BRITISH COLUMBIA
MINISTRY OF FORESTS

Tree Farm Licence 25

Issued to Western Forest Products Ltd.

Rationale
for
Allowable Annual Cut Determination

effective December 30, 1996

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Chief Forester

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Objective of this Document

This document is intended to provide an accounting of the factors considered and the rationale employed in making my determination, under Section 7 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 25. The document will also identify where new or better information is required for incorporation into future determinations.

Description of the TFL

TFL 25, also known as the Naka TFL, is held by Western Forest Products Ltd. (WFP). It covers 458 447 hectares comprising five non-contiguous blocks spread over five forest districts. This total area includes Fiordland Recreation Area, which was excluded when defining the timber harvesting land base; the recreation area does not contribute to timber supply in TFL 25. The locations, areas and administration centres of the five timber supply blocks are as follows:

Block	**Location**	**Total Area (hectares)**	**Forest District(s)**	**District Office(s)**
1. (Jordan River)	southwestern coast of Vancouver Island, west of Sooke	32 248	Duncan	Duncan
2. (Loughborough Inlet)	head of Loughborough Inlet on the lower central coast	66 645	Campbell River	Campbell River
3. (Naka Creek)	northern Vancouver Island, northwest of Campbell River	16 305	Campbell River	Campbell River
4. (Port McNeill)	northern Vancouver Island near Port McNeill	31 300	Port McNeill	Port McNeill
5. (Swanson Bay)	several islands and part of the mainland near Princess Royal Island on the northern coast	311 949	North Coast Mid Coast	Prince Rupert Bella Coola

All five blocks lie predominantly within the Coastal Western Hemlock biogeoclimatic zone, with only small areas of the Mountain Hemlock zone found in Blocks 2 and 5. The principal tree species are western hemlock and western redcedar, which are found in all blocks. Block 1 is the only block with a substantial component of Coastal Douglas-fir (44 percent of the timber harvesting land base).

The breakdown by timber harvesting land base is as follows:

Block	Operable Productive Forest		Current Timber Harvesting Land Base	
	Hectares	Percentage of Total Block Area	Hectares	Percentage of Total Block Area
1. (Jordan River)	26 372	82	20 539	64
2. (Loughborough Inlet)	16 008	24	12 402	19
3. (Naka Creek)	10 435	64	8716	53
4. (Port McNeill)	27 500	88	24 220	77
5. (Swanson Bay)	62 891	20	47 112	15
Total TFL	**143 206**	**31**	**112 989**	**25**

The relative contributions of each block to the overall long-term timber harvesting land base are shown below.

Block	Long-Term Timber Harvesting Land Base (hectares)	Percentage of Total TFL Long-Term Timber Harvesting Land Base
1. (Jordan River)	21 447	19
2. (Loughborough Inlet)	12 953	11
3. (Naka Creek)	8646	8
4. (Port McNeill)	24 255	21
5. (Swanson Bay)	47 126	41
Totals	**114 427**	**100**

Block 1 is bounded by TFL 46 to the northwest and the Arrowsmith Timber Supply Area (TSA) to the east and south. It has the longest harvest history of the five, with operations dating back to 1857, and there are now some areas of third growth. Nonetheless, there are still significant areas of old growth remaining. It is also the block with the most significant program of intensive silviculture. The terrain is generally moderate in slope, but is dissected by steep-sided creeks. The major waterways are the Jordan River and Sombrio, Loss, Noyse, and Muir creeks. Douglas-fir is the principal species in the drier, eastern part of the block, with western hemlock and western redcedar more prevalent in the wetter, western part.

Block 2 borders TFL 45 to the north, the Kingcome TSA to the west, TFL 47 and the Strathcona TSA to the south, and TFL 39 to the east. The block is split among four sub-units: Heydon Bay, Apple River, Frazer Bay and Stafford River. Harvesting in most areas began only in the 1960s and 1970s. The topography is relatively rugged, with steep-sided valley walls and flat, frequently

inundated, valley bottoms; consequently, only 24 percent of the total land base is considered operable. Western hemlock is the major species, but there are substantial areas of western redcedar and amabilis fir (balsam). Douglas-fir grows only on some drier, well-drained sites.

Block 3, which lies midway between Campbell River and Port McNeill, lies along Johnstone Strait and is surrounded on land by TFL 39. Harvesting began in 1974, and substantial areas of old growth remain. The Peel, Naka, Teissum and Cedarstadt watersheds and part of the Tsitika watershed lie within its borders. Most of the land base lies below 1000 metres in elevation, and the terrain features moderately sloped valleys generally visible from Johnstone Strait. Western hemlock and western redcedar are the most common tree species.

Block 4 is located near Port McNeill and, like Block 3, is surrounded largely by TFL 39 and Johnstone Strait. It also shares borders with the Kingcome TSA to the northwest and TFL 6 to the west. Harvesting in this block dates back to the 1930s, and it is the second most intensively managed block of the five. The major watersheds are formed by the Waukwass, Cluxewe and Keough rivers. There are three topographically distinct areas within the block: the gently undulating Suquash basin near the coast (below 300 metres in elevation), the Nawhitti Lowlands (low-relief areas rising to approximately 600 metres in elevation), and the more rugged Twin Peaks area in the south. Western redcedar and western hemlock are the dominant species.

Block 5 is by far the largest in the TFL. It extends over all or part of several islands—notably Princess Royal, Yeo, Roderick and Pooley—and portions of the mainland from Millbank Sound in the south to Douglas Channel and Gardner Canal in the north. It shares borders with the North Coast TSA to the northwest, the Mid Coast TSA to the south, and TFL 41 to the east and north. Large portions of the block are visible from the Inside Passage. Although harvesting actually began in the early 1900s, it has been limited to date; consequently, there are substantial areas of old growth remaining. Elevations are generally below 1000 metres, but the terrain is relatively steep in the northern portions of the block. Western hemlock and amabilis fir are the principal species. To the south, the topography is gentler and western redcedar is more common. The steep terrain and remoteness of the block have limited the area considered physically and economically operable to 20 percent of the gross block area.

History of AAC

In 1958, Forest Management Licence 25 was issued to Alaska Pine and Cellulose Limited. The license, which has since been replaced with TFL 25, is now held by Western Forest Products Ltd. The parent company is Doman Industries Ltd. The original AAC was 407 762 cubic metres, based on a timber harvesting land base of 113 442 hectares. Improved information, changes in forest management practices and changes to the estimated timber harvesting land base have led to a series of adjustments over the years. The history of the AAC and changes in the estimate of the timber harvesting land base are outlined in the table below.

Year	AAC (cubic metres)	Timber Harvesting Land Base (hectares)
1958	407 762	113 442
1966	594 654	122 564
1967	580 495	123 295
1972	614 475	140 950
1975	668 277	140 950
1977	615 891	152 209
1980	653 180	152 214
1988	653 000	154 941
1991	708 000	157 985
1993	783 000	157 985

The 1993 determination, made during the term of Management Plan (MP) 8, remains in effect today. Each block contributed to the determination as follows:

Block	Licensee Schedule A and B (cubic metres)
1	151 178
2	84 103
3	56 942
4	201 758
5	191 412
Helicopter Logging (2 and 5)	55 000
Licensee Subtotal	**740 393**
Small Business Forest Enterprise Program (all blocks)	42 607
Total	**783 000**

The licensee component includes a partition of 55 000 cubic metres per year attributable to stands in Blocks 2 and 5 classified as operable by helicopter only.

New AAC Determination

Effective December 30, 1996, the new AAC for TFL 25 with be 779 000 cubic metres, partitioned as follows:

Block	Annual Harvest Level (cubic metres)
1	**175 000**—6000 of this total is attributable to stands in areas classified as operable only by helicopter; 10 000 of the total is attributable to volumes harvested through commercial thinning
2	**92 000**—22 000 of this total is attributable to stands in areas classified as operable only by helicopter
3	**55 000**—2000 of this total is attributable to stands in areas classified as operable only by helicopter
4	**202 000**—5000 of this total is attributable to volumes harvested through commercial thinning
5	**255 000**—70,000 of this figure is attributable to stands in areas classified as operable only by helicopter

The overall impact, relative to the current AAC, is shown in the table below.

BLOCK	CURRENT ANNUAL HARVEST LEVEL		NEW ANNUAL HARVEST LEVEL	
	Conventional (m^3)	**Helicopter (m^3)**	**Conventional (m^3) (% change)**	**Helicopter (m^3)**
1. (Jordan River)	160 000	--	**169 000** (includes 10 000 commercial thinning partition) (+6%)	6000
2. (Loughborough Inlet)	92 000	share 55 000	**70 000** (-24%)	22 000
3. (Naka Creek)	61 000	--	**53 000** (-13%)	2000
4. (Port McNeill)	215 000	--	**202 000** (includes 5000 commercial thinning partition) (-6%)	
5. (Swanson Bay)	200 000	share 55 000	**185 000** (-8%)	70 000
Totals	**728 000**	**55 000**	**679 000 (-7%)**	**100 000 (+82%)**

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 25 includes the following:

- "Tree Farm Licence 25, Management Plan 9: Summary of Management Objectives, Options and Procedures" WFP, January 1996;
- "Tree Farm Licence 25: Management Plan 9" (draft) WFP, June 1996;
- "Tree Farm Licence 25: Management Plan 9—Timber Supply Analysis" WFP, June 1996;
- *Twenty Year Plan* WFP, October 1996;
- "Public Review of Draft MP 9, TFL 25" submitted by WFP, October 23, 1996;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Regulations*, April 1995;
- *Forest Practices Code Timber Supply Analysis*, British Columbia Forest Service (BCFS) and Ministry of Environment, Lands and Parks (MELP), February 1996;
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memo from the Minister of Forests, dated February 26, 1996, to the Chief Forester stating the Crown's economic and social objectives regarding visual resources;
- Technical information provided through correspondence and communication among staff from BCFS, MELP, WFP, and Simons, Reid Collins;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, including the AAC determination meeting held in Victoria on November 7-8, 1996;
- *Vancouver Island Land Use Plan*, Province of BC, June 1994.

Role and Limitations of the Technical Information Used

The *Forest Act* requires me to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis and the inventory and growth and yield data used as inputs to the analysis formed the major body of technical information used in my AAC determination for TFL 25. The timber supply analysis is concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

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

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural, and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide the complete answer or solution to forest management problems such as AAC 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 25, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory Framework

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

Guiding Principles

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

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

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

In considering the various factors that Section 7 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas or using unconventional technology that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the Forest Practices Code.

The impact of the Forest Practices Code on timber supply is a matter of considerable public concern. In determinations made before the Code was brought into force, no final standards or regulations were available at the time the timber supply analyses were conducted. Accordingly, the analyses were unable to assess the impacts of any new constraints on timber production that might be imposed under the Code. In those determinations I did not consider any more stringent restrictions or additional impacts upon timber supply beyond those anticipated to occur due to the application of guidelines current at the time of determination. However, I assumed that the Code would at least entrench the standards exemplified by those guidelines as statutory requirements.

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995. Studies in selected TSAs (*Forest Practices Code Timber Supply Analysis*, BCFS and BC Environment, February 1996) indicate that under the Code there will be some impacts on timber supply additional to those expected under previous guidelines. In AAC determinations made since the coming into force of the Code, I have viewed with some caution the timber supply projections in timber supply analyses that predate the Code, or that are based on information packages that largely predate the Code. At the same time, I am mindful that the full force of the Code may not be felt during the transition phase of its implementation, and the impacts of specific factors on timber supply may not yet have been assessed on a local basis.

The impact on timber supply of land-use decisions resulting from planning processes such as the Commission on Resources and Environment (C.O.R.E.) process or the Land and Resource Management Planning (LRMP) process is a matter often raised in discussions of AAC determinations. In determining AACs it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions that have not yet been taken by government. Thus I do not consider the possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made land-use decisions, it may not always be possible to analyze the full timber supply impact in AAC determinations. In most cases, government's land-use decision must be followed by detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made, it is impossible to properly assess the overall impact of the land-use decision. Where specific protected areas have been designated by legislation or Order in Council, these areas are no longer considered to contribute to timber supply. The legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

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

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

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interests of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations issues, I am aware of the Crown's legal obligations resulting from the June 1993 Delgamuukw decision of the B.C. Court of Appeal regarding aboriginal rights. The AAC I determine should not in any way be construed as limiting the Crown's obligation under the Delgamuukw decision, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 25. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Aboriginal rights will be taken into account as far as possible under Section 7(3) of the *Forest Act* and will be respected in the administration of the AAC determined.

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

Overall, in making AAC determinations, I am mindful of my obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

The Role of Base Cases in AAC Determinations

In considering the factors required under Section 7 to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review project for TSAs and, for TFLs, by the licensees.

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

In this determination a base case forecast was used for each block. A base case forecast represents only one of a number of theoretical forecasts, and may incorporate information about which there is some uncertainty. Its validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it. Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecasts are realistic and current, and the degree to which their predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current information available about forest management, which—particularly during the period leading up to, and now during, the implementation of the Forest Practices Code—may well have changed since the original information package was assembled.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecasts. But once an AAC has been determined that reflects appropriate assessment of all the factors required to be considered, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined—it would be impossible for any such analysis to fully incorporate the subtleties of the judgement involved.

Timber Supply Analysis Base Case Projections

For TFL 25, the timber supply analysis was performed by a consulting firm, Simons, Reid Collins, using its proprietary model, GIS COMPLAN. This software was developed for use as an operational harvest scheduling tool as well as a timber supply model. While the specific workings of this model differ from those of the BCFS simulation model, GIS COMPLAN incorporates the same general processes of forest growth and harvest under specified management regimes.

Each block was analyzed separately, and a number of harvest flow projections were submitted by the licensee for each. These were based on a wide variety of assumptions regarding harvest flow policy, contributions from commercial thinning, green-up ages, minimum harvestable ages, and a multitude of other factors.

The original harvest forecasts submitted by the licensee as the base case forecasts for each block began with initial harvest levels below the harvest levels proposed in MP 9 (described below). While these forecasts show the maximum possible non-declining flow forecast, they do not, in most cases, demonstrate the implications of the proposed harvest levels on future timber supplies. I consider those implications critical to my determination. Also, because some of these proposed base case forecasts begin at levels well below the proposed harvest level, they may not fully demonstrate the sensitivity of the harvest forecast to uncertainties in the various assumptions. As a result, various alternative forecasts were used for reference throughout the determination because they were deemed to be more similar to the harvest forecasts that might result from the proposed harvest levels.

Although some of these alternative forecasts—which have been adopted as base cases for the purposes of this determination—differ in a few assumptions from current or proposed management, I believe their harvest forecasts to be more representative of the harvest forecasts which are likely to result from current management. I also believe these alternative forecasts to be more demonstrative of the impacts of different harvest levels on future timber supplies.

On Block 1, the current annual harvest level is 160 000 cubic meters, and the licensee has proposed a program of commercial thinning that would expand the harvest to 170 000 cubic meters per year. To demonstrate that this initial level of harvest was feasible, even without commercial thinning, a harvest forecast that exceeded the proposed harvest level by 10 000 cubic meters per year was selected as a base case. This forecast, which begins at 180 000 cubic meters per year, declines in two 6 percent-per-decade reductions to a long-term level of 157 000 cubic meters. Both the increase in growing stock that accompanies this long-term level and the additional forecasts provided as sensitivity analyses for managed stand yield assumptions indicate that the long-term level is underestimated by this base case forecast.

On Block 2, the current annual harvest level is 92 000 cubic meters plus an unspecified portion of a 55 000-cubic-meter partition that was established to harvest lands identified as being outside the conventionally operable land base in Blocks 2 and 5. The licensee has proposed an initial annual harvest level of 92 000 cubic metres per year, *inclusive* of any harvests that would come from lands not identified as conventionally operable in the new operability mapping. A base case

forecast that demonstrates the feasibility of this initial harvest level requires a series of reductions of up to 10 percent over the next four decades. The reductions in harvest level portrayed in this forecast culminate in a long-term harvest level of 65 000 cubic meters. The rise in growing stock and the forecast of area denuded in the integrated resource management (IRM) and modification visual quality objective (VQO) zones suggest that an increase from the long-term harvest level portrayed may have been possible at some point during the simulation horizon.

The licensee has proposed a harvest-level reduction on Block 3 from the current harvest level of 61 000 cubic meters to a new harvest level of 55 000 cubic meters per year. A harvest forecast was considered that begins at the proposed harvest level and declines by 11 percent after the first decade to a long-term level of 49 000 cubic meters per year. In the opinion of BCFS staff, however, an alternative forecast that stepped down to this long-term harvest level in two smaller increments would also be feasible. It is also apparent that the long-term harvest level is conservative because growing stock levels rise over time and because the forest cover objectives in the IRM and modification VQO zones do not constrain timber supply.

On block 4, WFP has proposed a harvest level of 202 000 cubic meters per year, which is 6 percent below the current harvest level. A forecast was provided that starts at this initial harvest level and declines by 10 percent after the first decade to arrive at a long-term harvest level of 181 000 cubic meters. This forecast includes an additional 2500 cubic meters of commercial thinning above the 5000 cubic meters proposed in the management plan. Because there is little yield advantage to commercial thinning, and because the forest cover objectives are not constraining in the IRM zone, I expect that this harvest level could be achieved by conventional harvesting methods alone. It also appears likely that the potential long-term harvest level is underestimated as the forecast of denudation in the IRM zone is not limited by adjacency constraints (discussed below, under *forest cover requirements*) over the entire forecast and because total growing stock increases over the course of the simulation.

The current annual harvest level for Block 5 comprises 185 000 cubic meters from conventionally operable areas plus an unspecified portion of a 55 000-cubic-meter partition that was established to harvest lands identified as being outside the conventionally operable land base in Blocks 2 and 5. An annual harvest level of 255 000 cubic meters per year was proposed for Block 5 by the licensee. In support, it provided a harvest forecast that commenced at this level and declined by 6 percent per decade for three decades to a long-term harvest level of 215 000 cubic meters per year. The simulation for this forecast applied a visually effective green-up height requirement that exceeded the normal level for field operations in that area (see discussion below, under *visually sensitive areas*); therefore, a higher initial harvest level is likely possible. A higher potential long-term level is also indicated by the rise in total growing stock over the simulation horizon and by the non-constraining forest cover objectives in the IRM and modification VQO zones.

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

Section 7 (3)

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

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

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

Land base contributing to timber harvest.

- *general comments*

As part of the process to define the timber harvesting land base—i.e., the land base estimated to be economically and biologically available for harvesting—a series of area deductions were made from the productive forest. These deductions took into account factors such as environmental sensitivity and the presence of riparian areas, which may render an area undesirable to harvest for economic or ecological reasons. In reviewing this process I am aware that some areas may have more than one classification—e.g., environmentally sensitive areas may also lie in riparian areas. Hence, the figure shown for a given category in the netdown table in the timber supply analysis or mentioned in the AAC rationale does not necessarily reflect the total area with that classification; much of it may have been deducted earlier for other reasons. If the deduction order were changed, the areas taken from the listed categories could also change.

The overall area of TFL 25 is 458 447 hectares. This total area includes Fiordland Recreation Area, which was excluded when defining the timber harvesting land base; the recreation area does not contribute to timber supply in TFL 25. The total productive forest area is estimated at 248 541 hectares. Following reductions in the analysis for factors such as inoperable areas, riparian areas and environmentally sensitive areas, the current timber harvesting land base was estimated to be 112 989 hectares. This figure was based on both coniferous- and deciduous-leading stands, although only the softwood volumes in either type were assumed to be harvested. (See discussion below, under *deciduous.*) Once losses to future roads, trails and landings were incorporated, and not-satisfactorily-restocked areas were added back, the long-term timber harvesting land base was estimated at 114 427 hectares, approximately 25 percent of the total TFL area.

- *inoperable and inaccessible terrain*

WFP has recently updated its operability mapping for all five blocks. The revisions for Blocks 1 and 3 were accepted by Vancouver Forest Region staff, but concerns were raised regarding the accessibility of the Apple River drainage in Block 2. In response, the licensee has submitted draft access plans and engineering reports to support its contention that access is feasible. The issue is currently being reviewed by BCFS staff. The Apple River drainage contains significant amounts of old growth, and the short-term harvest projection is dependent upon harvesting there.

Regional staff also noted that some areas in Block 2 identified as helicopter-operable were previously considered conventionally operable. The licensee has responded that the increased costs of road construction have made helicopter logging the preferred option in those areas.

The operability mapping for Block 4 was accepted by Vancouver Region staff, as was the mapping for the southern portion of Block 5 lying within the Mid Coast Forest District. However, North Coast District staff questioned the operability estimates for the northern portion of the block, particularly the area designated as helicopter-operable. A consultant hired by the district reviewed the mapping and concluded that the helicopter-operable land base was overestimated by 12 percent and the conventionally operable land base was overestimated by 2 percent. As a compromise, the licensee reduced its estimates by 6 percent in the helicopter-operable land base and 1 percent in the conventionally operable land base. New harvest projections were provided to demonstrate the effect of those changes. (See further discussion below, under *helicopter logging*.) The new operability estimates were not accepted by Prince Rupert Forest Region staff.

I acknowledge that there is some uncertainty about the operability estimates for Blocks 2 and 5. I am aware that operability mapping in many units is subject to differences of opinion, particularly in areas such as Block 5 that have a limited history of operations. Bearing in mind the subjective nature of operability mapping, the licensee's expressed commitment to helicopter logging, and the fact that a partition for that harvest method will ensure harvesting is proportionately dispersed across the land base, I accept WFP's estimates as acceptable for use in this determination. Further data should be available for the next determination, and the issue will be reviewed again at that time.

- *environmentally sensitive areas*

WFP's ecosystem classification system or conventional ESA mapping was used in most areas to identify environmentally sensitive areas (ESAs). Elsewhere, extrapolations into unmapped areas were employed. The percentage excluded varied according to ecosystem and factor. In total, 11 127 hectares were removed, over half from Block 5.

<u>avalanches (Ea)</u>
No specific deductions were made for areas considered at risk to avalanches. However, BCFS staff indicate that any areas in question would likely be in the inoperable land base. I accept their assessment and regard the lack of specific deductions as reasonable for this determination.

<u>regeneration (Ep)</u>
Ecosystem mapping was used to predict areas in Blocks 1-4 likely to have regeneration problems. This methodology was unavailable for Block 5 and so conventional ESA mapping was used; this resulted in a 90 percent exclusion of the 1569 hectares identified.

The licensee has expressed concern that the conventional methodology has overstated the Ep area in Block 5, but provided no estimate of the suspected magnitude of the discrepancy. BCFS staff have confirmed that the 20-Year Plan does propose logging in some of the areas in Block 5 identified as Ep; however, they lack sufficient information yet to determine if the Ep mapping is accurate or if those blocks will, in fact, be available for harvesting.

Ecosystem mapping is based on a sophisticated methodology, and I am confident the Ep estimates for Blocks 1-4 are reasonable. I acknowledge there is some uncertainty about the estimates for Block 5, but in the absence of any better information—or of any evidence that better information would affect timber supply—I regard those estimates as appropriate for this determination. Ecosystem mapping is now underway for Block 5, and the results should be available in time for the next timber supply analysis.

soil stability (Es)

Soil stability mapping for Blocks 1 and 4 was completed in 1992 but has never been reviewed by BCFS staff. The mapping was conducted at a reconnaissance level and lacks the detailed resolution necessary to identify Es areas under the current five-class soil stability system recommended under the Forest Practices Code.

Mapping of the Stafford (1992) and Apple River (1995) drainages in Block 2 was accepted earlier in 1996 by Vancouver Forest Region staff. The previously logged Heydon Bay drainage, which covers approximately 40 percent of the block, has not been mapped, and Es areas were estimated through extrapolations from the adjacent Frazer Bay drainage. BCFS staff are uncertain about the accuracy of the extrapolations but lack sufficient data to determine if the Es areas have been over- or under-estimated.

Es mapping in Block 3, carried out in 1992, has also been accepted by Vancouver Forest Region staff. However, they have expressed concerns about its age, and have directed the licensee to update mapping during the term of MP 9.

For approximately 25 percent of Block 5, the 1992 Es mapping has been replaced by the new five-class soil stability system. For the remainder, the licensee extrapolated data from areas mapped on Pooley, Roderick and Yeo islands. North Coast District and Prince Rupert Region staff have accepted the mapping for the purposes of this timber supply analysis.

In reviewing the Es identifications I note that there is some uncertainty about the methodology used, particularly in Blocks 1 and 4, which have not been reviewed by BCFS staff. However, it is unclear if the existing maps have under- or over-estimated Es areas. As I have no better information I accept the current Es mapping as suitable for this determination. Nonetheless, I expect the licensee to update and refine its resource inventories in time for the next timber supply analysis.

- *deciduous*

In total, 1761 hectares of deciduous-leading stands—primarily in Blocks 1 and 5—were excluded from the current timber harvesting land base in the timber supply analysis. These were subsequently all added back to the long-term timber harvesting land base and modelled as contributing softwood volumes. Section 4.4 of MP 9 indicates that alder harvesting is planned only for Block 1. Section 5.93, however, proposes the conversion of 140 hectares of alder in Blocks 1 and 4 to coniferous. The timber supply analysis, in turn, assumed only softwood volume would be harvested in all stands, deciduous- or coniferous-leading.

There are thus some inconsistencies between MP 9 and the timber supply analysis, and within MP 9 itself. I have asked the licensee to clarify these as a condition of my approval of the management plan. It should be noted, too, that in the absence of a deciduous partition—for which I see no compelling reason in this unit—all volumes, softwood and hardwood, will count against the AAC I determine.

If the licensee carries out the conversion plans proposed in MP 9 for Blocks 1 and 4, this would mean the timber supply analysis has underestimated timber supply from deciduous-leading stands, because it has not accounted for hardwood volumes. On Block 1, where approximately 634 hectares, or 3 percent of the long-term timber harvesting land base, is accounted for by deciduous-leading stands, and where the licensee has indicated and demonstrated a preference for harvesting alder, I expect a modest amount of additional volume to be available for the hardwood component within deciduous and deciduous leading mixed stands. I estimate the area proposed for conversion on Block 1 should be able to support a harvest of about 10 000 cubic meters per year. Because the timber supply analysis has already accounted for softwood yields from these stands, I estimate that an additional 5000 cubic meters of hardwood should be available. On Block 4, I anticipate that the deciduous yield would be insignificant, because deciduous-leading stands account for only 109 hectares, less than half of 1 percent of the long-term timber harvesting land base.

For Blocks 2, 3 and 5, WFP has included the deciduous-leading stands in the long-term timber harvesting land base, but has proposed no intentions in MP 9 to use or convert these stands. As a result, these inclusions do not reflect current or planned practice and serve to inflate the timber supply forecast. The effect in the short term is minimal, however, as short-term harvest levels are not dependent to any significant degree on the softwood yields projected to come from these stands.

The contribution of deciduous-leading stands to timber supply will be further discussed below, under "Reasons for Decision."

- *parks*

Since the preparation of the information package for the timber supply analysis, a small portion of the timber harvesting land base in Block 1 has been formally added to the Juan de Fuca Marine Trail through an Order in Council. An equivalent area has been added to the TFL from the Arrowsmith TSA, and I expect there will be no net effect on timber supply from this land base exchange and exclusion of the new protected area.

In Block 3, 150 hectares of the total land base have been added to the Robson Bight Park. Similarly, 26 hectares of the total land base in Block 4 have been protected as Misty Lake Park. These areas were included in the timber supply analysis, but I must exclude them from consideration in this decision. However, given the small areas involved, there will be no short-term impact on timber supply and only very minor impacts in the long term.

- *low productivity sites and unmerchantable forest types*

A total of 2406 hectares of the productive forest met one of the following criteria and were excluded from the timber harvesting land base because they were not considered merchantable:

- "low" site class
- mature stands (older than 120 years) less than height class 3 (19.5—28.4 metres)
- pine-leading stands
- western hemlock-leading stands of both stocking class 2 and height class 3

One of the conditions of approval for MP 8 was that WFP report on operations in height class 3, stocking class 1 stands on Blocks 2, 3 and 5 during the term of that management plan. District staff confirm that there have been operations in height class 3 hemlock stands in all blocks. Given that timber supply is sensitive to harvesting in hemlock height class 3 stands in Blocks 1, 4 and 5, I expect to see a continuation of balanced harvesting in those areas in particular. For all blocks, however, I wish to see the licensee report performance in these stands types.

The merchantability criteria reflect practices in the TFL and are consistent with criteria used elsewhere on the coast; hence, I have no reason to question their suitability for this determination. In summary, I accept the merchantability assumptions as modelled in the timber supply analysis.

- *helicopter logging*

WFP has demonstrated performance in helicopter logging in Blocks 2 and 5 over the past several years and, in a recent letter to me, has committed to continuing this harvest method. MP 9 proposes an ambitious expansion of that program. Within every block except Block 4, the licensee has identified some portion of the timber harvesting land base in which helicopter operations are anticipated. Blocks 1 and 3 have no history of

aerial harvesting, but the licensee has indicated that the rising costs of conventional road construction have made aerial operations economically more attractive than before. (See earlier discussion under *inoperable and inaccessible terrain.*) As also noted earlier, North Coast District staff questioned the aerial operability estimate for the northern portion of Block 5. The final operability estimates used in the timber supply analysis are shown in the table below, along with MP 9's projection of aerial volumes for 1997.

Block	**Long-Term Timber Harvesting Land Base plus Future Roads (hectares)**	**Conventional Operability (percent)**	**Aerial Operability (percent)**	**1997 Proposed Volumes from Aerial Harvesting (cubic metres)**
1	21 671	97	3	6000
2	13 109	76	24	45 000
3	8895	91	9	2000
4	24 558	100	0	0
5	48 609	71	29	50 000
Totals	**116 842**	**84**	**16**	**103 000**

For this determination, I accept the operability breakdown by conventional and aerial systems. I acknowledge there is some uncertainty regarding the size of the helicopter- and conventionally operable land bases in Block 5 (see earlier discussion under *inoperable and inaccessible terrain*) but I have accepted the licensee's estimates. I have no reason to doubt that the modest volume targets for Blocks 1 and 3 are feasible. However, I have concerns about the proposed volumes for Blocks 2 and 5. This issue will be further discussed under "Reasons for Decision."

- *roads, trails and landings*

All existing roads of a significant width were mapped as polygons, with the area deducted from the gross land base. For narrower existing roads, a 10-metre corridor was assumed along the length of the road and the resulting area was deducted from the gross land base. In both instances, these deductions were made before deriving the operable productive forest land base. Future roads were estimated at 5 percent of the unharvested conventionally operable forest area of stands older than 139 years. These were deducted by the model at the projected time of harvest. No specific deductions were assumed for landings and trails. The licensee explained that few trails or landings are required because most forwarding is performed by hoe-chucking or grapple-yarding direct to the road; back spar trails are later rehabilitated. WFP also expects that the 10-metre corridor along existing roads will account for the few trails and landings that do occur. The relationship between existing and future roads and the operable land base is shown below.

Block	Conventionally Operable Land Base (including existing roads) (hectares)	Existing and Future Roads (hectares)	Percentage of Conventionally Operable Land Base (including existing and future roads)
1	21 816	958	4.4
2	10 214	399	3.9
3	8303	438	5.3
4	25 182	927	3.7
5	34 727	1612	4.6
Totals	**100 242**	**4334**	**4.3**

BCFS staff have expressed concern that the methodology generally yielded results of less than 5 percent. These appear low in comparison to some other management units on the coast. Campbell River Forest District staff examined historical cutblock data for Blocks 2 and 3, and found average road losses ranging from 4–7 percent.

Future road development was assumed to occur only in stands over 139 years. It is unlikely that all stands younger than that are fully roaded. Accordingly, further deductions for future roads—above the levels assumed in the timber supply analysis—will likely prove necessary. However, given that there are relatively few stands younger than 140 years that have a non-harvest origin (and, hence, are unroaded), the impact on timber supply will be quite modest and restricted to the long term.

In summary, I expect that the licensee's historical averages and those found in other areas of the coast will be borne out and that the overall modelled losses will prove to be low. This should affect timber supply only in the long term, however. This issue will be further discussed under "Reasons for Decision."

Existing forest inventory

- *age of the inventory*

The inventories for Blocks 1, 2 and 3 were undertaken in 1971; Block 4 was inventoried in 1970 and Block 5 in 1985. Height estimates are lacking, however, for all stands less than 141 years. The available data for the entire TFL was entered into a Geographical Information System (GIS) for MP 8. For this timber supply analysis all growth and depletions were updated to January 1, 1995.

No inventory audits have been conducted in the TFL; however, BCFS staff intend to audit Blocks 2 and 3 in 1998 and Block 4 in 1999 to help determine possible areas of concern with the current inventories. Block 1 is currently being reinventoried using the standards developed by Resources Inventory Branch for the new vegetation inventory methodology. The results of these undertakings, along with any further information, will be used in

future AAC determinations. At this time the existing inventories constitute the best available information.

- *age class distribution and species profile*

The age class distributions within the five blocks are shown in the following table. The percentages listed are relative to the long-term timber harvesting land base within each block.

Block	0-80 years	80-140 years	140 + years
1	74%	1%	25%
2	50%	2%	48%
3	30%	4%	66%
4	65%	10%	25%
5	9%	0%	91%
Total TFL	**39%**	**3%**	**58%**

The harvest forecast projects a rapid transition from old growth to second growth in Block 1, beginning in about 20 years. In Block 2 the transition will begin in about 60 years. For Blocks 3 and 4 the transition to younger stands is projected to begin in approximately 70 and 20 years, respectively. And for Block 5, old growth will continue to provide the bulk of the harvest volume for another 110 years. All these estimates are dependent, of course, upon the AAC determined and the management approach adopted.

The species distribution in the timber harvesting land base for each block and for the entire TFL is shown in the table below.

Block	Douglas-fir	Red and Yellow Cedar	Western Hemlock	Balsam	Spruce	Deciduous
1	45%	17%	33%	2%	0%	3%
2	4%	32%	48%	14%	0%	2%
3	2%	36%	56%	6%	0%	0%
4	1%	49%	47%	2%	1%	0%
5	0%	42%	36%	18%	2%	2%
TFL	**9%**	**37%**	**41%**	**10%**	**1%**	**2%**

- *volume estimates for existing stands*

Volume estimates for existing stands 141 years and older were estimated by calculating area-weighted average yields by leading species and by site class where inventory plot data was available. The Variable Density Yield Prediction (VDYP) model (Version 4.5)

was used for balsam-leading stands less than 141 years and for species/site combinations where an adequate number of inventory plots were unavailable.

Prince Rupert Forest Region staff and North Coast District staff have expressed concerns that the average inventory plot volumes may overstate yields for existing stands over 140 years in the northern portion of Block 5. A number of cutting permit cruise estimates from Block 5 have shown volumes of approximately 500 cubic metres per hectare, whereas the licensee's area-weighted estimates average about 600 cubic metres per hectare. Mid Coast Forest District staff, who oversee the management of the southern portion of Block 5 where most of the harvesting has occurred, have stated that the licensee's figures are consistent with their own cruise volume estimates.

Comparisons with cruise estimates do not provide a sound basis for judging the accuracy of volume projections. It is more important, from my perspective, that Resources Inventory Branch staff have approved the methodology used to calculate area-weighted average yields for stands over 140 years. I note, however that they are concerned that the 1971 inventory plot database, which was used for the estimates in Blocks 1–4, has not been updated to reflect management changes over the past 25 years. If harvesting has not occurred evenly across the sample populations—i.e., if the current inventory profile differs significantly from the profile at the time of the original inventory—the estimates could be inaccurate.

The more extensive logging history in Blocks 1 and 4 would suggest that existing yield estimates for those blocks are more at risk to outdated information in the inventory. However, a new vegetation inventory is currently underway in Block 1, which should address concerns there. For Blocks 2–4, the age of the inventory emphasizes the importance of the planned audits. (See earlier discussion under *age of the inventory*.) Nonetheless, the methodology used was approved by BCFS staff and the resulting yield estimates represent the best information available. Moreover, no evidence exists as yet to confirm whether harvest operations have taken stands out of proportion to the distribution indicated in the original inventory. For this determination, I accept the yield estimates for existing stands older than 140 years as suitable, but I expect the licensee to update its information in time for the next timber supply analysis.

Expected rate of growth

- *site productivity estimates*

The productivity of a site largely determines how quickly trees will grow and, therefore, affects expectations of timber volumes in regenerated stands. Estimates of site productivity (site indexes) are commonly expressed in terms of expected tree height 50 years after reaching 1.3 metres.

WFP adopted differing methods for determining site indexes, according to the availability of data for a given block. For Blocks 1, 3 and 4, site indexes were based on ecosystem mapping and site index relationships developed from ecosystem-classified yield plots. (See earlier discussions under *environmentally sensitive areas* and *age of the inventory*.) This procedure was accepted by BCFS Research Branch staff, but they noted a range of uncertainty in the final estimates. Block 1 had the most data available and Block 3 the least; accordingly, the estimates for Block 3 are believed to be less certain. While I am aware of the uncertainties, I have no information to indicate that the site index estimates are in fact inaccurate. The site indexes derived using the ecosystem mapping constitute the best available information for Blocks 1, 3 and 4, and I accept them as suitable for use in support of this determination.

Ecosystem mapping was incomplete for Blocks 2 and 5; these areas also lacked height estimates for stands less than 140 years of age. Consequently, the conventional BCFS methodology—which relies upon height and age information to determine site index—could not be used for those young stands in place of the ecosystem-based methodology adopted elsewhere in the TFL. Instead, alternative approaches were adopted.

In its harvest projections for Block 2, the licensee used the default site index values assigned by VDYP for all species and site class combinations identified in the inventory file, not just those less than 140 years of age. Research Branch staff, however, advised that the default site index values are acceptable only where no other method is possible. As age and height data does exist for stands over 140 years, the licensee was asked to calculate the site index values for those stands using the conventional BCFS methodology. The net effect of WFP's modelled methodology was a general shift of areas that would likely otherwise have been classified as having poor productivity into the medium site productivity category. The site index values derived using the BCFS method were incorporated into a sensitivity analysis, and results showed that harvests projected in the base case could still be achieved for the next few decades, while medium- and long-term timber supply would be lower than in the base case.

For Block 5, the average site indexes by leading species applied in the base case were derived using information from a small number of permanent sample plots (PSPs). The licensee's methodology resulted in a shift in the proportion of the land base in each site class, and a simultaneous change in site index values relative to the conventional BCFS methodology. Research Branch staff did not accept this methodology and asked WFP to recalculate the site index values using the same conventional approach as requested in Block 2. Sensitivity analysis using the site indexes derived using the conventional BCFS method showed similar results to Block 2: base case projected harvests could be attained over the next few decades, and medium- and long-term timber supply would be lower.

For Blocks 2 and 5, I have concluded that the licensee's methodology for deriving site indexes results in higher site index estimates than does the conventional BCFS method. However, I also note that based on studies in other areas the conventional methodology (which employs inventory information from old-growth stands to estimate site

productivity) results in site indexes that may underestimate the growth potential of managed stands. I am aware of no site productivity studies that apply specifically to TFL 25, and therefore do not know whether, or to what extent, results from elsewhere may apply in this area.

The overall effect on medium- and long-term timber supply due to the overestimate of site indexes relative to the conventional BCFS method, together with the possibility that actual site productivity is underestimated by existing inventory information on old-growth stands, is uncertain. The evidence before me does not clearly indicate that site index estimates used in the base case for Blocks 2 and 5 either under- or overestimate medium- and long-term timber supply. I believe it is most reasonable at this time, given the uncertainty and the lack of short-term effects, to view the information on site productivity used in the base case as satisfactory for this determination.

However, it is imperative that WFP and the BCFS Research Branch consult to develop a methodology that is appropriate for the conditions in TFL 25, and that this method be employed in the next timber supply analysis for the area. As ecosystem mapping progresses in Blocks 2 and 5, it should become possible to use more sophisticated and reliable methodologies to determine site productivity.

- *volume estimates for regenerated stands*

Volume estimates for stands less than 141 years of age and for those regenerating during the simulation were provided by the Tree and Stand Simulator (TASS) program for Douglas-fir and hemlock-leading stands. For redcedar-, yellow cedar- and Sitka spruce-leading stands, regenerated volumes were projected using the Table Interpolation Program for Stand Yields (TIPSY). VDYP was used to generate the regenerated stand yield curves for balsam-leading stands since managed stand yield estimates are not available specifically for balsam. For all species, except Douglas-fir and balsam, the standard operational adjustment factors (OAFs) were used in the timber supply analysis: 15 percent to account for openings in stands that reflect unproductive areas like small swamps and rock outcrops (OAF1), and 5 percent for age-dependent factors such as pests, disease, decay, waste and breakage (OAF2). For Douglas-fir-leading stands, both OAF1 and OAF2 were assumed to be 5 percent. (See also discussion below, under Decay, waste and breakage.)

Staff from Research Branch and Resources Inventory Branch have not approved the use of TASS and TIPSY to estimate volumes in unmanaged stands aged between 40 and 140 years. Management activity was generally less rigorous prior to the 1960s; hence, TASS and TIPSY—which are predicated on some level of stand management and, accordingly, project higher yields—are considered unsuitable for estimating volumes in stands over 40 years of age.

To justify the use of TASS and TIPSY for stands between 40 and 140 years old, WFP graphically compared stand yield curves based on those models with BCFS and licensee inventory plots in unmanaged stands. While the stand yield curves fall within the range of the plots, they exceed the average plot volumes. BCFS staff also note that the plots used were not randomly located and tend to have higher-than-average stocking and crown closure levels. As a result, yield estimates based on data from these plots may not represent average conditions on the TFL. Only Blocks 1 and 4 have significant area in the 40 to 140 year-old range, and therefore, the uncertainty regarding the applicability of TASS and TIPSY is important for timber supply only in those blocks. Relevant timber supply analysis results are discussed below.

In considering factors related to Block 1—the concerns raised by Research and Inventory branches regarding OAF1 in Douglas-fir stands; the prominence of Douglas-fir in the inventory of Block 1; the imminent transition to extensive second-growth utilization on that block; and a proposal for an increase in the harvest level—I requested that the licensee provide additional information to help reduce the uncertainty regarding the harvest forecast on Block 1.

In response to this request, the licensee submitted some preliminary growth and yield data and additional harvest forecasts for Block 1. One forecast indicates that if VDYP is used for existing stands greater than 30 years and less than 140 years, a harvest of 169 000 cubic meters can be maintained for one decade followed by a decline of only 1 percent. This level is then maintained for 110 years until an increase to 195 000 cubic meters is possible. This long-term level could likely have been achieved in the base case (which showed a long-term level of 157 000 cubic metres per year), but no attempt was made to do so.

The licensee has indicated, and BCFS staff concur, following a review of the results, that the proposed initial harvest level of 170 000 cubic metres per year could have been achieved, provided a slightly steeper decline occurred after the first decade. A harvest-level comparable to that used in the base case (180 000 cubic metres per year) would not be possible without substantially larger declines in the medium term.

Similar results are not available for Block 4; however, based on the projected harvest ages over time, I believe it is reasonable to expect that use of yield estimates from TASS and TIPSY may overestimate medium-term timber supply. The transition to harvesting of second-growth in Block 4 is projected to occur slightly further into the future than in Block 1.

To conclude, there is some indication based on analysis results that yield estimates used in the base case for stands aged between 40 and 140 years for Blocks 1 and 4 may result in overestimated short- and medium-term timber supply. This downward pressure is reflected in "Reasons for Decision."

I am also aware that BCFS Research Branch staff did not approve the OAF1 used by the licensee for Douglas-fir stands. The same inventory plots as used in attempting to justify application of managed stand yield estimates to 40-140-year-old stands—featuring higher-than-average stocking and crown closure levels—were used by the licensee to justify a reduction in OAF1 values. This issue overlaps with the general uncertainty regarding the appropriateness of using TASS and TIPSY for stands aged between 40 and 140 years, which is discussed above. For stands younger than 40 years of age, the lower OAF1 for Douglas-fir may result in an overestimate of volumes, however any effect on timber supply would occur in the medium to long term. WFP should work with the BCFS Research Branch to develop OAFs most appropriate for the conditions in TFL 25. Given the longer-term implications of the uncertainty regarding OAF1 for Douglas-fir, I will not make any adjustments in this determination. Any further information should be used in future analyses and AAC determinations.

The VDYP model is not normally used to estimate yields for managed regenerated stands as was done for balsam-leading stands in TFL 25. Considered alone, use of VDYP leads to a likely underestimation of future yields for balsam-leading stands. Conversely, yield estimates for balsam did not account for projected waste and breakage, which Resources Inventory Branch staff have advised would be 4 percent if applied in VDYP. The lack of accounting for waste and breakage offsets to some extent the likely underestimation caused by employing VDYP for regenerated stands. The available information does not allow for a complete assessment of the overall effect on stand yield estimates for managed balsam stands. I am also aware that balsam-leading stands constitute only about 10 percent of the overall timber harvesting land base, and in the blocks where balsam is most abundant (Blocks 2 and 5) there is little area in the 40–140 year-old range. Also, potential effects on timber supply of any changes in volume estimates for regenerated balsam stands would occur primarily in the long term. Based on these considerations, I will accept the estimates used in the base case for this determination. I request, however, that WFP work with the BCFS Research Branch to develop a more appropriate yield estimation procedure for balsam for the next timber supply analysis.

- *minimum harvestable ages*

The minimum harvestable age is the age at which stands reach a harvestable condition. In the timber supply analysis, the minimum harvestable ages were selected based on product objectives. The licensee analyzed 1990–1994 log production data by species and grade in order to establish existing mill log grade and size utilization. It then used a diameter distribution prediction model to determine the minimum average diameters and ages necessary to achieve those piece size and quality objectives. The results indicated the target diameters—defined as 45 centimetres in good site stands, 40 centimetres in medium site stands and 35 centimetres in poor site stands—would not be reached for relatively long periods, but these were nonetheless incorporated into the timber supply analysis as the minimum harvestable ages. For stands whose average diameters failed to reach the target sizes, culmination age—the age at which the mean annual volume

increment of a stand is at its maximum—was assumed as the minimum harvestable age. And in stands where culmination age occurs after the minimum diameter product objectives are attained, culmination age was established as the minimum harvestable age.

During this same period, the licensee also completed an economic analysis of investment returns from intensive silviculture. The study recommended generally shorter rotations than those based purely on product objectives, but the licensee did not use them in the timber supply analysis.

The following table compares minimum harvestable ages (MHAs) based on the licensee's stand diameter targets with those based on culmination age.

Site and Objective	Douglas-fir (MHA in years)	Western hemlock (MHA in years)	Western redcedar/ yellow cedar (MHA in years)	Balsam (MHA in years)	Spruce (MHA in years)
good site - 45 cm	83	77	112	99	64
- culmination age	70	80	90	52	70
medium site - 40 cm	155	101	205	116	88
- culmination age	85	100	100	63	110
poor site - 35 cm	163	163	205	150	98
- culmination age	90	130	105	80	150

Except in spruce and medium and good site hemlock stands, the ages associated with the stand diameter targets are far higher than those based on culmination age. MP 9 expresses a commitment to harvest according to the minimum harvestable ages specified in the timber supply analysis but does identify several circumstances in which exceptions would be made. Sensitivity analyses showed that timber supply is markedly constrained by the commitment to harvest at the modelled minimum harvestable ages. These analyses indicated that shorter rotation periods would allow higher initial and/or long-term harvest levels for each block than shown in the base case projections. In particular, sensitivity analyses submitted upon my request (see *volume estimates for regenerated stands*, above) showed that setting minimum harvestable ages at culmination age would increase short-term timber supply in Block 1, and offset the downward effects of lower volume estimates for 40–140-year-old stands. It is reasonable to expect that lower harvest ages would also provide considerably more operational flexibility. The licensee interprets the ages defined by product objectives as the upper limits on actual rotations, with culmination-based ages as lower limits. It is common practice in timber supply analysis in B.C. to define minimum harvestable ages based on culmination age or economic criteria that result in ages younger than culmination age.

In summary, younger harvest ages than were used in the base case could reasonably be applied. As a result, timber supply could be significantly greater in the medium and long

terms and in the short term, particularly in Blocks 1 and 4 where the transition to harvesting second growth is imminent. This issue will be further discussed in "Reasons for Decision."

(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 an area is accepted as being restocked with a specified minimum number of acceptable well-spaced seedlings. The timber supply analysis assumed a regeneration delay period of two years in planted areas (approximately 70 percent of logged sites) and four years in areas reforested through natural regeneration (30 percent). Duncan, Campbell River and Port McNeill Forest District staff have confirmed that these estimates reflect historical performance on Blocks, 1–4. Mid Coast Forest District staff estimate that regeneration delays range from 1–2 years for planted areas and 3–6 years for naturally regenerated areas in the southern part of Block 5. For the northern portion, however, North Coast Forest District staff have stated that the average for planted areas may be closer to three years.

The licensee's estimates are consistent with those for other areas of the coast, and I note that, for the most part, BCFS staff have accepted them. The uncertainty regarding regeneration delays in the northern portion of Block 5 may be related to the relatively limited scope of operations thus far. This issue will be reviewed again at the next AAC determination; if further experience and analysis of records leads to a revised estimate for the North Coast portion of Block 5 (or anywhere else, for that matter), I will take that into account at that time. For this determination, however, I accept the regeneration delay periods as modelled.

Impediments to prompt regeneration

Impediments to prompt regeneration are a concern primarily on Block 4, where competition from salal and other vegetation, and spruce weevil infestations have been common. To discourage salal ingrowth, the licensee is using smaller cutblocks (approx. 15 hectares), prescribed fire to prepare the sites, genetically improved planting stock and very short regeneration delay periods (less than one year). To combat weevil infestations, WFP is now planting western redcedar on sites where they might otherwise have planted Sitka spruce.

Deer browsing has set back cedar plantations in some areas, forcing the licensee to place guards around seedlings. This has proven to be an effective, albeit expensive, remedy. In some shallow-soil sites in Block 5, there have been problems establishing yellow cedar seedlings; western redcedar seedlings are now more commonly used.

I commend the licensee for its innovative strategies in addressing these problems. Accordingly, I find no reason to expect that any of these factors will significantly jeopardize the modelled regeneration delay periods.

Not-satisfactorily-restocked areas

The timber supply analysis identified 1996 hectares of current not-satisfactorily-restocked (NSR) areas and 96 hectares of backlog NSR. These were all included in the long-term timber harvesting land base.

The backlog NSR figure is minimal and is scheduled to be eliminated over the next two years. I have received no information that would lead me to doubt the accuracy of the current NSR figure, and I note that, as it is a reasonable estimate of two years of operations, it is consistent with the two-year regeneration delay period discussed above. For this determination, I accept that the timber supply analysis has appropriately accounted for NSR.

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

Silvicultural systems

Clearcutting is the most common silvicultural system and was modelled as such in the timber supply analysis. Alternative systems such as shelterwood harvesting, selection harvesting and clearcutting with reserves are being tried on certain sites. Although the licensee has noted problems with windthrow and also cited concerns about worker safety, it also projects in MP 9 that these alternative systems will be used to some extent in up to 25 percent of all cutblocks in the near future.

I am satisfied that the timber supply analysis has appropriately modelled the silvicultural systems in use in this TFL. If WFP expands the use of alternative systems, that will be taken into account in the next AAC determination.

Silviculture practices

Over the past five years, WFP has carried out an average of 325 hectares annually of juvenile spacing and has committed to maintain this program, pending the availability of funding from Forest Renewal BC (FRBC). These treatments were incorporated into the appropriate yield curves used in the timber supply analysis.

Since 1978, approximately 4220 hectares in Blocks 1 and 4 have been fertilized. If FRBC funding is available, WFP proposes to fertilize up to 750 hectares annually. Again, these proposed treatments were incorporated in the timber supply analysis.

MP 9 also outlines plans to convert 140 hectares of deciduous stands to conifers on Blocks 1 and 4 and to drain 150 hectares of wet sites on Block 4. As well, there are plans to expand the pruning program to improve timber quality. All three projects are dependent upon FRBC funding.

In summary, given that incremental silviculture is strongly dependent upon funding availability, there is uncertainty around the projected scale of incremental silviculture practices. If funding is not available, the assumptions in the timber supply analysis regarding juvenile spacing and fertilization may have led to an overestimate of timber supply in the medium and long terms. This issue, and the risk surrounding it, will be further discussed in "Reasons for Decision."

Commercial thinning

MP 9 proposes an ambitious program of commercial thinning based on a variety of criteria, including species, height, density and age. Some 10,000 cubic metres annually are projected for harvesting in Block 1, and 5000 cubic metres in Block 4. These volumes were proposed as partitions and incorporated in the timber supply analyses for the two blocks, although in neither block was the harvest forecast dependent upon commercial thinning. The 20-Year Plan also refers to some commercial thinning in Block 2, but this was not modelled in the timber supply analysis.

Since 1965 the licensee has commercially thinned approximately 186 hectares in Block 1, though no activity has occurred during the last few years. Duncan Forest District staff are satisfied that continuation of commercial thinning is an appropriate strategy for managing second-growth stands. Port McNeill Forest District staff have similarly expressed no objection to the proposed expansion of a 1995 trial project in Block 4 that yielded 3600 cubic metres. However, both they and the licensee are aware of the potential for windthrow problems in the hemlock-balsam stands targetted for thinning.

WFP recognizes that current commercial thinning plans will not increase the total yield from a given area; it is an operational tool that provides additional flexibility in harvest scheduling and in meeting visual management constraints. This issue will be discussed further, in "Reasons for Decision."

(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 maximum allowable stump height, minimum diameter at breast height (dbh), and minimum top diameter used to calculate merchantable timber volumes. The following utilization standards were assumed in the analysis: i.e., 30-centimetre stump height, 17.5-centimetre dbh (12.5 centimetres for stands under 120 years) and 15-centimetre top diameter (10 centimetres for stands under 120 years). District staff are satisfied that these standards reflect current management practices on all five blocks in the TFL.

I accept these standards as appropriate for use in projecting timber supply for this determination.

Decay, waste and breakage

As noted earlier, under *volume estimates for regenerated stands*, for stands whose yields were estimated by TIPSY and TASS, decay, waste and breakage was accounted for in the timber supply analysis by the application of operational adjustment factors (OAFs). Where volume projections were based on area-weighted average yields by leading species and by site class, (see earlier discussion under *volume estimates for existing stands*), the standard BCFS decay, waste and breakage factors were applied (with the exception of cedar- and hemlock-leading stands, for which local Kingcome factors were used).

For the few species and site combinations that used VDYP to project yields (e.g., balsam-leading stands), the standard BCFS decay factors were applied. By error, however, waste and breakage were not accounted for in these stands. With the exception of balsam-leading stands under 140 years of age, however, most of them do not account for a large portion of any block. BCFS staff estimate that a reduction of 3–5 percent of projected balsam volumes is needed to correct this oversight for those young stands.

I acknowledge that the absence of waste and breakage factors for younger balsam stands constitutes a downward pressure on timber supply, primarily in Blocks 2 and 5, where balsam-leading stands are most prevalent. However, the impact will be restricted to the medium and long terms, when these stands form part of the harvest profile. I note that the total area occupied by these stands is quite limited. Therefore, they are not a significant concern for this determination. My concern over the OAF1 used for Douglas-fir stands was noted earlier, under *volume estimates for regenerated stands.*

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

The TFL timber harvesting land base is divided into four management zones, distributed by block as follows:

Management Zone	**Block 1**	**Block 2**	**Block 3**	**Block 4**	**Block 5**
IRM	77%	68%	44%	74%	55%
Modification VQO	23%	8%	18%	15%	16%
Partial Retention VQO	0%	23%	35%	10%	24%
Retention VQO	0%	1%	3%	1%	5%

- *forest cover requirements*

In order to protect forest resource values such as wildlife and water quality, forest cover objectives are developed that prescribe the "green-up" stand conditions that must exist on a reforested site before timber on adjacent areas may be harvested. This provides for a distribution of harvested areas and retained forest cover across the landscape in keeping with overall management objectives for an area. Throughout the general IRM zone, which covers most of the TFL, green-up height is three metres.

To model this requirement, the timber supply analysis assumed that no more than 30 percent of the stands on the timber harvesting land base could be less than three metres high at any one time. District staff expressed concern, however, that operations in Blocks 1, 2 and 4 have more generally followed a pattern of adjacency that would be more appropriately modelled by a 25 percent maximum disturbance limit. In contrast, Campbell River Forest District staff attested that operations in Block 3 are appropriately represented by the modelled forest cover requirement. North Coast and Mid Coast Forest District staff stated that the 30 percent limit may actually be more restrictive than current operations in Block 5 would suggest.

Model projections of the area in a non-greened up condition confirmed that the harvest-level projections for Blocks 1, 2 and 4 would not be affected by lowering the maximum disturbance area to 25 percent of the timber harvesting land base. These outputs also indicated that the IRM forest cover constraint did not limit timber supply on Block 5; indeed, a shift to a 50 percent maximum would not alter the forecast at the proposed harvest level. With this in mind, I am confident that the uncertainty around this issue poses no risk of constraining timber supply more than what was modelled in the timber supply analysis. Forest cover requirements will be reviewed at the next determination.

- *biodiversity and old growth*

Biological diversity, or biodiversity, is the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. The Forest Practices Code acknowledges the importance of conserving biodiversity, and a supporting guidebook has been released that addresses stand- and landscape-level biodiversity management in a variety of ecological units found within the province. A major consideration in managing for biodiversity at the stand level is the retention of wildlife tree patches. At the landscape level, leaving sufficient and appropriately located mature and old-growth forests—including forest ecosystem networks (FENs)—for species dependent on, or strongly associated with, old-growth forests are the major biodiversity concerns.

Most of TFL 25 falls within the natural disturbance type (NDT) 1 classification, in which stand-initiating events such as fire and windthrow are considered rare. The balance of the land base is identified as NDT 2 (infrequent stand-initiating events). At present no landscape units or objectives have been designated in TFL 25, nor have any FENs or seral stage objectives been established. Accordingly, these were not accounted for in the timber supply analysis.

There are large areas of old growth outside the timber harvesting land base. These and the areas subject to visual management (see discussion below under *visually sensitive areas*) will help ensure landscape-level biodiversity requirements are met across the broad overall land base. Landscape unit planning, however, will likely lead to the establishment of FENs and seral stage objectives for biodiversity management. Future timber supply could be limited, particularly in Blocks 1 and 4. Those blocks have the lowest relative proportions of old growth remaining and may therefore have more difficulty providing FENs and sufficient old growth to meet seral stage objectives. Accordingly, it is important from a timber supply perspective that landscape-level biodiversity planning be undertaken soon in order to clarify any impact. The completion of landscape-level biodiversity plans is an important priority for this TFL. Once complete, they will be taken into account in future AAC determinations.

District staff have advised that current cutting permits for Blocks 1, 2 and 3 do include operational constraints to meet stand-level biodiversity requirements as set out in the

Biodiversity Guidebook. No provisions for wildlife tree patches exist in current cutting permits for Blocks 4 and 5, but district staff indicated they will be required in future permits. Forest management practices are thus projected to be consistent with Code requirements for stand-level biodiversity. The timber supply analysis, however, did not take these constraints into account. WFP assumed that reductions to the productive forest for other reasons (e.g., riparian areas) would satisfy overall biodiversity requirements.

BCFS staff disagree with this assumption. At the stand level, BCFS staff have estimated further deductions of 1–3 percent will be required in each block to account for wildlife tree patches. I find these estimates reasonable and note that they are consistent with the percentages predicted in the *Forest Practices Code Timber Supply Analysis.*

In summary, I anticipate that the stand-level biodiversity measures now required in the field represent a downward pressure in the medium and long terms on timber supply as modelled in the timber supply analysis. I also acknowledge that there is some concern that landscape-level requirements may be difficult to meet within individual landscape units (once those are established), and particularly within Blocks 1 and 4, but I am unwilling to speculate at this time on the results of the landscape-level planning process. This issue will be further discussed under "Reasons for Decision."

- *domestic water use considerations*

There are 27 domestic water use sites within the five blocks. No specific reduction was made for these in the timber supply analysis, but WFP is confident that the riparian area reduction (see discussion below, under *riparian areas*) accounted adequately for any constraints associated with those sites. Duncan Forest District staff have indicated that some small constraints may apply in Block 1, but provided no analysis to substantiate their view. At this time it is unclear that this would affect timber supply projections for that block. Concerns regarding the protection of water quality on these sites were also raised at an open house held in Sooke during the public review of MP 9.

I acknowledge that there is some uncertainty whether the riparian area reduction in Block 1 is sufficient to account for any watershed constraints that might apply, but I lack sufficient information to conclude that further land-base reductions are necessary. I can say that the Forest Practices Code will ensure that development does not jeopardize domestic water quality. If small area reductions are required, the base case forecast would not be affected, at least in the short term. For this determination, then, I accept the licensee's modelling assumptions.

- *visually sensitive areas*

The *Forest Practices Code of British Columbia Act* specifies that one of the forest resources to be managed in British Columbia is the recreation resource, which includes a "scenic or wilderness feature or setting that has recreational significance or value." In

order to manage such scenic features, visual landscape foresters in B.C., in collaboration with specialists in other parts of the world, have developed procedures for identifying and managing visually sensitive areas. These procedures incorporate both biophysical and social factors—including visual sensitivity ratings based on topography, slope and other biophysical factors, and social factors such as numbers of viewers and their perceptions—and provide recommended management objectives in the form of visual quality objectives (VQOs) for these visually sensitive areas. These objectives limit the amount of visible disturbance that is acceptable in these areas.

As is apparent from an earlier table, under Integrated resource management objectives, large portions of the TFL are under some form of visual management. Given the proximity of certain blocks to the Robson Bight Ecological Reserve (Block 3) and the cruise ship route along the Inside Passage (Blocks 4 and 5), this is not surprising. During the review of MP 9, various public submissions emphasized the need to protect viewscapes and expressed a general opposition to clearcutting.

Visual resource mapping is not yet complete for all parts of the TFL. Mapping for two compartments in the Heydon Bay drainage in Block 2 has not been performed, and the licensee chose to estimate the area that would be subject to visual management on the basis of VQOs assigned in adjacent areas. Similarly, mapping in Block 5 was completed only for some southern portions of the block, and the licensee extrapolated to the remainder. Regional staff have approved these estimates, but have noted that completion of visual resource mapping was a condition of MP 8.

The table below lists by block the areas within each visual management regime.

Block	Retention (hectares)	Partial Retention (hectares)	Modification (hectares)	TOTALS
1	60	15	5017	**5092**
2	189	2956	1028	**4173**
3	272	3088	1623	**4983**
4	281	2488	3683	**6452**
5	2229	11 719	7825	**21 773**
Totals	**3031**	**20 266**	**19 176**	**42 473**
% of Current TFL Timber Harvesting Land Base	**3%**	**18%**	**17%**	**38%**

I accept the visual resource mapping that has been completed, along with the extrapolations drawn in Blocks 2 and 5, as representative of the best available information. Nonetheless, I expect that mapping of the remaining areas in Blocks 2 and 5 will be a priority during the term of this MP.

For all blocks except Block 4, the licensee originally submitted timber supply analyses using a visually effective green-up height of seven metres. A five-metre green-up was modelled for Block 4. Several alternative analyses for Blocks 1–3 subsequently adopted the five-metre standard. Regional and district staff have advised that five metres is more commonly used in the field, and I have deferred to the alternative analyses (for Blocks 1, 2, and 3) as more representative of current management and, therefore, based on a more appropriate modelling assumption. I also note that the five-metre standard is less constraining on timber supply.

The base case and sensitivity analyses used for Block 5, however, nearly all assumed a seven-metre green-up height. One sensitivity analysis based on a five-metre green-up height projected a non-declining harvest flow of 225 000 cubic metres per year, 8000 cubic metres higher than a comparable, non-declining projection based on a seven-metre green-up height. In reviewing the visual resource mapping and harvest projections submitted, I note that timber supply in the base case is constrained in all time periods by green-up requirements in the retention zone and after 10 years in the partial retention zone. I find it reasonable to expect that the use of a five-metre green-up height in those zones would improve operational flexibility and make more timber available during those time periods. Given the large proportion of the block that lies in the retention and partial retention zones (29 percent), the licensee's modelling choice represents a significant influence on timber supply.

In summary, I find that visually sensitive areas have been modelled appropriately in all blocks except Block 5. There, I conclude that the visually effective green-up height modelled in the timber supply analysis has led to an underestimate of timber supply in all time periods. This issue will be further discussed below, under "Reasons for Decision."

- recreation

Just over 17 kilometres of the Kludahk hiking trail, and portions of the Sombrio Beach, Sandcut Beach and Mystic Beach trails lie within Block 1. The Vancouver Island Land-Use Plan established a low intensity area to cover the Kludahk Trail. WFP contends that operations can take place right up to the trails and, accordingly, made no deductions from the productive forest in the timber supply analysis to account for them. A small area of just under 4 hectares was deducted in recognition of a recreation site at Jordan River. Duncan Forest District staff have accepted the licensee's assumptions.

There are no developed recreation sites or trails in Block 2. In Block 3 most of the recreation activities occur in alpine areas outside the timber harvesting land base. A small campsite has been built adjacent to the logging camp at Naka Creek, but no deductions were made in the timber supply analysis to account for this. The size of the area, relative to the timber harvesting land base, indicates its removal would have an insignificant impact on timber supply. Campbell River Forest District staff agree that recreation assumptions have been modelled appropriately.

In Block 4 there are three significant recreation trails, two important recreation sites and a few other areas with high archaeological potential. To account for these values, the licensee applied a 90 percent reduction factor to all areas classified as Er1 (recreation) in the inventory file, thereby reducing the operable forest by 103 hectares. This procedure has been accepted by Port McNeill Forest District staff.

Recreation inventory information is incomplete for Block 5 (see earlier discussion under *environmentally sensitive areas*). However, all sites classified as Er1 in the inventory file were reduced by 90 percent in the timber supply analysis, leading to the removal of 258 hectares from the operable forest. These include boating, fishing and kayaking sites (virtually all recreation activities in Block 5 are water-accessed or water-based) and archaeological sites. Mid Coast and North Coast Forest District staff have accepted this procedure.

Several public submissions concerning recreation issues were received during the management plan review. These included a proposal to protect Bottleneck Inlet in Block 5 as a boat haven, and concerns over the preservation of large trees in the Jordan River area.

Bottleneck Inlet falls under the purview of the Central Coast LRMP, and its status should be clarified by that process. For all areas of concern the level of deductions for other reasons (e.g., riparian areas) will help protect recreation values, as will completion of recreation features mapping.

For now, I accept the licensee's procedures for including recreation considerations in the timber supply analysis. For the next analysis I expect WFP to complete recreation features mapping in Block 5, but I have no reason to believe that the missing information poses an unacceptable risk to timber supply at this time. Any changes to the recreation inventory or to the timber harvesting land base, as a result of new parks or recreation sites, will be taken into account in the next AAC determination.

- *wildlife*

For those blocks in the TFL in which wildlife habitat mapping was complete, reductions from the productive forest were made in the timber supply analysis. Areas identified in the inventory file as having highly sensitive (Ew1) wildlife values were reduced by 90 percent. A 40 percent reduction factor was applied to areas with moderately sensitive (Ew2) wildlife values. Some noted species of concern are deer (Block 1), grizzlies (Blocks 2 and 5), eagles (Blocks 4 and 5) and the Kermode bears on Princess Royal Island (Block 5).

In Block 1, only a very small area of Ew2 sites was identified and deducted. Staff from the Ministry of Environment, Lands and Parks (MELP) expect further area reductions will be required to protect wildlife habitat under the Forest Practices Code. As yet, however, they have insufficient data to estimate the magnitude of that potential change.

No wildlife habitat data are currently available for Block 2, although a mapping project is now underway. As an estimate of the potential impact, the licensee applied a 90 percent reduction to 5 percent of the total land base, thereby removing 707 hectares of operable forest. MELP staff have accepted this reduction.

A very small Ew1 area was mapped in Block 3 and reduced by 90 percent in the timber supply analysis. Block 4 contains a few small areas of Ew1 and Ew2 sites for which 32 hectares of operable forest were deducted.

At present there are no Ew1 areas identified in the inventory for Block 5. A large number of Ew2 sites associated with grizzly bear habitat were reduced by 40 percent, thereby removing 1452 hectares of operable forest. To improve its information, the licensee commissioned a wildlife survey for a substantial portion of Block 5 earlier this year. That study is currently under review by BCFS and MELP staff. Until specific prescriptions are developed in response, the impacts on timber supply are impossible to estimate. WFP is also conducting a research project specifically on the Kermode bears of Princess Royal Island to gather population and habitat data. In the interim, the licensee has suspended all operational plans for the area, which holds 6500 hectares of the timber harvesting land base.

There was considerable public input regarding management measures to protect Kermode Bear and grizzly bear habitat. The Kermode Bear, in particular, is the focus of

international attention and will be one of the issues addressed by the LRMP process now underway on the central coast.

In reviewing the reductions for wildlife habitat, I conclude that the best available information was used and that the area reduction percentages selected are appropriate. Nonetheless, the absence of more comprehensive wildlife inventory information for the entire unit is a concern, and I encourage the completion of the projects now underway.

It is clear, however, that the management objectives for Princess Royal Island will remain uncertain until the completion of the Central Coast LRMP process. I am aware of the sensitivity surrounding this issue, but it would be inappropriate for me to speculate now on the outcome of the planning process. I can say that the base case projections are relatively stable in the short term even with changes in the land base. The next AAC determination should be better positioned to take into account any changes in timber availability that arise as a result of the LRMP recommendations. This issue will be further discussed under "Reasons for Decision."

- *riparian areas*

There are 154 watersheds wholly or partly in TFL 25, most of which support anadromous fish. At the time the licensee began assembling the information for use in the timber supply analysis, the Forest Practices Code *Riparian Management Area Guidebook* had not been released. Accordingly, direct estimates of the timber harvesting land base and timber yield reductions for FPC riparian management were not possible. Instead, two different sources of information were used to account for riparian management requirements in the timber supply analysis.

In all areas, with the minor exception of recently harvested sites, the licensee identified inoperable riparian areas that, because of an adjacent stream or lake, were excluded from the timber harvesting land base. This classification includes an unknown amount of area which is inoperable for reasons other than the protection of riparian resources.

A second method was used in the portion of the TFL where streams have been mapped and classified according to the Coastal Fisheries Forestry Guidelines (CFFG). There, the licensee used a predictive model to estimate Code retention requirements based on the CFFG classification. The model used survey information from two drainages and extrapolated to the other drainages where CFFG stream classifications exist.

BCFS staff and staff from the federal Department of Fisheries and Oceans (DFO) have expressed concern that small streams may be under-represented in the CFFG mapping. DFO staff have also questioned whether the two surveyed drainages used to calibrate the predictive model adequately represent the other drainages. BCFS staff note, however, that the retention estimates used in the predictive model overestimate the actual Code riparian retention requirements on CFFG classified streams and lakes by approximately

50 percent. This general overestimate of the riparian area deduction is offset to some extent by the lack of accounting for some small streams. However, I expect that this omission will not account for a substantial area due to the rather low retention requirements placed on these types of streams by the Code. Moreover, I accept that the inoperable riparian area mapping covers some of the areas where CFFG mapping was incomplete. While I acknowledge there is some risk associated with the extrapolation procedure questioned by DFO staff, I accept the data from these areas (which were selected by the licensee's consultant) as the best available information. I have no evidence to indicate otherwise.

In considering if estimates of the timber harvesting land base and available inventory used in the base case should be adjusted to reflect more closely the riparian requirements of the Code, I note that the procedure used to identify inoperable riparian areas does not distinguish those areas removed for reasons of inoperability from those removed to meet riparian requirements. Also, for those areas with CFFG mapping, the retention percentages adopted are larger than required under the Code. While a precise estimate cannot be made due to overlaps in the available information, more than 5 percent of the productive forest area was deducted to represent the protection of riparian areas. The deduction as a percentage of the timber harvesting land base is most likely larger since riparian areas tend to be concentrated more in areas that would otherwise be available for timber harvesting.

In a nearby coastal unit for which riparian requirements were assessed in some detail (*Forest Practices Code Timber Supply Analysis)*, land base deductions for riparian protection were about 5 percent of the timber harvesting land base. In addition, timber volume estimates were reduced in that unit by approximately 4 percent to account for forest cover requirements in riparian management zones. Overall, it is uncertain how the land base deductions made in the TFL 25 base cases compare to the land base and stand yield reductions made in the nearby area, or whether the adjustments made in that area apply closely to TFL 25. Therefore, it is also uncertain whether the measures taken in the TFL 25 analysis under-, over- or correctly estimate the effect of Code requirements. However, based on the information available, I believe that if there is any discrepancy between the representation of riparian management assumptions in the timber supply analysis for TFL 25 and actual Code requirements, the difference will be small.

I will make no adjustments related to riparian management for this determination. However, I encourage the licensee to rationalize its approach to classifying riparian areas to facilitate both planning, future analysis and evaluation of the achievement of Code requirements.

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

<u>20-Year Plan</u>

The 20-Year Plan was submitted quite recently; as a result, district staff did not have time to fully review the plan at the time of this writing. Campbell River Forest District staff have expressed concern at the relatively high level of helicopter logging projected for Block 2, a higher level than indicated in MP 9. They also warned that three of the cutblocks identified in the plan will probably not be available for harvesting because adjacent blocks will not have achieved visually effective green-up at the projected time of harvest. If so, harvesting would not be approved by the district.

In Block 3, Campbell River staff have noted a high level of proposed harvesting near Peel Creek, an area in which a five-year deferral is scheduled to expire in January 1997. The planned operations are located in a rain-on-snow zone, and would cause more than 25 percent of the zone—the threshold recommended by hydrologists—to fall below the 10-metre hydrological green-up standard.

The proposed first-decade harvest levels for Block 1 have not been demonstrated in the 20-Year Plan. The licensee has explained that the plan was completed before the timber supply analysis was complete and before the proposed harvest level was known. Consequently, the plan assumed a target harvest level of 160 000 cubic metres per year, rather than 170 000 cubic metres. The licensee believes it can meet the shortfall by making adjustments to the plan.

In summary, I note that there are concerns about some elements of the plan and that it has not been approved yet by all districts concerned. For now, I will accept the licensee's assertion and assume that it can be modified to address those concerns without jeopardizing timber supply and in a manner consistent with the management plan objectives for the TFL. However, if district approvals require subsequent revisions that introduce substantive new concerns or additional information, I am prepared to revisit this determination before the end of the five-year period.

Harvest Queuing

Harvest priority in the timber supply analysis was given to stands in order of age, with oldest first. Stands eligible for commercial thinning took precedence over stands to be clearcut. No consideration was given to operability; conventional and helicopter stands were generally scheduled for harvesting in the model in the order in which they were encountered.

I find these to be reasonable assumptions, reflective of management objectives for the TFL and acceptable for consideration in this determination.

Partitioned component of the harvest

As discussed earlier, under "History of AAC," the current AAC determination includes a partition for helicopter-operable stands in Blocks 2 and 5. In MP 9, the licensee has requested further helicopter partitions on Blocks 1 and 3, as well as partitions for commercial thinning on Blocks 1 and 4. I intend to partition the AAC for this TFL, and this will be discussed in detail below, under "Reasons for Decision."

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

Harvest flow alternatives

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many TFLs across the province that have a large old-growth component. In the short term, the presence of large volumes of older wood permits harvesting above long-term levels without jeopardizing the future productivity of the forest land. This is the situation to varying degrees in TFL 25. Blocks 1 and 4 have much more limited stocks of old growth whereas Block 5, with its rather short harvesting history, is dominated by old growth.

In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined so as to ensure that current and mid-term harvest rates will be compatible with a smooth and orderly transition toward the usually, but not always, lower long-term harvest rates. That is, timber supplies should remain sufficiently stable that there will be no inordinately adverse impacts on current or future generations. To achieve this, the rate set must not be so high as to cause disruptive shortfalls in supply later, nor so low as to cause undue social and economic impacts that are unnecessary to maintain forest productivity and future harvest stability.

As previously discussed in "Timber Supply Analysis Base Case Projections," the original base cases provided by the licensee were all stable, non-declining forecasts. I note that these forecasts are predicated on an immediate 14 percent reduction from the current AAC, which is neither consistent with current management or the social and economic objectives of the Crown, as discussed below under Minister's letter and memorandum.

Difference between AAC and actual harvest

Over the past six years the licensee has harvested, on average, within 10 percent of the target harvest levels for Blocks 1, 2 and 4. In Block 3, actual performance was 15 percent above the target harvest level, while in Block 5 harvesting fell 25 percent short of the target harvest level. WFP cited logistical problems in implementing helicopter operations in Block 5 as well as delays in road construction and obtaining plan approvals. It remains confident, however, that it can meet the harvest level proposed in MP 9 on a block-by-block basis, and has confirmed that intention in a recent letter to me.

The SBFEP has accumulated an undercut in recent years, particularly in Blocks 3 and 4. Port McNeill District staff have advised, however, that licences will be issued for the balance of the undercut in Block 4 by the spring of 1997. SBFEP undercuts have the potential to create operational planning challenges as the land base accommodates a temporarily elevated SBFEP harvest in order to clear up the backlog. Plans for the SBFEP undercut in Block 3 are less clear at this time.

Despite year-to-year fluctuations in harvest levels I am satisfied that the current target harvest levels are achievable over the term of this AAC. If harvesting of the small business undercut proceeds, it will be reflected in the inventory depletions for the next analysis, and the resulting decrease in timber supply will be accounted for in future determinations.

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

Current and proposed timber processing facilities

Doman Industries Limited, the parent company of the licensee, operates a number of facilities that depend to a greater or lesser extent upon fibre from TFL 25. These include two pulp mills in Port Alice and Squamish. The former employs 495 people and has a capacity to process approximately 160 000 tonnes of fibre annually. The Squamish mill employs 360 people and can process approximately 240 000 tonnes annually. The company also operates six sawmills—four on Vancouver Island in Nanaimo, Chemainus, Cowichan Bay and Ladysmith, and two in Vancouver—with a combined annual capacity of 900 million board feet. As well, the company owns a log merchandizer in Nanaimo and a value-added lumber remanufacturing plant in Chemainus that can produce up to 60 million board feet of lumber annually.

Other communities that depend upon operations in TFL 25—either because they provide harvesting crews or because they have mills that purchase fibre harvested on the tenure—include Waglisla, Port McNeill, Campbell River and Sooke.

In addition to TFL 25, Western Forest Products holds TFLs 6 and 24 on Vancouver Island and in the Queen Charlotte Islands, and three forest licences in the Mid Coast, Strathcona and Kingcome TSAs. Together, the six tenures provide approximately two-thirds of the fibre processed by Doman's various facilities. The balance is obtained through purchases and trades. Of the six, TFL 25 has the second largest individual AAC, providing approximately a third of the total fibre harvested on the various tenures. Accordingly, it plays a significant role in the economic well-being of the different communities, particularly the smaller towns on Vancouver Island.

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

Minister's letter and memorandum

The Minister expressed the economic and social objectives of the Crown for the province in two documents to the Chief Forester—a letter dated July 28, 1994, (attached as Appendix 3), and a memorandum dated February 26, 1996, (attached as Appendix 4). I understand both documents to apply to TFL 25. They are consistent with the objectives stated in the Forest Renewal Plan and include forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for continuity of employment.

The Minister stated in his letter that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the Chief Forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. The latter would likely require the use of alternative harvesting systems, and to encourage this the Minister suggested consideration of partitioned AACs.

As discussed earlier, under Commercial thinning, the licensee has proposed an ambitious program of commercial thinning in Blocks 1 and 4. Although there are no net volume gains projected from commercial thinning, it does enhance management flexibility and can be useful in offsetting temporary shortfalls in supply. This issue will be further discussed below, under "Reasons for Decision."

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. As noted earlier, under *visually sensitive areas*, I have accepted the manner in which visual resources were modelled in certain runs in the timber supply analysis (based on a five-metre rather than seven-metre green-up height), although I expressed concern that considerable mapping remains to be done in Blocks 2 and 5.

Local objectives

As part of the information package presented to me, the licensee enclosed copies of the submissions received during the public review process for MP 9 as well as information on the various open houses. In reaching my determination I have reviewed and taken into consideration that public input.

The Central Coast LRMP process is now under way and can be expected to forward final land-use recommendations to government during the term of this AAC determination. Once available, those recommendations will constitute a comprehensive gauge of public objectives for a large portion of the mainland coast, including Blocks 2 and 5. In particular, I expect that Princess Royal Island in Block 5 will be the focus of considerable discussion. It is premature at this time, however, to speculate on what the land-use table's recommendations might be or on government's response to them.

During the public review of MP 9, concerns were raised regarding the protection of culturally modified trees and other aboriginal heritage values. These concerns are addressed by the Forest Practices Code and the ministry's aboriginal rights policy. Both the Silviculture Prescription Guidebook and the Stand Management Prescription Guidebook stipulate that where archaeological sites, culturally modified trees, heritage trails or other examples of historical use are found in the field, their locations should be mapped and specific management strategies developed in accordance with the Archaeological Impact Assessment Guidelines and the *Heritage Conservation Act*. With regard to aboriginal rights in general, I discussed earlier, under "Guiding Principles," the extent to which I can take the Delgamuukw decision and treaty negotiations into account in AAC determinations.

The Sierra Club of British Columbia also provided a lengthy submission covering a range of issues, including overharvesting of old growth, promotion of selective logging, support for longer rotation ages, protection of wildlife and fisheries habitat, encouragement of local secondary manufacturing, and preservation of scenic values. Some of these concerns are discussed, to the extent they can be, in the various sections of this document. Others are operational matters that are best raised with district staff and the licensee.

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

Unsalvaged losses

The licensee estimated unsalvaged losses by calculating the proportion of the timber harvesting land base classified as NSR due to natural disturbance. This fraction was then applied against the proposed harvest level to yield an annual volume estimate for unsalvaged losses. The calculations were done on a block-by-block basis and resulted in a predicted annual loss of less than 0.1 percent of the projected harvest level for the entire unit. District staff have expressed concerns that the individual block estimates are low.

As described earlier, under *biodiversity and old growth*, most of the timber harvesting land base falls within the NDT1 classification, in which stand-initiating events such as fire and wind are rare. It is thus not unreasonable that projected unsalvaged losses would be lower than in many other management units throughout the province. And I note that, relative to other units—including some coastal TSAs— the licensee's estimates are low.

The infrequency of these stand-initiating events also makes it difficult to estimate unsalvaged losses on an annual basis. There is considerable uncertainty regarding this issue, and a provincial initiative is currently underway to develop a more reliable and consistent methodology for calculating unsalvaged losses. For this determination I accept the licensee's estimates as the best available information. Over the next few years, however, I expect that better data and greater methodological rigour will provide a higher level of certainty to the estimates for this management unit.

Reasons for Decision

In reviewing the information for this determination, I have identified a number of factors that indicate the actual timber supply in TFL 25 may be either greater or less than that projected in the base cases. Some of these factors can be quantified and their impacts assessed with some certainty. However, others cannot be reliably quantified and influence timber supply by adding an element of risk or uncertainty to the decision. Given the geographical separation and disparate nature of the five blocks, it seems most reasonable to address the factors on a block-by-block basis.

Block 1

The base case forecast I have adopted projects an initial harvest level of 180 000 cubic metres per year, declining after two decades to a long-term harvest level of 157 000 cubic metres per year.

There are two factors that suggest timber supply may be higher on Block 1 than indicated in the base case. The first, and most significant, concerns the minimum harvestable ages assumed in the analysis. Definition of harvest ages is speculative due to difficulties in foreseeing future markets and product demands. While the licensee's approach to deriving harvestable ages based on product objectives is sound, it did result in ages significantly older than those based on culmination age for most species, as discussed under *minimum harvestable ages*. I acknowledge that one cannot be certain that culmination age will more closely reflect actual future harvest ages. However, culmination age is a reasonable basis for deriving minimum harvestable ages, and hence is often used in timber supply analysis, since harvesting at that age maximizes long-term timber productivity. The licensee has indicated that consideration would be given to harvesting at earlier ages than projected in the base case if doing so could assist in providing timber supply or achieving other forest management objectives. Given that this unit is on the verge of a rapid transition to second-growth harvesting, minimum harvestable ages are particularly important in defining short-term timber supply.

Sensitivity analysis indicated that employing culmination ages rather than the minimum harvestable ages used in the base case increases timber availability significantly over all time frames in TFL 25. If culmination ages were used as the minimum harvestable ages, analysis results showed an initial harvest level of 173 000 cubic metres per year for Block 1, rising after 11 decades to a long-term harvest level of 185 700 cubic metres. Given that this forecast assumes no hardwood contributions from deciduous-leading stands, employs unmanaged rather than managed stand volume estimates for intermediate-aged stands (see discussion below), and does not maximize long-term harvests (reflected by increasing growing stock over time), I expect that even higher levels, in both the short and long terms, would be possible. In contrast, using the same assumptions, but with the base case minimum harvestable ages, results in an initial harvest level of 169 000 cubic metres for 1 decade followed by a 1 percent decrease.

While it is difficult to determine the exact magnitude of the potential increase in timber supply given uncertainties inherent in deriving minimum harvestable ages, I am confident that timber availability can reasonably be increased over that shown in the base case by employing younger minimum harvest ages in some circumstances to offset downward influences on timber supply. I believe that viewing the potential for younger minimum harvestable ages as an upward influence on timber availability is consistent with the social and economic objectives of the Crown (discussed earlier, under Minister's letter and memorandum).

The second upward factor concerns the lack of any accounting for utilization of hardwood volumes from deciduous-leading stands. Given that approximately 634 hectares, or 3 percent of the long-term timber harvesting land base, is occupied by deciduous-leading stands, and given that the licensee has indicated and demonstrated an intention to harvest alder (see earlier discussion under *deciduous*), I expect a modest amount of additional volume will be available relative to that indicated in the base case. The area proposed for conversion from deciduous- to coniferous-leading stands should be able to support an annual harvest of about 10 000 cubic metres, with approximately one half of this being hardwood volumes.

Four factors suggest timber supply may be less than projected in the timber supply analysis.

1. Inadequate deductions were made for future roads, trails and landings, which will reduce timber supply in the long term.
2. The OAF1 used to estimate losses in Douglas-fir stands is considered to underestimate probable losses, which will reduce medium- and long-term timber supply.
3. Timber volume estimates for stands aged 40–140 years were derived using managed stand yield models (TASS and TIPSY) rather than an inventory projection model (VDYP). This will decrease short- and medium-term timber availability in Block 1, as reflected in sensitivity analysis.
4. No provision was made for stand-level biodiversity requirements under the Forest Practices Code, which will reduce the available timber inventory in all time frames.

Only stand-level biodiversity and volume estimates for intermediate-aged stands affect timber availability in the short term. The effects of these two factors are offset by the upward influences associated with minimum harvestable ages and hardwood volumes discussed above.

In addition to the above factors, three others have the potential to impact timber supply in future but their status is presently uncertain: funding for the fertilization assumed in the timber supply analysis is not guaranteed; domestic water use sites may require more constraining management regimes than modelled in the analysis; and future management for landscape-level biodiversity, which was not modelled in the analysis, may further constrain timber supply. None of these factors places firm downward pressure on timber supply; however, they lead me to interpret timber supply projections with some caution. Fertilization and water-use issues relate to a small proportion of the timber harvesting land base, and uncertainty regarding fertilization would affect the medium and long terms only. I am aware

that landscape-level biodiversity is an issue because of the limited old growth remaining in Block 1. However, objectives have not been developed, and I will not speculate on the outcome of future planning processes. In addition, forest outside the timber harvesting land base will contribute to landscape-level biodiversity objectives to some extent. Should more information on these issues become available over the next few years, I will review it at the next determination. At this time, the upward influences of minimum harvestable ages and hardwood utilization more than offset these uncertainties, and the downward factors discussed earlier.

The licensee has proposed a target harvest level of 170 000 cubic metres per year, including components of helicopter logging and commercial thinning. As discussed earlier, under *helicopter logging*, I concluded that the helicopter annual harvest target of 6000 cubic metres is a reasonable one, and I note that it is assumed in the base case forecast. I therefore have no concerns about providing the licensee the opportunity to demonstrate this proposed performance through establishment of a partition for 6000 cubic metres per year attributable to timber harvested on lands identified as operable only by helicopter. I must emphasize, however, that these volumes are linked to the helicopter-operable land base and not to the harvest method. That is, volumes from the conventionally operable land base harvested by helicopter cannot be credited to the helicopter partition.

As with the helicopter partition, I am willing to provide an opportunity for the licensee to demonstrate that it can undertake commercial thinning at the proposed level. As discussed in the Timber Supply Analysis Base Case Projections section, the base case I have adopted more than adequately allows for the additional volume sought from commercial thinning in the first decade. Accordingly, I will establish a partition of 10 000 cubic metres per year (the volume proposed in MP 9) attributable to timber harvested by commercial thinning.

As noted above, I have concluded that an annual harvest of 10 000 cubic metres is feasible from deciduous-leading stands. I am not establishing a formal partition for this volume, but I do expect it to form part of the profile harvested using conventional methods. The contributions from these stands should be identified in the regular annual report for this tree farm licence. If performance in these stands is not forthcoming, I will reconsider their contributions at the next determination. In the meantime, this approach provides the licensee with the necessary flexibility to develop these areas on a periodic basis. This volume will be the product of a program to convert deciduous-leading sites to coniferous, so the harvest is not intended to be sustainable. Nonetheless, operations will need to respect the role of deciduous stands in maintaining biodiversity across the landscape. Accordingly, I expect the licensee to work with Ministry of Environment, Lands and Parks staff to ensure any environmental concerns are addressed.

In summary, the new harvest level for Block 1 is 175 000 cubic metres per year. This total is divided as follows: the harvest level on the conventionally operable land base is set at 169 000 cubic metres per year, including a partition of 10 000 cubic metres for commercial thinning, and an expectation that at least 10 000 cubic metres will be harvested from

deciduous-leading stands; and the harvest on the helicopter-operable land base is partitioned at 6000 cubic metres per year.

Block 2

The base case harvest forecast I have adopted for Block 2 projects an initial harvest level of 92 000 cubic metres per year, declining after four decades to a long-term harvest level of 65 000 cubic metres per year. There are two factors that suggest timber supply may be higher on Block 2 than indicated in the timber supply analysis. The first factor concerns what I believe to be the unnecessarily low long-term harvest level of 65 000 cubic metres per year. I note that growing stock is projected to increase over time and that the average harvest age also rises over time after the 11th decade. Timber supply is also not constrained over time by forest cover requirements in the IRM zone, although it is sensitive to a change in requirements for the partial retention visual management zone, which covers 23 percent of the timber harvesting land base. Bearing these indicators in mind, it is reasonable to conclude that the long-term harvest level could be higher than currently projected.

The second factor concerns the minimum harvestable ages assumed in the timber supply analysis. The resulting modelled rotation periods for most species and site combinations were longer than those based on culmination age, at which long-term timber production is maximized. As most second-growth stands in this block are still relatively young, changes in minimum harvestable age are unlikely to make significant new volumes available in the short term. However, assuming second growth will be available earlier than in the base case does increase the rate at which existing mature timber can reasonably be harvested over the short and medium terms.

Three factors suggest timber supply may be less than projected in the timber supply analysis.

1. The analysis assumed utilization of coniferous volumes from deciduous-leading stands, and included the area in the long-term timber harvesting land base, but MP 9 did not propose harvest or conversion of these stands in this block.
2. Inadequate deductions were made for future roads, trails and landings which will reduce timber supply in the long term.
3. No provision was made for stand-level biodiversity requirements under the Forest Practices Code which reduces the available timber inventory over all time frames.

The only factors that affect the land base and inventory available for harvest in the short-term are contributions from deciduous-leading stands, and management for stand-level biodiversity. However, these downward influences are at least balanced by the opposing upward influence of the conservative assumption regarding minimum harvestable ages.

In addition to the above factors, there are two that have the potential to impact timber supply in future but whose status is presently uncertain. Block 2 lies within the area of interest of the Central Coast LRMP, and it is possible that process may lead to changes in land-use

objectives for some areas within the block. The second factor concerns future management measures for landscape-level biodiversity, which were not modelled in the analysis due to lack of plans and objectives for biodiversity, but which may constrain timber supply. The significant amount of old growth remaining in Block 2 provides comfort that awaiting results of planning will not create undue risks to biodiversity. Any further information on these initiatives will be taken into account at the next AAC determination.

The base case indicates that harvests can be reduced to the long-term harvest level in a gradual and controlled manner over the next few decades. In light of my earlier conclusion that there is no compelling reason to lower the harvest level now, I am guided by the Minister's emphasis on maintaining timber supply where possible without jeopardizing long-term sustainability. Accordingly, I will maintain the harvest level for this block at 92 000 cubic metres per year, as proposed by the licensee.

Although the licensee has proposed that almost half this volume come from areas identified as operable only by helicopter, I note that those portions of the land base represent only 24 percent of the long-term timber harvesting land base. To ensure a proportional harvest across the land base I will therefore partition the helicopter component at 24 percent of 92 000 cubic metres per year—that is, 22 000 cubic metres.

Block 3

The base case forecast I have adopted for Block 3 has an initial harvest level of 55 000 cubic metres per year, declining after one decade to a long-term harvest level of 49 000 cubic metres per year.

The principal upward pressure on timber supply, as in the other blocks, stems from the likelihood that minimum harvestable ages can be significantly shorter than assumed in the base case.

I also note that the long-term harvest level projected in the base case appears somewhat conservative. Base case results show that growing stock increases over the long term, as well as in most sensitivity analyses, which suggests a higher long-term level is achievable.

In contrast to the above considerations, three factors suggest timber supply may be less than projected in the base case:

1. The analysis assumed utilization of coniferous volumes from deciduous-leading stands, and included the area in the long-term timber harvesting land base, but MP 9 did not propose harvest or conversion of these stands in this block.
2. Inadequate deductions were made for future roads, trails and landings which will reduce timber supply in the long term.
3. No provision was made for stand-level biodiversity requirements under the Forest Practices Code which reduces the available timber inventory over all time frames.

The only factors which can affect timber supply in the short-term are the removal of contributions from deciduous-leading stands and management for stand-level biodiversity. However, these downward influences are at least balanced by the opposing upward influence exerted by the potential of employing younger minimum harvestable ages than in the base case, as discussed above.

In addition to these factors, two additional issues have the potential to impact timber supply in future but their effects are presently uncertain: the harvest projection depends upon operations in the Peel Creek area; and future management for landscape-level biodiversity, which were not modelled in the analysis, may further constrain timber supply.

As noted earlier, under 20-Year Plan, the licensee has proposed several cutblocks in the Peel Creek area, following the lifting of the five-year deferral there. I am aware that management in this area remains sensitive, and that the planned operations will be scrutinized closely. Nonetheless, at this time I have no evidence to indicate the proposed harvesting will not be approved.

As in other blocks, future management for landscape-level biodiversity, was not modelled in the analysis. This issue is not as urgent as in areas with less remaining old growth (Blocks 1 and 4); however, the possible future restrictions on timber supply associated with landscape-level biodiversity leads me to interpret timber supply projections with some caution. Nevertheless, given the stability offered by the upward pressures in this block, I do not believe that landscape-level biodiversity considerations present sufficient risks to jeopardize achievement of the harvest level proposed by the licensee.

In reviewing the upward and downward factors discussed above, and the uncertainties associated with land use in the area, I am confident that the proposed harvest levels for Block 3 can be attained for the term of MP 9.

The base case initial harvest level of 55 000 cubic metres per year represents a decline from the current harvest level of 61 000 cubic metres. Within the total volume for the block, WFP has also proposed to harvest 2000 cubic metres per year from areas designated as operable by helicopter only. This volume represents less than 4 percent of the projected short-term harvest. Given that helicopter-operable lands represent approximately 9 percent of the timber harvesting land base, 2000 cubic metres should be a very feasible target. Over time the helicopter harvest should increase to match the proportional contribution of helicopter-operable areas to the land base. However, considering the relatively small proportional contribution of helicopter areas, the risks of concentrating harvests on the conventionally operable land base are low (in contrast to Block 5, as discussed below). Therefore, I find the proposed helicopter harvest of 2000 cubic metres per year to be reasonable for the term of MP 9.

The new harvest level for Block 3 is 55 000 cubic metres a year, which includes a partition of 2000 cubic metres attributable to timber harvested on lands identified as operable by helicopter only.

Block 4

The base case harvest projection I have adopted for Block 4 begins at 202 000 cubic metres per year and declines after one decade to a long-term harvest level of 181 000 cubic metres per year. No helicopter logging is proposed, but the base case incorporated 5000 cubic metres annually of commercial thinning.

Two factors indicate that timber supply may have been underestimated in the base case. The first and principal upward pressure on timber supply stems from the likelihood that minimum harvestable ages can be significantly shorter than assumed in the base case.

The second factor is that no allowance was made in the timber supply analysis for hardwood volumes from deciduous-leading stands despite a declared intention in the management plan to harvest alder. In contrast to Block 1, however, deciduous-leading stands in this block occupy only a marginal proportion of the timber harvesting land base. Consequently, the extra volume in question would not significantly affect timber supply.

In contrast to the above considerations, three factors suggest timber supply may be less than projected in the base case:

1. Inadequate deductions were made for future roads, trails and landings which will reduce timber supply in the long term.
2. No provision was made for stand-level biodiversity requirements under the Forest Practices Code which reduces the available timber inventory over all time frames.
3. Timber volume estimates for stands aged 40–140 years were derived using managed stand yield models (TASS, TIPSY) rather than an inventory projection model (VDYP). This exerts downward influence on medium-term timber availability in Block 4.

Most of the impact arising from these factors will be felt in the medium and long terms only. Short-term downward pressures on timber availability can be expected from implementing measures to meet stand-level biodiversity requirements, however, these are counterbalanced by the substantial upward influence associated with the potential of employing younger minimum harvestable ages than in the base case.

In addition to these factors, two others have the potential to impact timber supply in future but whose effects are presently uncertain: funding for the fertilization assumed in the timber supply analysis is not guaranteed; and future management for landscape-level biodiversity, which could not be modelled in the analysis, may further constrain timber supply. These considerations lead me to interpret timber supply projections with some caution. None of these factors places firm downward pressure on timber supply; however, they lead me to

interpret timber supply projections with some caution. However, fertilization applies only to a small proportion of the timber harvesting land base, and uncertainties would affect the medium and long terms only.

I am aware that landscape-level biodiversity is an issue because of the limited old growth in remaining in Block 4. However, objectives have not been developed, and I will not speculate on the outcome of future planning processes. In addition, forest outside the timber harvesting land base will contribute to landscape-level biodiversity objectives to some extent. Should more information on these issues become available over the next few years, I will review it at the next determination.

Given the general stability of the base case projection, and the upward influence associated with minimum harvestable ages, I am confident that the modelled initial harvest level can be achieved despite the uncertainties and downward pressures.

In summary, I find the base case initial harvest level of 202 000 cubic metres per year to be appropriate for this block. The base case included more than 5000 cubic metres per year from commercial thinning. WFP's proposal to experiment with commercial thinning operations is consistent with a request made in the Minister's letter (discussed earlier, under Minister's letter and memorandum) to consider possible contributions from commercial thinning. I see no reason that commercial thinning operations would be unreasonable in this block. Accordingly, the total annual harvest level of 202 000 cubic metres will include a partition for 5000 cubic metres attributable to timber harvested through commercial thinning.

Block 5

The base case projection I have adopted for Block 5 begins with a harvest level of 255 000 cubic metres per year, and declines over the second and third decades to a long-term harvest level of 212 000 cubic metres per year.

Two factors suggest that timber supply may be higher than indicated in the base case:

1. The potential for harvesting at ages younger than the minimums used in the base case. A sensitivity analysis with minimum harvestable ages set at culmination age projects a non-declining harvest-level of over 250 000 cubic metres per year. While the initial harvest level in the sensitivity analysis is slightly lower than the base case, I note that the harvest projection was constrained to an even-flow pattern. The medium-term supply is significantly higher than in the base case, indicating that, in general, the lower minimum harvestable ages offer substantial flexibility over the next several decades, including the short term. Even with this higher long-term rate, I note the average harvest age is projected to rise for the next eight decades, suggesting that higher short- and medium-term harvests could be achieved without causing timber supply disruptions.
2. Use of a visual effective green-up height of 7 metres in the base case rather than the more generally accepted 5 metres constrains timber supply more than necessary to achieve visual quality objectives. Therefore, timber availability is higher than indicated in the base case by an unquantified amount over all time frames.

In contrast to the above considerations, three factors suggest timber supply may be less than projected in the base case:

1. The analysis assumed utilization of coniferous volumes from deciduous-leading stands, and included the area in the long-term timber harvesting land base, but MP 9 did not propose harvest or conversion of these stands in this block.
2. Inadequate deductions were made for future roads, trails and landings which will reduce timber supply marginally in the long term.
3. No provision was made for stand-level biodiversity requirements under the Forest Practices Code which reduces the available timber inventory over all time frames.

The only factors that affect the land base and inventory available for harvest in the short-term are removal of contributions from deciduous-leading stands, and management for stand-level biodiversity . However, these downward influences are at least balanced by the opposing upward influence of the conservative assumptions regarding minimum harvestable ages and visual effective green-up discussed above. Therefore, I conclude that harvests projected for this block in the short term are achievable for the term of MP 9.

As in other blocks, future management for landscape-level biodiversity, was not modelled in the analysis. This issue is not as urgent as in areas with less remaining old growth (Blocks 1 and 4); however, the possible future restrictions on timber supply associated with landscape-level biodiversity leads me to interpret timber supply projections with some caution.

However, the significant amount of old growth remaining in Block 5 provides comfort that awaiting results of planning will not create undue risks to biodiversity. Also, given the stability offered by the upward pressures in this block, I do not believe that landscape-level biodiversity considerations present sufficient risks to jeopardize the ability to achieve the harvest level in the base case.

The future management regime of Block 5 is subject to some uncertainty because the block lies within the area of interest of the Central Coast LRMP. As noted earlier, under *wildlife*, the status of Princess Royal Island will be a significant point of discussion for the Central Coast LRMP. At present, no operations are planned for the island, though it remains in the timber harvesting land base. If this or any other area is removed from the timber harvesting land base, timber supply would be affected. As outlined in "Guiding Principles," however, it would be inappropriate of me to speculate on the outcome of the land-use planning process; hence, I will assume these areas will contribute to timber supply for this determination.

In reviewing the upward and downward factors discussed above, and the uncertainties associated with land use in the area, I am confident that the short-term harvest levels projected in the base case can be attained for the term of MP 9 while still allowing for gradual and controlled declines to projected medium-term timber supply levels. With this in mind, I accept that the licensee's proposed harvest level of 255 000 cubic metres per year can be attained subject to the provisions noted below.

Approximately 29 percent of the long-term timber harvesting land base was assumed in the timber supply analysis as operable only for helicopter. The base case forecast and various sensitivity analyses confirmed the feasibility of using helicopters to harvest more than the 50 000 cubic metres per year proposed by the licensee. The helicopter contribution in the different analyses ranged as high as 127 000 cubic metres per year in the first decade. The forecasts also confirm that helicopter harvesting contributes significantly to harvest volumes over all time frames. Accordingly, I regard 50 000 cubic metres (20 percent of the total block harvest level) as a conservative estimate of the potential harvest from helicopter systems.

To ensure distribution of operations across the land base and avoid concentration of operations on the conventionally operable land base, the helicopter harvest should approximately reflect the proportional contribution of helicopter areas to the land base. Analysis results confirm that a helicopter harvest higher than the 50 000 cubic metres per year modelled in the base case is possible. Accordingly, I expect that 70 000 cubic metres per year—approximately 27 percent of the new Block 5 harvest level—should be attributable to timber harvested on helicopter-operable lands. Even taking into consideration the uncertainty regarding the exact area of the helicopter-operable land base, this target should be feasible for at least the term of this determination.

In summary, the new harvest level for Block 5 will be 255 000 cubic metres per year, of which 70 000 cubic metres are partitioned to timber harvested on land identified as operable by helicopter only.

Determination

It is my determination that timber harvest levels that accommodate objectives for all forest resources during the next five years, that reflect the socio-economic objectives of the Crown for the area, that ensure longer-term IRM objectives can be met, that reflect current management practices, that avoid severe curtailment of locally established patterns of socio-economic activity based on timber harvesting, and that minimize disruptive shortfalls in future wood supply, can best be achieved in this TFL at this time by establishment of an overall AAC of 779 000 cubic metres. This AAC will be partitioned as follows:

Block	Annual Harvest Level (cubic metres)
1	**175 000**—6000 of this total is attributable to stands in areas classified as operable only by helicopter; 10 000 of the total is attributable to volumes harvested through commercial thinning
2	**92 000**—22 000 of this total is attributable to stands in areas classified as operable only by helicopter
3	**55 000**—2000 of this total is attributable to stands in areas classified as operable only by helicopter
4	**202 000**—5000 of this total is attributable to volumes harvested through commercial thinning
5	**255 000**—70 000 of this total is attributable to stands in areas classified as operable only by helicopter

Implementation

This determination comes into effect on December 30, 1996, 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. I leave the administration of the various partitions to the judgement of the Regional Managers of the Vancouver and Prince Rupert Forest Regions. In combination with expectations and directions specified throughout this document, I have also outlined a number of instructions in the Management Plan approval letter.

Larry Pedersen
Chief Forester

December 20, 1996

Appendix 1: Section 7 of the *Forest Act*

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

Allowable annual cut

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

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

(b) each tree farm licence area.

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

(a) makes an order under section 6 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 33.1 (1) (a) to (d),

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

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

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

(1.11) If

(a) the allowable annual cut for the tree farm licence is reduced under section 7.1 (3), and

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

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 7.1 (6).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Purposes and functions of ministry

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

(a) encourage maximum productivity of the forest and range resources in the Province;
(b) manage, protect and conserve the forest and range resources of the Crown, having regard to the immediate and long term economic and social benefits they may confer on the Province;
(c) plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Crown and with the private sector;
(d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and
(e) assert the financial interest of the Crown in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994
Appendix 4: Minister of Forests' memo of February 26, 1996