedule A) land. Productive forest areas, excluding non-forest and non-productive areas account for 332 924 hectares, or approximately 47 percent of the total TFL area.

As part of the process used to derive the timber harvesting land base (i.e., the land base estimated to be economically and biologically available for harvesting) a series of deductions was made from the productive forest land base. These deductions account for factors that operate to reduce the forest area available for harvesting for economic, ecological, or social 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.

After these deductions, the current timber harvesting land base for TFL 41 was estimated to be 69 686 hectares—21 percent of the productive forested area of TFL 41—or about 10 percent of the total TFL area. Details of these deductions are described below.

In reviewing the deductions I am also aware that some areas may have more than one classification—e.g., environmentally sensitive areas (ESAs) may also lie within 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. Hence, a specific deduction for a given factor reported in the analysis or the AAC rationale does not necessarily reflect the total area with that classification; some portion of it may have been deducted earlier under another classification. For TFL 41, I acknowledge that the licensee used the above approach to appropriately derive the timber harvesting land base and I find the results to be reasonable for use in this determination.

- *non-forest and non-productive areas*

Non-forested areas in TFL 41 include rock, rivers, swamps, lakes, gravel bars, gravel pits, tidal flats and urban areas. Based on the TFL inventory, the licensee deducted 333 833 hectares of non-forested areas and 36 988 hectares of non-productive forest from contributing to the TFL 41 timber harvesting land base. Standard procedures were followed in the analysis to exclude these areas.

- *physical operability*

Terrain characteristics and accessibility typically affect the areas on which the licensee may potentially conduct harvest operations. For the TFL 41 timber supply analysis, the licensee defined three operability categories: areas that are expected to be harvested using conventional harvesting systems ('conventional' operability class); areas where non-conventional harvesting systems are expected to be used ('non-conventional' operability class); and, areas that are physically inaccessible or which are covered with forests of marginal economic value ('inoperable' class).

Areas classified as 'conventional' are those areas harvestable using grapple, high-lead cable, or A-frame yarding systems. Conventional harvesting systems are assumed to be limited to a maximum yarding distance of 300 metres. Non-conventional operability areas were specifically defined as areas where helicopter yarding or skyline cable harvesting systems are required to access stands, and where the yarding distance exceeds 300 metres.

Of the total productive area, 85 489 hectares are classified as harvestable using conventional means, 7199 hectares using non-conventional means, and 240 236 hectares as inoperable. BCFS Kalum District staff support the criteria used to define operability.

I note that during the term of MP No. 6, the licensee proposes to harvest 34 000 cubic metres per year from the non-conventional operability areas. This proposal is supported by the licensee's past performance using non-conventional harvesting methods. During 1994 to 1998, the licensee successfully harvested 124 596 cubic metres (seven percent of the total volume harvested) using helicopters.

In response to MP No. 6, the Prince Rupert regional manager indicated that 93 percent of the non-conventional operability areas are situated within the offshore component of the TFL. According to him, to achieve the proposal, a high proportion of non-conventional harvesting would be required within the offshore areas. He suggests that operating costs in these areas may on average be higher than in the onshore areas. As a result, stand quality and volume requirements may need to be higher to offset development costs. I have considered the regional manager's assessment and agree that economic factors will most likely determine the licensee's ability to access volume in these areas.

The licensee provided a sensitivity analysis to demonstrate the impact on timber supply of including the non-conventional operability area in the timber harvesting land base. The analysis showed that the initial harvest level of 400 000 cubic metres per year could be maintained for an additional decade compared to the base case forecast. Medium-term timber supply was also higher than projected in the base case, and the long-term timber supply increased from 448 000 cubic metres per year to 510 500 cubic metres per year.

I have reviewed the analysis results and discussed the criteria with district staff. For this determination I accept the licensee's operability classification, noting that changing economic conditions may influence the viability of non-conventional harvesting operations, particularly those in the offshore portion of the TFL. Based on West Fraser's recent performance using non-conventional harvesting technologies, and the licensee's proposal to continue these operations, I will include a partition for harvesting in the non-conventional operability area. I have discussed this partition further under "Partitioned component of harvest". I am also mindful that the inclusion of the non-conventional operability area increases timber supply throughout the forecast horizon compared to the base case and have considered this in my "Reasons for decision".

- *non-commercial cover*

In the timber supply analysis, the licensee identified 45 265 hectares of areas covered by non-commercial brush species. The licensee considers that timber production is unlikely on these areas and therefore appropriately excluded them from the timber harvesting land base.

- *low productivity areas*

TFL 41 includes areas of low productivity that are not expected to contribute to timber harvesting. The licensee identified low productivity areas on TFL 41 using the same site index limits developed for the adjacent Kalum TSA. After other previous reductions, approximately 68 hectares were excluded from the timber harvesting land base. District staff accept the licensee's approach and the reductions applied in the analysis.

Having examined the methodology and assumptions used, I accept the deductions made in the base case for low productivity areas and find them acceptable for this determination.

- *deciduous forest types*

The licensee's inventory identifies 4088 hectares of deciduous-leading stands. Since the licensee does not currently harvest deciduous-leading stands on TFL 41, all stands that are predominantly deciduous were excluded from the timber harvesting land base. District staff confirmed that the licensee does not harvest deciduous forest types.

Having reviewed the procedures applied in the base case to account for deciduous species I find them appropriate.

- *environmentally sensitive areas (ESAs)*

Based on the licensee's resource inventories, 11 381 hectares of ESAs were deducted from the TFL 41 timber harvesting land base. These deductions were made to account for the protection of sensitive soils, recreation areas, wildlife habitats, avalanche-prone areas, areas with hydrological concerns, and difficult-to-regenerate areas.

Specific details of each ESA category are considered later in the section entitled, "Integrated resource management objectives".

- *non-merchantable stands*

In the timber supply analysis, a total of 1178 hectares were excluded from the timber harvesting land base to account for low volume and low productivity stands that exceed the classification of low productivity stands based on site index, but are currently uneconomical to harvest. To assess the merchantability of stands, the licensee used a combination of volume per hectare, crown closure, age and height criteria. District staff agree with the assumptions used to assess these areas.

Having reviewed the criteria and approach used by the licensee, I accept the deductions for non-merchantable stands for use in this determination.

- *estimates for roads, trails and landings*

West Fraser estimated that *existing* unclassified roads, trails and landings cover approximately six percent of all forested stands less than 35 years old. In the base case, the licensee therefore excluded 1281 hectares from the timber harvesting land base to account for existing roads, trails and landings.

To account for *future* roads, trails and landings, the licensee indicates that a similar six percent deduction would be required, based on the assumption that future road development is likely to occur at approximately the same intensity as existing road development.

A 1996 BCFS report on measured site disturbance showed that roads, trails and landings on TFL 41 reduced the productive forest area by 7.8 percent. District staff indicated that, while six percent may be appropriate for existing roads, trails and landings, 7.8 percent is more likely indicative of the road area that will be required in the terrain types where the licensee will be operating in the future.

In response, West Fraser applied an eight percent reduction in the base case to stands older than 35 years to account for future roads, trails and landings.

I note that in MP No. 6 the licensee indicates that road deactivation may be considered on the TFL including permanent deactivation where roads are no longer required. The licensee also advises that road deactivation plans may be modified in response to public demand for recreational access. While road deactivation and subsequent rehabilitation can return areas to productive forest, I note that the extent to which this will occur on TFL is currently uncertain and was not modelled in the base case.

Having reviewed the estimates of roads, trails and landings used in the analysis and the associated assumptions, I accept that the reductions applied for existing, unclassified roads are based on the best currently available information. Although subject to uncertainty, it is likely that the actual percent of the area occupied by roads in the future will fall between six and eight percent. For this determination I have considered that any changes in the area of future roads will not affect short-term timber supply. I therefore accept that the deductions applied in the base case are adequate.

Existing forest cover inventory

- *current inventory*

The licensee completed a new forest cover inventory of TFL 41 in 1998 using aerial photography taken during 1996 and 1997. The information used in the timber supply analysis is current for growth and depletions.

Since the previous timber supply analysis the total productive land base for TFL 41 has decreased by approximately 315 996 hectares. This decrease was largely attributable to removal of the Kitlope Heritage Conservancy following its designation as a protected area in August 1994.

I acknowledge that the licensee's inventory is very recent, was developed to accepted standards and represents the best available information. I therefore find it suitable for this determination.

- *age-class distribution*

The forest structure of TFL 41 developed largely without the influence of large natural disturbance processes such as wildfires. As a result, the forests of TFL 41 include a large proportion of older stands. Excluding areas of non-commercial brush, approximately 69 percent of the productive forest of TFL 41 is covered with stands more than 250 years

old. 12 percent of forest stands are between 140 and 250 years old, 10 percent are between 40 and 140 years old, and nine percent are less than 40 years old.

- *species profile*

The TFL 41 timber harvesting land base supports a variety of commercial tree species. Approximately 83 percent of the timber harvesting land base consists of hemlock- and cedar-leading stands. Balsam-, spruce- and lodgepole pine-leading stands comprise a further 13, 3, and 0.4 percent respectively.

- *volume estimates for existing stands*

The licensee used the BCFS variable density yield prediction (VDYP) model to generate volume estimates for existing stands aged 40 years and older, and for naturally-established stands less than 40 years old with no history of silviculture treatment. The VDYP model uses information gathered from a large number of sample plots throughout the province and is generally accepted in B.C. as an appropriate model for projecting volumes in existing natural stands.

For this analysis the volume estimates projected by VDYP for hemlock-, balsam- and cedar-leading stands were modified to reflect local conditions using adjustment factors derived from 1974 field sampling of stands aged 140 years and older. To derive the adjustment factors, the licensee sampled the same stands in 1997 and compared the results to the 1974 data. No spruce-leading stands were located in the sampled areas and therefore no adjustments were applied to the yield tables projected by VDYP for spruce. The BCFS Resources Inventory Branch reviewed and accepted the adjustment method and the resulting yield tables.

The licensee followed recognized procedures and used local information to derive the volume estimates for existing stands. I therefore accept the estimates for use in this determination.

<u>Expected rate of growth</u>

- *site productivity estimates*

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

In general, in B.C., forest stands between 30 and 40 years of age provide the most reliable estimates of site productivity whereas site indices determined from younger stands or older stands may not accurately reflect the potential productivity of a site. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where studies—known as the old-growth site index or OGSI project—suggest that actual site indices are higher than those indicated by existing data from mature forests.

For the TFL 41 timber supply analysis, the approach used by the licensee to assign site index values varied according to stand age and leading species. For all stands over 30 years of age, West Fraser assigned site index using the VDYP growth and yield model.

Site indices for stands aged less than 30 years were assigned using information from a series of 198 field samples established in plantations and naturally regenerated areas. For hemlock- and Sitka spruce-leading stands, the licensee used standard BCFS growth intercept equations to estimate site indices. Growth intercept equations compute site index from the early average height growth of young stands. For other species site index was estimated using height and age measurements and the appropriate site index curves.

To account for the underestimate of site index in old growth forests, site indices for western hemlock stands in the CWH biogeoclimatic zone were intended to be adjusted in the model following harvest in accordance with the findings of MOF Research Working Paper 27 (Site index adjustment for old-growth CWH stands in the Kalum Forest District). However, in the base case the licensee inadvertently adjusted the site index of all hemlock-leading stands in both the CWH and MH biogeoclimatic zones. According to a sensitivity analysis provided by the licensee, if the adjustment had been applied only in the CWH biogeoclimatic zone, short- and medium-term timber supply would be unaffected and long-term timber supply would be reduced by approximately three percent compared to the base case.

I note that the OGSI adjustment used for hemlock in the CWH biogeoclimatic zone is considered by BCFS Research Branch to be statistically the most reliable approach for TFL 41. In addition, different studies suggest that the site index of other stands inside and outside the CWH biogeoclimatic zone may be underestimated.

Having reviewed the information before me, I acknowledge that the uncertainty in site index estimates on TFL 41 primarily influences long-term timber supply. I note that site index adjustments were incorrectly applied to the hemlock stands in the MH zones but that this involves a minor proportion of the TFL. Furthermore, the impact of applying site index adjustments to stands other than hemlock although uncertain is likely to more than offset the above impacts.

I therefore conclude that long-term timber supply may be slightly underestimated compared to the base case projection and have discussed this below under "Reasons for decision".

- *aggregation procedures*

In the timber supply analysis, the inventory for TFL 41 was aggregated into 11 analysis units based on inventory type group (leading species) productivity class and age. Existing and managed stand yield tables were generated for each of these analysis units.

I have reviewed the approach used by the licensee and consider the analysis unit definitions and aggregation procedures adequately capture the productivity of this unit.

- *volume estimates for regenerated stands*

Volume estimates for regenerated stands were derived using the Table Interpolation Program for Stand Yields (WinTIPSY version 1.1) 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 timber supply analysis, all existing stands less than 31 years old and all future regenerated stands were assumed to be managed. BCFS Research Branch staff reviewed and accepted the licensee's managed stands yield tables for use in the timber supply analysis.

During the preparation of the analysis, district staff expressed concern that the relative proportion of areas assumed to be planted versus those regenerated naturally was less than the proportion indicated by the licensee. The licensee indicated that 90 percent of harvested areas are planted while the district staff suggest the percentage is closer to 70.

In response, the licensee assumed that 100 percent of areas were regenerated naturally in the base case. The licensee's 'conventional' and 'planned management' harvest forecast options assumed that the 70 percent of areas were regenerated via planting.

A sensitivity analysis provided by the licensee showed that increasing regenerated stand yields by ten percent significantly increases medium- and long-term timber supply. By contrast, decreasing regenerated stand yields by ten percent causes significant harvest flow disruptions during decades ten and 20 but does not impact short-term timber supply.

I have reviewed the above harvest forecasts and the sensitivity analysis and have considered as follows. While there is some uncertainty regarding the relative proportion of area regenerated through planting versus natural means, current performance suggests it is likely that at least 70 percent of regenerated stands will be planted. I note that yields projected in WinTIPSY for planted stands are higher than for natural stands. Based on the results of the sensitivity analysis, I therefore conclude that the timber supply projected in the base case is underestimated in the medium and long term by an uncertain amount and have discussed this below under "Reasons for decision".

- *operational adjustment factors (OAFs)*

To account for the loss of timber volume due to operational conditions, the licensee applied standard OAFs to the yield projections for regenerated stands used in the timber supply analysis. In the base case, West Fraser assumed a 15 percent OAF for unmapped stand openings, irregular tree spacing and losses from endemic pests and diseases (OAF 1) and a five percent OAF to account for decay and other age-related losses such as waste and breakage during harvest (OAF 2).

I have reviewed the OAFs applied in the analysis and note they are standard provincial values. In the absence of better information I therefore accept the licensee's assumptions.

- *minimum harvestable ages*

Minimum harvestable age is an estimate of the earliest age at which a stand has grown to a harvestable condition. The minimum harvestable age (MHA) mainly impacts the time when second growth will be available for harvest. This in turn affects how quickly existing stands may be harvested such that a stable flow of harvestable timber may be maintained.

In the TFL 41 timber supply analysis, a stand must satisfy minimum volume, diameter-at-breast-height and age requirements to be eligible for harvest. Stands had to attain a minimum volume of 300 cubic metres per hectare, a minimum age equal to the age at which the stand attains 300 cubic metres per hectare, and a minimum average of 30 centimetres.

BCFS staff indicate that in deriving the minimum age criteria, the licensee used the average diameter-at-breast-height of stands of all trees within a given stand rather than an alternative approach, often used in timber supply analysis, of using the largest 250 trees in the stand. As a result, BCFS staff suggest that the licensees assumption may act to overestimate the minimum harvestable ages used in the analysis. Moreover, for several analysis units, stands do not attain an average diameter of 30 centimetres at breast height at any point during the simulation period. Therefore, in the model, these stands (covering a total of 3128 hectares) do not contribute to timber supply following harvest.

The licensee provided a sensitivity analysis to demonstrate the impact of varying minimum harvestable age. The results showed that increasing the minimum harvestable ages by ten years severely reduces medium-term timber supply compared to the base case forecast. Decreasing minimum harvestable ages by ten percent increases medium-term timber supply by a significant amount but the initial harvest level in the base case can still be maintained for one decade.

I acknowledge that predicting the age at which stands may be harvested in the future is difficult and subject to considerable uncertainty. However, having reviewed the criteria applied in the base case, I find that the assumptions used may result in conservative estimates of minimum harvestable ages. I consider it unlikely that stands that have not been excluded from the timber harvesting land base by virtue of their low productivity would not attain adequate characteristics to make them economic for harvest within a reasonable time period.

Having examined the licensee's assumptions and reviewed the results of the sensitivity analysis, I therefore conclude that medium-term timber supply may be underestimated on account of this factor and have discussed this below under "Reasons for decision". I note that medium-term timber supply is highly sensitive to changes in minimum harvestable age and therefore request that the licensee to continue to refine the assumptions of minimum harvestable age and update or revise them in accordance with operational experience and product objectives before the next analysis.

Harvest profile

The timber supply model TREEFARM enables a preferred harvest profile to be established for the simulation period. In the base case, initially the licensee targeted stands for harvest which were over age 140 and in proportion to their occurrence in the inventory. During the simulation period, the harvest profile changed to harvesting of oldest stands first.

I have reviewed the approach used in the analysis and find it adequately reflects current practice. I therefore consider it suitable for this determination.

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

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. During timber supply analysis, regeneration delays are normally accounted for within the timber supply model or applied directly to the regenerating stands yield tables.

In the base case the licensee assumed that all future stands are naturally regenerated with a four-year regeneration delay. In the 'conventional' harvest forecast option, the licensee modelled regeneration delay by assuming 30 percent of harvested areas would be naturally-regenerated (4-year regeneration delay) and 70 percent of harvested areas would be planted (2-year regeneration delay).

District staff indicate that the average 2-year regeneration delay for planted stands reasonably reflects current practice. They also suggest that the average regeneration delay (four years) for naturally regenerated areas may be underestimated by one to two years. However, because the base case assumptions do not reflect the high proportion of areas that are planted, the average regeneration delays are likely less than the 4-year regeneration delay that was assumed in the analysis.

Having reviewed the licensee's assumptions and harvest forecast options, I find that the approach used in the base case to model for regeneration delay is not entirely consistent with observed management practice on TFL 41. However, the analysis showed that timber supply was not sensitive to variations in regeneration delay. For the purposes of this determination, I am therefore satisfied that the base case assumptions provide a reasonable accounting of regeneration delay and have made no further adjustments.

Not-satisfactorily-restocked areas

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

On TFL 41, there are approximately 1600 hectares of NSR areas on the timber harvesting land base. About 82 hectares are presently classified as backlog NSR and the balance (1518 hectares) is considered current NSR. I note that the area reported as current NSR is larger than is suggested by the average annual area harvested. The licensee maintains that a significant proportion of the area classified as current NSR is in fact adequately restocked. In MP No. 6 West Fraser indicates that by the end of 1998, current NSR had been reduced to 658 hectares.

While the actual area of current NSR is less than was assumed in the analysis, because of the relatively small size of the area involved, I accept the licensee's assumptions regarding NSR areas as modelled in the base case. I acknowledge the licensee's commitment to continue to review the status of NSR areas during the term of MP No. 6. The results of additional assessments of NSR areas can be incorporated into the next analysis.

Impediments to prompt regeneration

West Fraser's ESA inventory identified approximately 52 829 hectares of productive forest areas where new stands would be difficult to re-establish. In the timber supply analysis the majority of these areas were excluded from the timber harvesting land base as inoperable areas. The licensee excluded 100 percent of the remaining areas classified as having severe regeneration problems (Ep1) and 20 percent of areas identified as having moderate regeneration problems (Ep2). Following previous reductions approximately 1419 hectares were deducted from the timber harvesting land base. District staff agree with the assumptions used for the timber supply analysis.

Having reviewed this ESA classification and the criteria used in the analysis, I am satisfied that this factor has been accounted for appropriately.

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

Silvicultural systems

The predominant silvicultural system currently in use on TFL 41 is clearcutting; partial cutting systems are rarely applied on TFL 41. Even-aged management was therefore assumed in the base case.

BCFS district and regional staff confirm that the the information as modelled adequately reflects current management on the TFL. I am satisfied that the assumptions used in the analysis are suitable for this determination. I note that the licensee also accounted for wildlife tree patches in the analysis and I have discussed this below under *stand-level biodiversity*.

Silvicultural treatments

Basic silviculture on TFL 41 currently includes the planting of suitable species, natural regeneration, and brushing and weeding treatments aimed at ensuring disturbed areas achieve free-growing status within a specified period.

In the timber supply analysis, the licensee included harvest forecasts that assumed harvested areas would be regenerated with a mix of coniferous species through a combination of planting and natural regeneration. Annual summaries from 1976 to 1998, indicate that 22 540 hectares have been successfully regenerated by planting or natural regeneration.

Having reviewed the assumptions used in the analysis and discussed them with BCFS staff, I conclude that the licensee is performing basic silviculture adequately to support the timber supply as projected in the base case. Moreover, any uncertainty in the regeneration assumptions will not affect the short-term timber supply of TFL 41.

Incremental silviculture

Incremental silviculture activities practiced on TFL 41 include juvenile spacing and pruning. These activities, discussed further below, are not part of the licensee's basic silviculture obligations required to establish a free-growing forest stand.

- *juvenile spacing*

TFL 41 includes areas that typically regenerate to dense stands of western hemlock and balsam. To date, approximately 4283 hectares of stands have been juvenile spaced on TFL 41. While the licensee has identified suitable stands for spacing operations, current practice is to space these areas subject to funding availability. The licensee did not assume any completed or planned spacing activities in the base case.

While spacing treatments may improve stand value, I note that as a general rule, juvenile spacing is unlikely to significantly impact stand volume across a wide range of stand densities. However, I note that some areas that have been juvenile spaced are likely to reach a minimum harvestable age earlier than was assumed in the base case.

As discussed above under *minimum harvestable ages*, medium-term timber supply on TFL 41 is highly sensitive to reduced minimum harvestable ages. Therefore it is possible that medium-term timber supply may be under-estimated in the base case by an uncertain amount and I have accounted for this below in my "Reasons for decision".

- *pruning*

A limited amount of pruning treatments have been applied on TFL 41 since 1993. The target species are hemlock and balsam in stands of average or above average site productivity. The objective of the pruning treatments is to increase the proportion of high quality, knot-free wood. Because pruning affects the value of the timber not the volume, no special provisions were made in the analysis to account for pruning activities.

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

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. These standards were incorporated into the timber supply analysis for TFL 41 to estimate minimum merchantable stand volumes for existing and regenerating stands. To derive stand volumes, a 30-centimetre stump height, a 17.5-centimetre diameter-at-breast-height (dbh), and a 10-centimetre top diameter-inside-bark were assumed in the base case. District staff confirm that the utilization standards used in the analysis are consistent current operational practice.

Having reviewed this information I find that the utilization standards used in the analysis follow provincial standards and are acceptable for this determination.

Decay, waste and breakage

To account for decay, waste and breakage, the licensee applied data specific to the TFL (Special Cruise #341) to the VDYP growth and yield model used to generate stand volumes. The approach was reviewed and accepted for use in this timber supply analysis by BCFS Resources Inventory Branch staff.

I consider that the estimates for decay, waste and breakage used in the timber supply analysis reflect the best available information and are therefore suitable for use in this determination.

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

Integrated 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.

- *green-up and adjacency*

Green-up time refers to the period following harvest necessary for a regenerating stand to attain a specified condition, expressed in terms of stand height or average green-up age. Current harvesting practices limit the size and shape of cutblocks, and establish 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 timber supply analysis the licensee identified a ‘general’ and an ‘enhanced forestry’ resource management zone. The ‘enhanced forestry’ zone covers approximately 52 percent of the timber harvesting land base, and includes areas where the licensee expects positive economic returns from intensive silviculture activities. The ‘general’ resource management zone covers 28 percent of the timber harvesting land base and according to the licensee includes “areas with a diverse array of resources where no single resource warrants specific management”.

The remaining 20 percent of the timber harvesting land base is comprised of riparian management areas, visually sensitive areas as well as community watersheds (discussed below under the appropriate sections).

In the base case, West Fraser assumed a maximum allowable disturbance in both the 'general' and 'enhanced forestry' resource management zones of 35 percent of the timber harvesting land base, and assumed a minimum 'green-up' height of three metres. The time required to reach three metres in height was determined using unadjusted site indices. Using the adjusted site indices would have resulted in a decrease in the age required to reach green-up height.

A sensitivity analysis demonstrated that the timber supply on TFL 41 was not sensitive to increases or decreases in the green-up height. Because the height-at-age calculations were made without the OGSI site index adjustments (see *site productivity estimates*), the ages used in the analysis may be underestimated by a small but uncertain amount.

I have reviewed the data and the results of the sensitivity analysis. I have also examined the timber supply implications of excluding the OGSI adjustments in assessing the time to reach green-up height. Based on my assessment, and in view of the demonstrated insensitivity to changes in green-up height, I am satisfied that the uncertainty in the licensee's assumptions regarding adjacency and green-up presents no risk to the timber supply projected in the base case. I therefore accepted the information as modelled for use in this determination.

- *recreation*

Recreation use on TFL 41 includes camping, hiking, sport fishing, boating and hunting. The licensee's ESA inventory identified 806 hectares of areas with high recreation value (Er1) and 21 641 hectares with moderate recreation value (Er2). The majority of these areas overlap with areas not accessible to timber harvesting (inoperable areas) and were excluded from the timber harvesting land base as part of other deductions. After previous reductions, a total of 1454 hectares was deducted from the timber harvesting land base to account for areas sensitive to recreation concerns.

I note that TFL 41 also includes approximately 18 hectares of areas established as recreation sites or trails under the *Forest Practices Code of B.C. Act*. These were also adequately accounted for in the base case.

I am satisfied that the licensee has used the best available information and has adequately accounted for recreation use on the TFL.

- *sensitive soils*

Environmentally sensitive soils identified on the TFL are classified as highly unstable or moderately unstable and sensitive to disturbance. Based on the licensee's ESA inventory, West Fraser identified 57 426 hectares of areas with highly and moderately sensitive soils on the TFL. In the base case 90 percent of each area classified as highly sensitive (Es1)

and 20 percent of areas classified as moderately sensitive (Es2) were excluded from the timber harvesting land base. After previous deductions a total of 5578 hectares was excluded to account for sensitive soils

The licensee has completed 'level C' terrain stability mapping covering approximately 80 percent of the TFL area. However this inventory was not available during development of the information package and therefore was not used in the timber supply analysis.

District staff compared the terrain stability mapping to the area identified as unstable in the ESA inventory. Their review indicated that in some watersheds the areas classified as unstable (terrain classes IV and V) in the more up-to-date terrain classification exceeded those identified as being unstable in the ESA inventory. In addition, district staff consider some areas in the south Hirsch drainage that are included in the current timber harvesting land base in the analysis to be inoperable because of soil stability concerns.

I acknowledge that some uncertainty exists in the amount of area that should be excluded from contributing to timber supply due to soil stability concerns. It is likely that the area identified as being unstable in the analysis was underestimated. Completion of the terrain stability mapping will probably reduce this uncertainty and therefore, as noted below under Implementation, I have requested the licensee to complete this mapping during the term of MP No. 6.

I accept that the extent of the unstable areas was likely underestimated in the base case and consider that medium- and long-term timber supply may be overestimated compared to the base case forecast. I have further discussed this below under "Reasons for decision".

- *archaeological sites*

An Archaeological Overview Assessment (AOA) and a Traditional Use Study were completed in 1996 and 1998 respectively. The AOA indicated that approximately one percent of the total TFL area has a high potential for containing archaeological resources while another 15 percent has a medium potential. Most of the culturally sensitive areas are situated within or adjacent to areas that were previously deducted from the timber harvesting land base for other values (e.g., riparian reserves).

MP No. 6 identifies 14 known archaeological sites along the shoreline of the TFL including petroglyphs, culturally modified trees, eulachon fishing sites and an abandoned village site. In the analysis each site was afforded a 50-metre buffer and the abandoned village site was provided with a 150-metre buffer. A total of 13 hectares of productive forest were considered unavailable for timber supply purposes and were removed from the timber harvesting land base.

District staff have reviewed the deductions for archaeological sites, and support the assumptions made by the licensee. They indicate that the location of CMTs is generally restricted to within 300 metres of the coastal shoreline.

I am satisfied that the licensee has adequately accounted for known archaeological resources and have made no further adjustments.

- *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. For the timber supply analysis, areas within and outside the timber harvesting land base were assumed to contribute to meeting biodiversity requirements.

- *stand-level biodiversity*

Stand-level biodiversity is managed in part by retaining reserves of mature timber, or wildlife tree patches, within cutblocks and in adjacent inoperable and other retained areas to provide structural diversity and wildlife habitat.

In the timber supply analysis for TFL 41, West Fraser used the *Biodiversity Guidebook* to estimate the area required for wildlife tree patches. The licensee deducted a total of 1867 hectares of areas from the timber harvesting land base to account for wildlife tree patches. District staff consider that the reductions made to account for wildlife tree patches are appropriate and consistent with current operational practice.

The licensee provided a sensitivity analysis to illustrate the timber supply implications of managing for stand-level biodiversity, by eliminating the requirement for wildlife tree patches, thus increasing the size of the timber harvesting land base. The results showed only a marginal increase to long-term timber supply compared to the base case projection.

I note that West Fraser's assumptions are consistent with the provisions of the *Biodiversity Guidebook*. Having reviewed the approach used in the analysis, I accept the information as modelled.

- *landscape-level biodiversity*

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that this—together with other provisions in the Forest Practices Code, such as riparian management, maintenance of wildlife trees, and other forest cover objectives as discussed throughout the document—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 reasonably 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 are 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 sub-regional biodiversity management strategy. A range of biodiversity emphasis options (BEO) may be employed when establishing biodiversity management objectives for a landscape unit. The *Biodiversity Guidebook* outlines three biodiversity emphasis options—lower, intermediate and higher. If a reasonable distribution of options is maintained across the land base, it is generally considered that biodiversity can be maintained in conjunction with harvesting options.

Current government policy, intended to balance social and economic impacts against the risk to biodiversity, stipulates that the eventual distribution of emphasis options within a sub-regional planning unit should include approximately 45 percent of the area within the lower, 45 percent in the intermediate, and ten percent within the higher biodiversity emphasis options.

Neither the landscape unit boundaries nor the corresponding biodiversity emphasis options have been established in the Kalum Forest District including the area of TFL 41. In the timber supply analysis, the licensee therefore assumed a 'weighted' distribution of 45 percent lower, 45 percent intermediate and ten percent higher biodiversity emphasis—consistent with current government policy.

The timber supply analysis showed that the appropriate old seral requirements derived from the *Biodiversity Guidebook* could be maintained throughout the planning horizon in all 46 landscape unit/biogeoclimatic variant combinations. In only one combination did the proportion of old seral forest cover approach (but not violate) the minimum requirement during the simulation period.

For each landscape unit/biogeoclimatic variant combination, the licensee also compared the above 'weighted' old seral forest cover requirements to those derived using the corresponding draft biodiversity emphasis options.

In only one combination did the assigned old seral forest cover requirement exceed the old seral requirement applied in the analysis. In all other combinations, the draft biodiversity emphasis option resulted in a lower old seral forest cover requirement. Therefore, if the draft biodiversity options are established, there will be no impact to timber supply compared to the base case projection.

Having reviewed the assumptions applied in the base case and the sensitivity analyses, I conclude that timber supply is not constrained by the old seral requirements applied in the base case nor would it be if the current draft landscape unit biodiversity emphasis options were established on TFL 41. I note that there is an abundance of productive forest outside the timber harvesting land base and that these areas will provide a significant contribution to old seral forest cover requirements on TFL 41. I therefore accept the landscape-level biodiversity assumptions applied in the base case as suitable for this determination and have made no further adjustments.

- *visually sensitive areas*

Careful management of scenic areas visible from communities, public use areas and travel corridors is an important IRM objective. The Code enables the management of visual resources by providing for scenic areas to be identified and made known, and by providing for the establishment of visual quality objectives (VQOs). To achieve these objectives, visual landscape inventories are carried out to identify, classify and record visually sensitive areas.

To achieve VQOs, constraints are placed on timber harvesting, road building and other forest practices. The constraints, which are based on research and experience and on public preferences, are expressed in terms of "forest cover" requirements that relate to the maximum percentage of a "viewshed" that may be harvested at any one time, and to 'visually effective green-up' (VEG)—the stage at which a stand of reforested timber is perceived by the public to be satisfactorily "greened-up" from a visual standpoint.

An inventory of visual resources on TFL 41 was completed in 1997. The inventory identified 18 492 hectares of visually sensitive areas within the timber harvesting land base. Scenic areas on TFL 41 have not yet been made known under the Forest Practices Code.

In the base case, the licensee used approved procedures to determine the maximum allowable disturbance for each of three visual quality classes (retention, partial retention and modification). Visually effective green-up was assumed to occur when stands achieve a minimum height of five metres.

Results from the harvest simulation indicate that the base case harvest forecast could be achieved well within the maximum disturbance levels in areas classified as ‘partial retention’ and ‘modification’; harvesting in areas classified as ‘retention’ was constrained for the entire planning horizon of 250 years. However, because of the relatively small size of the area classified as ‘retention’ (less than 0.01 percent of the timber harvesting land base), the potential impacts on timber supply are not considered to be significant. Sensitivity analysis showed that removing VQO constraints resulted in an increase in long-term timber supply of approximately 1000 cubic metres compared to the base case projection.

Having reviewed the approach used by the licensee, as well as outputs from the harvest simulations, I conclude that visually sensitive areas were adequately accounted for in the timber supply analysis. I consider the information appropriate for use in this determination, and acknowledge that management of visually sensitive areas may be further refined through the approval of known scenic areas. Any new information can be applied in subsequent analyses.

- *wildlife habitat*

The varied topography of TFL 41 supports abundant wildlife including grizzly and black bear, mountain goat, black-tailed deer, birds, furbearers and invertebrate species. Many of the rivers and streams within the TFL provide important rearing habitat for salmon, steelhead, freshwater trout as well as eulachon, a species of important cultural significance to local First Nations.

The licensee's ESA inventory includes 2422 hectares of areas identified as having high wildlife sensitivity (Ew1) and 3932 hectares of areas with moderate wildlife sensitivity (Ew2). Following previous reductions, a total of 915 hectares was excluded from the timber harvesting land base to account for wildlife ESAs. District staff accept the ESA reductions applied in the analysis.

No other assumptions were applied in the base case to explicitly account for wildlife. Habitat requirements were assumed to be addressed through ESA reductions and the seral stage distribution and management practices described under *landscape-level biodiversity*.

I note that the draft Kalum LRMP proposes several seral stage requirements for grizzly bear management. If adopted, in watersheds greater than 10 000 hectares, less than 30 percent of the area covered in stands on the forested land base will be permitted to be between the ages of 25 and 100 years old. To protect mountain goat winter terrain, a proposed no-harvest buffer zone of 400 metres around identified escape terrain is also suggested. While the LRMP and associated guidelines have not yet been approved, given the large proportion of the TFL which is situated outside of the timber harvesting land base, these requirements—if adopted—are unlikely to significantly impact the base case timber supply projection.

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* (IWMS) provides direction for managing critical habitat for identified wildlife species and contains provisions to manage for these species including the establishment of Wildlife Habitat Areas.

For this determination, it is not possible to specify the exact location or precise amount of habitat area that will be required within the timber harvesting land base to implement the *Strategy*. However, given the Province's commitment to implementing the IWMS, and given the policy decisions and projected one-percent impact—and noting the expected

occurrence of identified wildlife in this TFL—it is necessary and appropriate to account for an expected but not fully quantified impact on the timber supply. Therefore I am accounting for a reduction of up to one percent in the timber harvesting land base throughout the forecast period, and I have considered this in my "Reasons for Decision".

As the Province implements the IWMS for the management of species at risk, I expect the specific implications to be reflected in future timber supply analyses for TFL 41 and these will be taken into account in future AAC determinations. I encourage the licensee to refine the inventory and mapping of critical wildlife in cooperation with MELP specialists. Such information will reduce the uncertainty in the management of identified wildlife species and allow an assessment of the implications of wildlife management in future timber supply analyses.

- *riparian habitat*

Riparian habitats occur along streams, lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones that exclude timber harvesting, as well as 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 and stream channel width.

For the timber supply analysis the licensee used a computer based (GIS) technique to derive the area within the riparian reserve zone (RRZ) and riparian management zone (RMZ) adjacent to streams, lakes and wetlands. For classified streams the appropriate RRZ and RMZ widths specified in the *Riparian Management Area Guidebook* were applied.

A large proportion of the streams within TFL 41 are currently *unclassified*. For these streams, the licensee approximated average RRZ and RMZ widths based on the distribution of *classified* streams. Using a computerized approach, the licensee derived corresponding estimates for the total area of RRZs and RMZs on the TFL. West Fraser then excluded 100 percent of the estimated RRZs areas from contributing to the timber harvesting land base, consistent with the *Riparian Management Area Guidebook.*

To account for the areas within the riparian management zones (RMZs) that do not contribute to timber supply, West Fraser employed an area-weighted approach and excluded 11 percent of the total RMZ area from the timber harvesting land base. In the model, the licensee also applied a forest cover requirement to the remaining RMZ area within the timber harvesting land base to better simulate current and expected management regimes.

Kalum district staff and MELP specialists confirm that the assumptions and reductions applied in the analysis adequately reflect current management of riparian areas on TFL 41.

Having reviewed the criteria and methodology used in the analysis, I find that the licensee used acceptable procedures to represent riparian resources. I note that while many streams are still unclassified the approach used to model these streams represents the best available information and is consistent with the *Riparian Management Area Guidebook.* I therefore accept the information as modelled and have made no adjustments to the projected timber supply with respect to this factor.

- *watershed considerations*

Within TFL 41, there are 15 water licences that access water from the Kitimat River and nearby creeks. Although the water licences are within the TFL, the water intakes or points of diversion are located downstream and outside the TFL boundary.

TFL 41 contains a designated community watershed where the protection of water quality and quantity is of primary concern. The Wathl Creek watershed is used for domestic water supply for Kitamaat Village and comprises 2639 hectares (3.8 percent) of the timber harvesting land base.

In the base case, a forest cover requirement was applied, whereby a maximum of 9.1 percent of the productive forest or 25 percent of stands within the timber harvesting land base in this area were permitted to be less than nine metres in height at any time. No operations are planned in the Wathl Creek community watershed during the next five years, and the licensee has indicated that a coastal watershed assessment will be completed prior to any development in the Wathl Creek community watershed.

I acknowledge the licensee's commitment to conduct, where necessary, appropriate assessments to protect water resources. The results of any assessments can be incorporated into future analyses. For this determination, I accept the assumptions applied in the base case as adequately reflecting current practice.

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

<u>Kalum Land and Resource Management Planning (LRMP) process</u>

The Kalum LRMP is one of 18 Strategic Land Use planning processes currently underway in British Columbia. Once completed, this plan will provide a set of recommendations and strategies that will direct management activities on all Crown land within the Kalum planning area for the next ten years.

The Kalum LRMP has reached an agreement-in-principle on the plan's objectives and strategies, and the BCFS and MELP staff are currently completing resource assessments. Outstanding timber sensitive issues should be addressed with the completion of these

assessments. It is expected that ecosystem networks and wildlife corridors linking habitats will be created with the acceptance of the plan. Thirteen proposed Goal 2 protected areas are identified in the TFL, totalling approximately 1290 hectares of operable forest.

The final LRMP recommendations are expected to be approved next year. Once the plan is accepted by government, all land-use activities within the planning area must conform to the intent of these management objectives and strategies. Government may declare all or portions of the Kalum LRMP as a higher-level plan under the Forest Practices Code.

While 1290 hectares within TFL 41 have been identified as future protected areas, no decision has yet been made by government. Consistent with my "Guiding Principles", I therefore cannot speculate on the final outcome of the strategic land use decisions of government, nor can I speculate on the impact on timber supply of eventual approved management practices within specific resource management zones. I acknowledge that completion and implementation of the LRMP may in future affect the timber supply of TFL 41, and am mindful that subsequent determinations for TFL 41 will reflect the completion and ongoing implementation of the LRMP.

Twenty-year plan

The purpose of the 20-year plan is to show if the harvest volume projected in the base case over the next 20 years can be appropriately configured in specific areas on the TFL.

District staff have reviewed the 20-year plan for TFL 41, and accepted it on October 26, 1999. In the plan, the licensee identifies a harvest level of 433 000 cubic metres per year, beginning in 1999, combining conventional and non-conventional harvesting methods. The non-conventional harvest is assumed to vary from 41 000 to 42 500 cubic metres per year, within each of the four 5-year planning periods.

District staff raised several concerns about the proposed 20-year plan, pertaining to unstable terrain, visually sensitive areas, and green-up requirements.

With respect to visually sensitive areas, district staff suggest that by the end of the 20-year period, all operable drainages within the TFL will support some harvesting, and this may conflict with management objectives for these sensitive areas. The planned cutblocks are large and contiguous, resulting in only small retained areas of forest cover adjacent to the proposed harvest areas.

District staff indicate that onshore draft landscape units (Kitimat, Bish, Jesse, Wathl Creek and Wathlsto) appear to be able to support the harvest levels proposed in the plan. However, the Wathl Creek landscape unit will be operationally constrained by community watershed requirements. Many of the soil types in this area are marine clays, and combined with the current level of terrain stability hazard mapping, suggest that the proposed 20-year plan will be difficult to achieve.

It is also uncertain if the volume remaining after the period of this plan will be sufficient to make future entries economically feasible. This is of particular concern in offshore areas where stand volume and quality may be lower, and access costs higher than average. Given current operating costs and variable markets, I acknowledge the economic challenges facing the licensee.

In summary, I note that it may be difficult for the licensee to distribute the proposed harvest exactly as configured in the 20-year plan. I am mindful that the 20-year plan is not an operational plan but rather one alternative distribution of the proposed harvest over time. However, I am confident that for the first five-year period, the initial harvest level in the base case can be achieved, and I therefore find the 20-year plan to be adequate for use in this determination.

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

Alternative harvest flows

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

In addition to the base case, the licensee presented an even-flow harvest projection of 295 983 cubic metres per year. This alternative represents an approximate reduction of 34 percent to the initial harvest level in the base case. However, the alternative forecast shows that reducing the initial harvest level does not significantly increase medium term timber supply compared to the base case.

The licensee's harvest projections and associated sensitivity analyses have provided me with additional perspective of the timber supply dynamics of this unit and I have considered them in my determination.

Partitioned component of 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. Partitioning an AAC is intended to ensure that harvesting is appropriately distributed in differing forest types, operability classes, or distinct areas.

The 1994 determination included a partition of 180 000 cubic metres specified as attributable to the onshore portion of the TFL, and 220 000 cubic metres attributable to the remainder of the TFL. The objective of the partition was to encourage the licensee to balance harvesting operations between the two areas. I acknowledge that the licensee has demonstrated performance in these areas during the period of MP No. 5.

I acknowledge that the feasibility of harvesting in remote areas is an operational factor that the licensee must address in times of lower economic returns. I also note that the initial harvest level projected in the base case is not dependent on the contribution to timber supply of 'non-conventional' areas.

I have reviewed the licensee's proposal and discussed the information with district staff. To encourage the licensee to harvest the full profile of stands within the TFL, I have considered the benefits of maintaining both the existing partition and assigning a new partition to the non-conventional areas. I have discussed this further below under "Reasons for decision".

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

Timber processing facilities

The licensee operates a large sawmill in Terrace with an annual capacity of approximately 650 000 cubic metres. Eurocan Pulp and Paper Co. Ltd., a subsidiary of West Fraser, operates a large kraft and mechanical pulp plant in Kitimat. The plant produces over 300 000 metric tons of linerboard, 100 000 metric tons of kraft paper, and 125 000 metric tons of newsprint annually. The licensee also has an agreement with Skeena Cellulose Inc. to chip logs for Skeena's Prince Rupert operation. Operations within the Kalum, Nass and North Coast TSAs, and TFL 41 account for 799 914 cubic metres per year. Approximately 47 percent of all the mill requirements are met from TFL 41.

I note the contribution of the TFL 41 timber harvest is significant to the licensee's B.C. operations, 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 41. The letter and memorandum include references to 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. For TFl 41, I have reviewed the distribution of forest types as well as the licensee's current performance in different operability classes. As discussed in "Partitioned component of the harvest" I Have considered partitions for TFL 41.

The Minister's February 26, 1999 memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. As discussed under *visually sensitive areas*, forest cover requirements for these areas were adequately modelled and I have made no further adjustments.

Local objectives

The communities of Terrace, Kitimat and Kemano are the population centres most closely associated with the TFL. While the economy of the region is relatively well diversified, forestry operations and associated manufacturing activities contribute significantly to local employment. Average annual direct employment related to the licensee's local operations is approximately 1250 person years.

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 SMOOP, draft MP No. 6, and the timber supply analysis, by advertising in local newspapers, holding open houses, and making the documents available for public viewing. In response, eight persons attended an open house and the licensee received one written submission from the Kitamaat Village Council (discussed below).

Although public input was limited, I have considered the general employment and community stability implications of TFL 41 in my determination.

First Nations

TFL 41 is situated within the traditional territory of the Haisla First Nation. In a written submission to the licensee, the Kitamaat Village Council expressed general concerns regarding aboriginal title and rights to the lands and resources within its traditional territory. Other concerns included First Nations employment levels, economic opportunities and protection of the eulachon fishery.

I acknowledge that the Haisla Nation has entered into a Framework Agreement with the federal and provincial governments as part of the B.C. Treaty Consultation Process. As described above in my "Guiding Principles", the AAC I determine for TFL 41 should in no way be construed as limiting the Crown's legal obligations with respect to the treaty process.

I note that the licensee's commitment to maintaining on-going dialogue and cooperation with First Nations groups. I acknowledge the Haisla Nation's concern regarding the eulachon fishery, and in my approval letter for MP No. 6, I have requested that West Fraser pay particular attention to the protection of eulachon spawning habitat.

Should additional concerns specifically affecting timber supply on TFL 41 be identified in the future, I will consider the potential impacts in subsequent determinations.

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

Unsalvaged losses

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

In the analysis, the licensee deducted 2000 cubic metres annually throughout the forecast horizon to account for unsalvaged losses. Estimated net losses from insects, windthrow and fire are 500, 1000, and 500 cubic metres per year respectively. The licensee indicates that while wind is the major damaging agent, most losses are salvaged given the proximity of windthrow to harvesting operations.

For this determination, and 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 41, I have considered all of the factors presented above and have reasoned as follows.

The timber supply analysis base case projected an initial harvest level of 400 000 cubic metres per year for two decades before declining to a harvest level of 291 058 cubic metres per year in decade five. In decade nine, the projected harvest level further declines to 222 112 cubic metres per year and then increases beginning in decade ten. A long-term harvest level of 448 000 cubic metres per year is achieved in decade 11.

In determining this AAC, I have identified factors which, considered separately, indicate that the timber supply may be either greater or less than that projected in the base case. Generally, 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 this determination in more general terms.

In the determination for TFL 41, I identified the following factors as possible indications of an underestimation in the projected timber supply, although none is certain nor quantified:

- *physical operability*: A total of 5161 hectares of area accessible using non-conventional harvesting methods was identified but was not included in the base case timber supply projection. Given that the licensee has demonstrated performance using non-conventional harvest systems during the past 5-year period, I have considered the likelihood that all or a proportion of the non-conventional operability area, as defined in MP No. 6, may contribute to timber supply. I therefore concluded that timber supply may be underestimated over the forecast horizon by an unquantified amount.

- *old-growth site index adjustments:* The licensee applied local OGSI adjustments to old-growth hemlock stands in the Coastal Western Hemlock (CWH) biogeoclimatic zone. Although the licensee incorrectly applied the same adjustment to hemlock-leading stands in the Mountain Hemlock (MH) biogeoclimatic zone, provincial OGSI studies suggest that the site index in old-growth stands other than hemlock-leading, and in other biogeoclimatic zones, may be underestimated. In reviewing sensitivity analyses, I concluded that the net impact of these uncertainties resulted in a small underestimation in medium- to long-term timber supply compared to the base case harvest forecast.

- *minimum harvestable ages*: In deriving the minimum harvestable age criteria, the licensee used the average diameter-at-breast-height (dbh) of stands of all trees within a given stand rather than the more commonly accepted approach of averaging the dbh of the largest 250 trees in a stand. As a result, the licensees assumption may overestimate the minimum harvestable ages on TFL 41. I considered the licensee's sensitivity analysis which illustrated that medium-term timber supply is sensitive to changes in minimum harvestable age and concluded that the medium-term timber supply may be underestimated.

- *juvenile spacing*: Significant areas of TFL 41 have been previously spaced and additional stands may be treated in the future. Spaced stands may achieve a merchantable size earlier. Although the spacing activities were not reflected in the base case, sensitivity analyses showed that reducing minimum harvestable ages increases medium-term timber supply and may also improve flexibility during the transition from old-growth to second-growth stands. Due to funding uncertainty for future spacing activities, and the small proportion of areas treated, I concluded that the potential timber supply impact, while uncertain, is likely small and influences the medium term.

Of the foregoing factors, I note that with the exception of *physical operability* the uncertainty in these factors affects primarily medium- to long-term timber supply. Counteracting these influences, two factors were identified that exert a downward impact on the base case timber supply projection although none is certain nor quantified:

- *soil stability*: Information from the licensee's level 'C' terrain stability assessment suggested that the licensee's ESA classification underestimates the areas of sensitive soils on TFL 41. I therefore concluded that medium- to long-term timber supply may be overestimated by an uncertain amount compared to the base case.

- *identified wildlife*: In the timber supply analysis there was no explicit accounting of identified wildlife habitat in the base case harvest projection. A number of rare and endangered species are known to occur within the boundaries of TFL 41 and I considered that their habitat requirements may not have been fully accommodated in the timber supply analysis. Current provincial policy on identified wildlife limits provincial impacts to one percent. Accordingly, in the absence of information specific to the TFL, I concluded that timber supply may be overestimated by up to one percent over the forecast horizon.

Having considered the above factors, I note that the small upward pressures on timber supply attributed to *old growth site index adjustments* and *juvenile spacing* act to offset the potential overestimate in timber supply associated with *sensitive soils* and the *Identified Wildlife Management Strategy*. Although unquantified, by order of magnitude the timber supply impacts of these factors is small and primarily influence medium- to long-term timber supply. While not insignificant, I note the combined impact of these factors occurs well beyond the duration of this AAC.

I have noted the importance of completing the terrain hazard mapping assessments and have encouraged the licensee to refine the inventory and mapping of critical wildlife species in cooperation with MELP. This information will help reduce uncertainty for subsequent determinations. In addition, ongoing studies will continue to refine provincial OGSI estimates including those for species other than hemlock within the Kalum Forest District. This will reduce the uncertainty in site productivity estimates for future analyses.

I also noted that medium-term timber supply is highly sensitive to changes in minimum harvestable age. I considered the likelihood that the approach used by West Fraser may be overly conservative and I encourage the licensee to further refine the methodology used to derive these estimates before the next analysis. While the analysis illustrated the potential for a significant increase in medium term timber supply, the uncertainty does not affect the short-term harvest forecast projected in the base case.

To ensure that harvesting continues to be distributed among the different stand types and geographic areas on TFL 41, I have maintained the existing partition of 180 000 cubic metres and 220 000 cubic metres for the onshore and offshore areas respectively. I have also considered the licensee's proposed distribution of harvestingin the non-conventional operability class and have partitioned 34 000 cubic metres per year to this area. While I indicated a potential upward pressure on timber supply based on the contribution of these areas to timber supply, the viability of long-term operations in these areas remains unproven. The unconventional areas will provide the licensee with an opportunity to further demonstrate performance using non-conventional harvesting technologies. Based on the licensee's performance over the next 5-year period, the contribution of the non-conventional areas to the timber harvesting land base can be refined and the results incorporated into the next determination.

I note the Kalum Land and Resource Management Planning process is nearing conclusion and acknowledge that completion and implementation of the LRMP may in future affect the timber supply of TFL 41. I remain mindful that subsequent determinations for TFL 41 will reflect the completion and ongoing implementation of the LRMP.

Having considered and reviewed all the factors 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 400 000 cubic metres per year represents a suitable harvest level for TFL 41 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, reflects the socio-economic objectives of the Crown for the area, ensures meeting long-term IRM objectives, and reflects current management practices, is best achieved on TFL 41 by determining an AAC of 400 000 cubic metres.

This AAC includes a partition of 180 000 cubic metres attributable to the onshore portion of the TFL defined in MP No. 6 as planning cells 1 to 11 and 14 to 19. The balance of the AAC (220 000 cubic metres) is partitioned to the remainder of the TFL (the offshore portion).

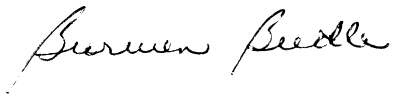
I am also including a partition of 34 000 cubic metres to the areas within the non-conventional operability class in order to provide the licensee with an opportunity to demonstrate the viability of operating in these areas. The volume harvested from the non-conventional operability areas may be harvested from within either the onshore partition or the offshore partition or both.

Implementation

This determination is effective June 11, 1999 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 encourage the licensee to:

- complete terrain stability hazard mapping for those areas supporting previous or current harvesting activities;
- review the criteria and methodology used to determine minimum harvest ages.



Bronwen Beedle
Deputy Chief Forester
December 22, 1999

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1999, reads as follows:

8. Allowable annual cut

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

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

(b) each tree farm licence area.

(2) If the minister

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

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

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

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

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

(3) If

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

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

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

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

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

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

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

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine 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) The regional manager or the regional manager's designate must determine a volume of timber to be harvested from each community forest agreement area during each year or other period, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

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

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

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

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

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

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

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

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

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

(c) 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 British Columbia;

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

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

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

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

File: 10100-01

JUL 28 1994

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

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

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

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

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

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

.../2

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

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

Yours truly,

Andrew Petter
Minister

Province of British Columbia
Ministry of Forests
OFFICE OF THE MINISTER

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

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

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

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

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

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

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

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

Andrew Petter
Minister of Forests