BRITISH COLUMBIA
MINISTRY OF FORESTS AND RANGE

Cranbrook Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective November 1, 2005

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Objective of this Document

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

Description of the Cranbrook Timber Supply Area

The Cranbrook TSA, approximately 1 244 350 hectares in total area, is administered from the BC Forest Service (BCFS) Rocky Mountain Forest District Office in Cranbrook. The TSA is bounded by the height-of-land of the Skookumchuck, Bull and Elk River drainages to the north, the Canada-U.S. border to the south, the Alberta border to the east and the southern Purcell Mountains height-of-land to the west. The major drainage in the TSA is the Kootenay River, which flows southward through the Rocky Mountain Trench.

Approximately 47 000 people reside in the TSA based on a 2001 census. About 60 percent of the population is located in the three major communities of Cranbrook, Kimberley and Fernie with a combined population of about 29 600. Smaller communities include Sparwood and Elkford. The public sector, tourism, mining and forestry account for about 83 percent of the total employment in the Cranbrook TSA with forestry at 13 percent.

The Ktunaxa Nation Council (KNC) is proceeding through the BC Treaty Commission process of land claim negotiations and the Cranbrook TSA is located within these land claim areas. Two of the five member bands of the KNC have reserves located in the Cranbrook TSA, these are the St. Mary's Band and the Tobacco Plains Band.

Numerous natural resources occur within the Cranbrook TSA. These include timber, fish and wildlife habitat, recreation and tourism resources. Other important resources include range, farmland, and coal and mineral deposits.

The varied terrain and climate creates an exceptionally diverse environment. Due to the range of habitat types, the area is often described as being unique in North America, given its density and diversity of ungulates and other mammals and birds.

The timber harvesting land base - the area considered available for timber harvesting - comprises approximately 28 percent of the Cranbrook TSA.

History of the AAC

In 1981, the AAC for the Cranbrook TSA was determined to be 900 000 cubic metres. This AAC stayed constant through a 1985 review until 1987 when the AAC was reduced to 873 810 cubic metres. This reduction reflected a land transfer from the (then) Cranbrook Forest District to the (then) Invermere Forest District. Temporary AAC increases to account for salvage of mountain pine beetle killed trees occurred in 1990 (1-year increase of 376 000 cubic metres), 1991 (2-year increase of 284 000 cubic metres per year) and 1993 (1-year increase of 20 000 cubic metres). In 1995, the AAC increased

to 900 947 cubic metres due to the land area of tree farm license (TFL) 13 and its associated AAC of 27 137 cubic metres being added to the Cranbrook TSA. In 1996, the Chief Forester decreased the AAC to 850 000 cubic metres. In 2001 this was increased to 871 000 cubic – composed of 838 000 cubic metres of conventional timber and 33 000 cubic metres from marginally economic sites. In 2004, the AAC was further increased by 70 000 cubic metres per year for 3 years to address fire damaged stands - bringing the AAC to 941 000 cubic metres per year. The current apportionment of the AAC is as follows:

Apportionment	Cubic metres per year	Percentage
Replaceable Forest Licences	738 752	78
Non-replaceable Forest Licences	100 000	11
Timber Sale Licences 10 000 cubic metres or smaller - replaceable	5 672	1
BC Timber Sales	88 458	9
Forest Service Reserve	8 118	1
Total	**941 000**	**100**

New AAC determination

Effective November 1, 2005, the new AAC for the Cranbrook TSA will be 974 000 cubic metres. This AAC includes a temporary uplift of 70 000 cubic metres which will remain in place until January 1, 2007 to complete the salvage of timber from the 2003 fires. The AAC maintains the partition set on January 1, 2001 for 33 000 cubic metres per year of harvest to come from marginal stands. Please note the possibility of an earlier determination, discussed below in 'Reasons for Decision'.

Information sources used in the AAC determination

Under the Defined Forest Area Management (DFAM) initiative, DFAM participants were collectively responsible for completing the Cranbrook TSA timber supply analysis. The Cranbrook DFAM group consists of Tembec Industries Inc., Galloway Lumber Company Ltd. and B. C. Timber Sales (BCTS). Forsite Consultants Ltd. undertook the 2004 timber supply analysis on behalf of the Cranbrook TSA DFAM group.

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

- *DFAM interim standards for data package preparation and timber supply analyses,* BC Ministry of Forests 2003. Timber Supply Branch.
- *DFAM interim standards for public and First Nations review,* BC Ministry of Forests, 2003. Timber Supply Branch.
- *Biodiversity Guidebook,* Province of BC, 1995.
- *Kootenay-Boundary Higher Level Plan Order*. BC Ministry of Sustainable Resource Management, October 2002, and variances.

- *Kootenay-Boundary Land Use Plan Implementation Strategy*, Kootenay Inter-Agency Management Committee, 1997.
- *Southern Rocky Mountain Management Plan*, BC Ministry of Sustainable Resource Management, 2003.
- *Cranbrook Timber Supply Area Timber Supply Review Data Package*, Forsite Consultants Ltd., February 2004.
- *Cranbrook Timber Supply Area Timber Supply Review Analysis Report*, Forsite Consultants Ltd., May 2004.
- *Cranbrook Timber Supply Area Timber Supply Review Summary of Public Input (draft)*, BC Ministry of Forests, July 2004.
- *Cranbrook TSA Inventory Audit*, Ministry of Forests Resource Inventory Branch, 1999.
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province.
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources.
- Letter from the Deputy Ministers of Forests and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts on timber supply from biodiversity management.
- *Riparian Management Area Classification for Cranbrook Forest District*, GeoSense, March 1998.
- *Cranbrook Forest District Problem Forest Type Summary Report*, BC Ministry of Forests, July 1998.
- *Cranbrook Forest District Timber Harvest Uplift and Partition Cut Strategy*, BC Ministry of Forests, December 1999.
- *Identified Wildlife Management Strategy*, Volume 1, Province of BC, February 1999.
- *Forest and Range Practices Act* 2002 and Amendments.
- *Forest Practices Code of British Columbia Act Regulations* and Amendments, consolidated to June 1999.
- *Cranbrook TSA Rationale for AAC Determination*, January 7, 2004.
- *Landscape Unit Planning Guide*, 2000.
- *Identified Wildlife Management Strategy, Procedures for Managing Identified Wildlife*, Version 2004.
- Notice — Indicators of the amount, distribution and attributes of wildlife habitat required for the winter survival of ungulate species in the Cranbrook Timber Supply Area.
- Notice — Indicators of the amount, distribution and attributes of wildlife habitat required for the survival of species at risk in the Rocky Mountain Forest District.
- Order: UWR requirements under sections 7(2) and 10(1) of the Government Actions Regulation

- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS and staff from the former Ministry of Water, Land and Air Protection (MWLAP), including the AAC determination meeting held in Cranbrook, April 26-28, 2005 and a helicopter review of portions of the TSA on April 25, 2005 with district staff.

Role and limitations of the technical information used

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

The computerised analytical models currently used to assess timber supply unavoidably simplify the real world and also involve uncertainty in many of the inputs, due in part to variations in physical, biological and social conditions. While ongoing science-based on improvements in the understanding of ecological dynamics will help reduce some of these uncertainties, technical information and analytical methods alone cannot incorporate all the social, cultural and economic factors relevant to forest management decisions, nor do they necessarily provide complete answers or solutions to the forest management problems addressed in AAC determinations. However, they do provide valuable insight into potential outcomes of different resource-use assumptions and actions-important components of the information that must be considered in AAC determinations.

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

Statutory framework

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

Guiding principles for AAC determinations

Current forest management practices in British Columbia follow the standards and legislation set out by the *Forest Practices Code*. When the *Forest and Range Practices Act* (FRPA) becomes fully implemented, which is expected to occur by December 2006, this Act will guide forest management practices in the province. Under FRPA, forest companies must outline in forest stewardship plans how they can best achieve objectives set by government for wildlife, fish and biodiversity as well as for soils, timber, water and cultural heritage values. Government may also require results or strategies for the special management of areas of local concern, such as wildlife habitat areas, winter range for animals such as deer and mountain goats, community watersheds, fisheries-sensitive watersheds, recreation trails and scenic vistas.

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

In determining AACs in the context of these provincial requirements for forest management practices and in the context of change in its many forms, I proceed under a set of stated principles as follows.

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

Two important ways of dealing with uncertainty are:

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

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

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

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

As British Columbia progresses toward the completion of strategic land-use plans, in some cases the eventual timber supply impacts associated with land-use decisions

resulting from various regional and sub-regional planning processes remain subject to some uncertainty before formal approval by government. In determining AACs it has been and remains my practice not to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government.

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

In the Cranbrook TSA, much clarification of land and resource use has been provided by government's Kootenay-Boundary Higher Level Plan Order, which guides many aspects of current management as addressed in my considerations in many sections of this document.

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

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

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

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from decisions in recent years in the Supreme Court of Canada. The AAC that I determine should not be construed as limiting the Crown's obligations under these

decisions in any way, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Cranbrook TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. I consider those aboriginal interests raised during the consultation process associated with timber supply review. As I am able, within the scope of my authority under Section 8 of the *Forest Act*, I address those interests. When aboriginal interests are raised that are outside of my jurisdiction, I will endeavour to forward these interests for consideration to other decision-makers.

Overall, in making AAC determinations, I am mindful of the mandate of the Ministry of Forests and Range as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the Section 8 of the *Forest Act*, under the Code and under the new *Forest and Range Practices Act*.

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

The role of the base case

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

For each AAC determination for a TSA a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. The Forest Service Simulator (FSSIM) was the computer simulation model used for the Cranbrook TSA. Using FSSIM and the data from the information package, the DFAM group produced a series of timber supply forecasts, reflecting different decline rates, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

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

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are

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

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

Base case for the Cranbrook TSA

The base case in the current (TSR 3) timber supply analysis incorporates a number of changes in input data and methodology from the analysis used for the previous AAC determination effective January 8, 2004. The January 2004 determination, as noted in the history section, was a temporary AAC increase necessitated by the extensive wildfires of 2003. The January 2004 decision was based on the data from the December 1999 Cranbrook TSA Analysis Report. A modification of the base case was requested by the chief forester to assist in his December 7, 2000 determination. This modified base case more accurately reflected current management practices by incorporating many standard practices of the day such as: the regional land use plan biodiversity emphasis options, changes to the forest cover constraints used to account for recreational values, removal of the relative-oldest-first harvest rule, modifications to ungulate winter range (UWR) modelling to reflect adjacency constraints, and other base case refinements. This modified base case was referred to as the “chief forester’s run”.

The major changes from TSR 2 to TSR 3 are:

- The current timber harvesting land base area in TSR 3 is smaller than in TSR 2 by about 5.2 percent. Much of this difference is due to using area reductions in TSR 3 rather than volume curve reductions (used in TSR 2) to account for roads trails and landings.
- Operability for the TSA was reviewed in 2003 to confirm the merchantability and economic viability of accessing forest stands in the TSA. Areas were both removed and added to the old operability line, resulting in a net reduction to the timber harvesting land base area.
- Older environmentally sensitive area (ESA) soils mapping has been replaced with current terrain stability mapping. This has significantly reduced the amount of area deducted from the timber harvesting land base for unstable soils.

- Biogeoclimatic Ecosystem Classification (BEC) mapping for the Cranbrook TSA was revised in 2002. This altered the area of some BEC variants and introduced new BEC variants that had not previously existed.
- New visual quality objectives (VQOs) were made known by the District Manager for the TSA in March 2003.
- The Higher Level Plan Order (October 2002) gave legal status to landscape units, biodiversity emphasis, old and mature retention targets, caribou, green-up, Grizzly bear habitat and connectivity corridors, consumptive use streams, enhanced resource development zones, fire maintained ecosystems (FMER), scenic corridors, and social and economic stability.
- The Southern Rocky Mountain Management Plan (SRMMP) was implemented August 2003 for the eastern portion of TSA and is considered government policy.
- The TSR 3 base case modelled the use of select seed for lodgepole pine, hybrid spruce, and western larch. No select seed was modelled in the TSR 2 base case or the Chief Forester's run.
- Spatially explicit old growth and mature management areas (OGMAs / MMAs) have been generated for use in the analysis. OGMAs are modelled in all landscape unit/BEC combinations and MMAs are modelled in the specific landscape unit/BEC combinations identified by the HLPO (about five percent of the units). TSR 2 applied full mature targets in all landscape unit/BECs.
- Ecosystem restoration mapping has been completed for about half of the NDT 4 area. This mapping is field based and where available replaced the algorithm generated fire maintained ecosystem restoration mapping used in TSR 2.
- In TSR 2, wildlife tree patch reductions were applied as a percent volume reduction to yield tables based on the Landscape Unit Planning Guide recommendations with an accounting for the spatial distribution of productive forest areas located outside of the timber harvesting land base. For TSR 3, a volume reduction for future wildlife tree and other in-block retention was applied to all stand volumes. This reduction was based on a 2004 in-block retention study and corresponds to the Landscape Unit Planning Guide and new BEC mapping.
- The inoperable area was disturbed for each landscape unit as per the fire return interval assumptions in the *Biodiversity Guidebook*. This was not done in TSR 2 where the inoperable areas were aged indefinitely within the model.
- TSR 3 used harvest sequence rules to try to better reflect the current harvest profile. The TSR 2 chief forester's run used the random harvest rule.

Due to these and other changes, the current and previous base case projections are not directly comparable. Comprehensive details of the assumptions made in representing current forest management in the Cranbrook TSA in the 2004 base case are provided in the 2004 timber supply analysis report and many are also discussed in relevant sections of this rationale.

In the 2004 base case, the harvest flow objectives included maintaining or increasing the current AAC for as many decades as possible with a gradual, controlled decline in

harvest levels if required to reflect forest management assumptions. The objectives also included achieving a maximum even-flow long-term supply where the growing stock is stable.

The resulting forecast reflected the 3 year uplift of 70 000 cubic metres per year to quickly salvage timber damaged in the catastrophic fires of 2003. This uplift was the main focus of the January 2004 AAC determination. At the completion of the 3 years, by the end of 2006, the projected harvest level drops from 908 000 cubic metres to 838 000 cubic metres per year.

In the base case the volume from conventional harvest was maintained for 3 decades and was then stepped down to a mid-term harvest level of 767 000 cubic metres per year from decade 4 through decade 9. A projected long-term harvest level of 841 000 cubic metres per year is attained by decade 11. Merchantable growing stock is at its lowest level in decades 6 and 11. This lowered timber availability makes necessary the decrease in mid-term harvest level that lasts from decade 3 through 10. Growing stock rises after decade 10-allowing the increase to the long-term harvest level.

From my review of the timber supply analysis, including detailed discussions with Forest Service analysts, I conclude that the base case forecast provides a suitable basis of reference for use in my considerations in this determination.

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

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

Section 8 (8)

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

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

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

Land base contributing to timber harvest

- *general comments*

The total area of the Cranbrook TSA is approximately 1 244 351 hectares. A total of 760 590 hectares (about 61 percent), is classified as the Crown forest land. Crown forest land is made up of land that is capable of growing productive forest stands and is managed by the Crown. Land not owned by the Crown (private, federal, dominion and First Nation reserves) or not directly managed by the Crown (woodlots, Christmas tree permits and miscellaneous leases) are not included in the Crown forested landbase. The timber harvesting land base is a portion of the Crown forest land which is considered to be economically and biologically available for harvest. The main reasons that forests are

unavailable for harvest are because they are considered inoperable, unmerchantable, environmentally sensitive, a park or reserve, or need to be retained to address objectives such as riparian areas. The Cranbrook TSA current timber harvesting land base is estimated to be 416 196 hectares.

In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors, prior to quantifying appropriate areas to be deducted from the productive forest area to derive the timber harvesting land base. A detailed accounting of the areas deducted from the total TSA area or the Crown forest land base is given in the 2004 timber supply analysis report.

My consideration of the remaining deductions follows.

- *parks and reserves*

Parks and reserves under provincial Crown ownership can contribute to forest management objectives such as landscape level biodiversity though they are not part of the area available for harvesting. There are 22 389 ha of such forested parks and reserves which are deducted from the timber harvesting land base.

- *non-forest and non-productive sites*

Areas considered not capable of growing productive forest stands were deducted from the total Cranbrook TSA area since they do not contribute to the Crown forested land base. Staff from the then Ministry of Sustainable Resource Management provided an analysis of inventory data for the TSA to determine total hectares contained in non-forest or non-productive categories such as alpine, rock, non-productive and open range. The 495 333 hectares of non-forest and non-productive sties are not included in the TSA Crown forested land base.

I have reviewed the assumptions for non-forest and non-productive sites and note that a small error became apparent after completion of the timber supply analysis. BCFS staff have advised me that during the inventory assessment, 6713 hectares of recent logging were incorrectly labelled as non-productive. I note that deducting these hectares from the TSA land base results in a potential 1.6 percent underestimation of the timber harvesting land base. Had these hectares been correctly labelled, timber supply would have been slightly higher in the mid-term and up to a 1.6 percent higher in the long-term compared to the base case projection. I have discussed this further in my “Reasons for decision”.

- *non-commercial cover*

Non-commercial cover is productive forest land that is otherwise occupied by non-commercial tree or shrub species. Area classified as non-commercial cover does not currently grow commercial tree species and is not expected to do so without intervention. A total of 3474 hectares of non-commercial cover was identified in the forest cover inventory and excluded from the Crown forest land base.

I accept that the best available information regarding non-commercial cover was used in the analysis.

- not satisfactorily restocked areas

Not satisfactorily restocked (NSR) areas are those where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Areas where the standard regeneration delay has not yet elapsed since harvesting are considered 'current' NSR and the amount fluctuates with the amount of disturbance (e.g. harvesting, fires) taking place. Since 1987 there has been a legal obligation to reforest harvested areas. Where a site was harvested prior to 1987 and a suitable stand has not yet been regenerated, a classification of 'backlog' NSR applies.

The NSR polygons in the forest inventory were reviewed in 2001-2002 using map and air photo assessment and updated as necessary. District silviculture data indicates that there are 14 790 hectares of current NSR which has legal obligations to be reforested. Staff indicate that a portion of this area is already stocked but has not yet been surveyed to have its classification changed.

Currently 1381 hectares of backlog NSR is estimated for the TSA based on district silviculture data. District staff indicate that 732 hectares should remain in the timber harvesting land base and the remainder is unlikely to contribute to timber supply. The backlog NSR remaining in the timber harvesting land base was regenerated within the base case as natural stands. The remaining 525 hectares of backlog NSR was therefore excluded from the Crown forest land base.

I have considered the information and have no concerns about NSR assumptions that would require adjustments to the base case for this determination.

- roads, landings and trails

In the analysis, an area equivalent to that covered by existing roads, landings and trails was deducted from the total TSA land base. To estimate this area, existing roads as shown on a 2003 road layer forest cover map were assigned to categories (highway, secondary road, logging road, trail, railway, power line or pipeline) and appropriate buffers applied to the total length of road in each category. This resulted in a total area of 22 908 hectares of existing roads, landings and trails with a sequential deduction (considering overlaps with previously deducted areas) of 13 821 hectares from the total TSA land base.

In-block trails and landings are unclassified and are not identified on forest cover maps. The regional pedologist provided estimates for TSR 2 of net productivity reduction for in-block trails and landings. These same estimates were used for the current analysis. As a result a 5.76 percent area reduction was applied to previously harvested stands to account for in-block trails and 3.71 percent was applied to account for in-block landings, resulting in 14 015 hectares being deducted from the land base.

For TSR 2 the regional pedologist also provided estimates to account for productivity losses associated with future roads and landings. The DFAM group notes that current management is similar to management practices in place at the time of TSR 2 and therefore the same estimates were used for TSR 3. As a result, the reduction to the future timber harvesting land base to account for future roads and landings is 19 977 hectares or 4.8 percent of the current timber harvesting land base.

Public comment was received regarding increasing the timber harvesting land base by bringing spur roads, skid roads and landings back into a productive state. This comment addresses concerns about potential future road reclamation practices. If such practices are demonstrated operationally, their potential impact on timber supply can be considered in future analyses. I note that the advice of the regional pedologist was based on changing practices during different time periods in the history of the TSA. I therefore accept the information provided on in-block trails and landings, plus the information on existing roads, landings and trails as reasonably reflecting current and past practices. I note that deductions on future roads and landings were based on practices as determined in TSR 2—including assumptions that all future bladed trails are restored to productivity. Though the basis for the information on future roads and landings is somewhat dated, I accept it as reasonable approximation of future conditions, recognizing that the scale of change that could be anticipated from updating this information is small, and as better information is determined, it will be assessed in future analysis.

- *inoperable areas*

Those portions of the TSA which are not physically accessible for harvesting, or which are not feasible to harvest economically, are excluded in deriving the timber harvesting land base. In the Cranbrook TSA inoperable areas are often located on steep slopes with lower site productivity.

Operability mapping was first completed in 1987. To more accurately reflect the areas where timber harvesting is not likely to occur, this mapping was revised in 2003 by forest district staff in consultation with licensees. The revised operability mapping resulted in areas both being removed (about seven percent) and added (about two percent) to the old operability mapping. In total, 256 408 hectares of inoperable land were identified, and after accounting for previous deductions 238 972 hectares were excluded from the timber harvesting land base. This is about 3 percent more area excluded than was identified in the 1987 operability maps.

I note that during the last AAC determination, the Chief Forester requested an evaluation of harvesting occurring on difficult terrain. This request resulted in the revisions to the operability lines and I accept this accounting for inoperable areas as reasonably reflecting current practices.

- *non-merchantable forest types*

Non-merchantable forest types are stands that contain tree species that are not currently utilized, or timber that is of low quality, small size and/or low volume. In the Cranbrook TSA, this resulted in four categories of forest types which were excluded from the timber harvesting land base.

Deciduous-leading stands are not considered economically viable in the Cranbrook TSA and therefore 8154 hectares of deciduous leading stands are excluded from the Crown forest land base. Whitebark pine-leading stands are not expected to be harvested due to the generally poor wood quality and high biodiversity value. A total of 217 hectares of whitebark pine-leading stands were therefore excluded from contributing to timber supply. Whitebark pine was noted in the TSR 2 rationale as an important wildlife habitat species and of importance to First Nations. Instructions were given in the TSR 2

rationale to consider whitebark pine when assigning biodiversity retention areas. The exclusion of all whitebark pine leading stands reflects this consideration of the biodiversity and First Nations' values of the species.

Decadent timber types are not economic to harvest and therefore 3019 hectares were excluded from the timber harvesting land base. In the Cranbrook TSA, these decadent types are stands over 200 years old with western red cedar, western hemlock or sub-alpine fir as the leading species.

These non-merchantable forest types do not provide harvesting opportunities, though, as noted particularly for whitebark pine, they do provide ecological opportunities. In the timber supply analysis, after accounting for other land base deductions, a total of 11 390 hectares are excluded from the productive forest land base.

I accept the reductions made to account for non-merchantable forest types as appropriately representing current practices.

- *sites with low timber productivity*

Low-productivity sites are not likely to become merchantable within a reasonable length of time and therefore are not counted as part of the timber harvesting land base. In the current timber supply analysis, after accounting for other land base deductions, 11 582 hectares of low-productivity sites were excluded from the productive forest land base. The criteria for exclusion were the same as used in TSR 2.

I have reviewed the information and accept the deductions applied in the base case as the best available information and appropriate for use in this determination.

- *problem forest types*

An evaluation of a variety of forest inventory types suspected of not contributing to sawlog production was completed in 1998 to determine stands which can contribute—sometimes with allowance for reduced volume expectation and an extended rotation—versus stands that are true problem forest types.

True problem types occupy sites that have the potential to produce merchantable timber but the stands are not utilized due to marginal merchantability. In the Cranbrook TSA, these problem forest types are generally dense, small-diameter lodgepole-pine stands. A total of 38 845 hectares of problem forest type was estimated with a sequential netdown of 17 856 hectares of true problem forest types being excluded from contributing to timber supply.

In TSR 2, the AAC included a 33 000 cubic metre partition associated with problem forests from marginal stands outside the timber harvesting land base. The partition was created to encourage opportunities to rehabilitate dense pine stands and provide harvest opportunities for post and rail products. Of this partition about 308 hectares are to be harvested annually from problem forest types and 230 hectare are to be harvested annually from fire-maintained ecosystem restoration areas. A timber sale license to harvest 100 hectares of the problem forest types is currently about three-quarters complete. The successful harvesting on this timber sale license indicates that problem forest types can provide a viable economic opportunity while accomplishing stand

rehabilitation at, in some instances, no cost to the Crown. As the problem forest type stands are harvested the resulting regenerated stands will contribute to the timber harvesting land base.

In considering this information, I am satisfied that the approach taken represents a reasonable accounting for this factor for the purposes of this determination.

- *environmentally sensitive areas*

Environmentally sensitive areas (ESAs) in the Cranbrook TSA were identified in forest cover inventory for severe avalanche risk (Ea1), hydrologic sensitivity (Eh1) and severe regeneration problems outside the Rocky Mountain Trench (Ep1). All these areas are considered very sensitive to disturbance and are fully excluded from contributing to timber supply. This resulted in 7341 hectares being deducted from the timber harvesting land base.

I accept that environmentally sensitive areas have been adequately accounted for.

- *unstable terrain*

Since TSR 2, the ESA work for soils has been replaced with terrain stability mapping. The terrain stability mapping is based on field reconnaissance results for the steeper operable portions of the TSA and is therefore more accurate than the older ESA mapping. In the analysis, polygons determined to have a high mass wasting hazard from level B mapping, or unstable terrain from the less intensive level D mapping were 100 percent removed. Polygons classified as having moderate mass wasting hazard in community watersheds were also 100 percent removed to recognize the extra caution exercised in these areas. Considering the sequential order of netdowns, 5871 hectares were deducted from the timber harvesting land base to account for unstable terrain in those three categories.

I accept that these deductions reflect the best information available for the TSA and reasonably account for unstable terrain.

- *wildlife tree and in-block retention*

Wildlife tree retention is done within harvested cutblocks and is the primary means of addressing stand-level biodiversity and is a requirement under the Forest Practices Code and the *Forest and Range Practices Act*.

Within the Cranbrook TSA, retention requirements vary between landscape units. Highly operable landscape units have higher retention requirements than highly inoperable ones. These wildlife tree retention requirements were recently updated by the DFAM group and accepted by the district, resulting in slightly lower requirements than were modelled in the base case.

The area of wildlife tree patch retention in existing managed stands was determined by summing the area of mapped wildlife tree patches on previously harvested cutblocks. These existing wildlife tree patches totalled 2254 hectares. This area was deducted from the timber harvesting land base to account for wildlife tree retention in existing managed

stands. Since only mapped wildlife tree retention was summed, the assessment did not account for dispersed wildlife trees left as single tree retention or small patches.

The DFAM group also undertook an assessment of silviculture prescriptions to determine the total residual volume left on cutblocks, both as dispersed and patch retention. The purpose of this assessment was to determine the volume reduction that would best account for wildlife tree retention associated with future harvesting. The residual area was determined for 42 randomly selected silviculture prescriptions. The area for dispersed retention was determined for an 'equivalent-to-patch' area by comparing the basal area left in dispersed retention areas to a local average basal area of a fully-stocked stand. A total of 15 percent retention was determined. This consisted of 12.1 percent for long-term retention and 2.9 percent for short-term retention. The intent of short-term retention was to remove the retained trees prior to the end of the rotation.

To reflect the potential timber supply impact of wildlife tree retention in future cutblocks, the licensee applied a further 2.7 percent reduction to yield curves of all existing and future stands, except for the open-forest analysis units which were handled as a special case. The open forests are fire-maintained ecosystems with low tree density in the Rocky Mountain Trench. For open forest analysis units, it was assumed that 50 cubic metres per hectare were reserved from harvest at the first entry and that harvestable volumes from future stands were 51.5 percent of the VDYP volume predictions. Inherent in the 2.7 percent reduction was the licensee's assumption that accessible wildlife tree retention in excess of the stated silviculture prescription target would be harvested in the future, or left to provide wildlife tree habitat for future adjacent cutblocks.

Subsequent to completion of the base case, the DFAM group identified some double counting in the wildlife tree retention assumptions. It was determined that existing mapped WTPs identified on forest development plans were removed from the timber harvesting land base (as described above) and a 2.7 percent yield curve reduction was also applied to these same stands. The DFAM group indicated that only the yield curve reduction should have been applied, thus the timber harvesting land base was underestimated by about 2254 hectares (0.5 percent of the timber harvesting land base).

District staff have reviewed the assumptions used in the base case and acknowledge that current management practices are exceeding wildlife tree retention minimum requirements—sometimes by substantial amounts. However, staff suggest that past practices do not currently support the likelihood of licensees returning to cutblocks to harvest retention patches that are in excess of minimum requirements. District staff suggest a more realistic assumption is that about one-half of the leave tree volumes above minimum requirements might be harvested in the future or left to serve as wildlife tree retention for adjacent blocks. Based on their assessment, and incorporating the double-counting noted above, District staff suggest that the timber supply impact of future residual volume is about 1.7 percent higher than was modelled in the base case.

I have reviewed the information and assumptions regarding wildlife trees and in-block retention. I acknowledge the district's concern that based on current and past practice, the likelihood of harvesting retention patches that are in excess of minimum requirements is uncertain. I prefer to have greater evidence to substantiate the licensee's assumptions

and conclude that the timber supply projected in the base case may be over-estimated by an uncertain amount. I have discussed this below in my "Reasons for Decision". As noted under Implementation, I request that licensees monitor the reserve volumes in the field and further refine the assumptions for wildlife tree retention for use in future timber supply analyses.

- *riparian habitats*

Riparian areas along streams, lakes and wetlands provide key habitat for fish and wildlife and help conserve water quality and biodiversity. The Forest Practices Code (Code) and the *Forest and Range Practices Act* (FRPA) provide for riparian reserve zones (RRZs) that exclude timber harvesting and riparian management zones (RMZs) that restrict timber harvesting in order to protect riparian habitats.

Stream classifications came from the DFAM group, based on their operational knowledge, or the (then) Ministry of Sustainable Resource Management (MSRM) inventory. Classifications not available from those two sources were generally grouped into fish or non-fish streams depending on the stream gradient. The total stream length within each stream class was tallied, reserve widths applied, and an area reduction calculated. Management practices as defined in the *Riparian Management Area Guidebook* were used to determine the area retained within the riparian management zone. The Kootenay-Boundary Higher Level Plan Order requires a larger management zone on portions of S5 and S6 streams in community watersheds. This requirement was not modelled in the base case since it affects a very small area and has a negligible impact.

The TSA's lakes and wetlands were identified from forest cover and TRIM inventory data. Classification of the lakes and wetlands, and designation of reserve widths and amount of retention in management zones was done according to *the Riparian Management Guidebook* and the *Regional Lake Classification* and current management. In the analysis an 'effective' buffer width was determined for each lake or wetland. The effective buffer represents both reserve zone full retention and the partial retention within management zones.

The total riparian area assumed in the analysis was 42 567 hectares. After previous deductions, 26 740 hectares were excluded from the timber harvesting land base for riparian habitat in stream, lakeshore and wetland riparian management areas (riparian reserve zones plus riparian management zones). I accept that these modelling assumptions appropriately reflect current practice regarding management of riparian habitat.

- *identified wildlife*

'Identified wildlife' are those wildlife species and plant communities that have been approved by the (then) Ministry of Water, Land and Air Protection (MWLAP) as requiring special management. The province's Identified Wildlife Management Strategy (IWMS) addresses plant communities and species at risk, and regionally significant species, that have not been accounted for by other existing management strategies. For

example, management strategies for protected areas, biodiversity, riparian management or ungulate winter range.

Identified wildlife can be protected through the establishment of wildlife habitat areas (WHAs) with objectives or general wildlife measures. The objectives or general wildlife measures may preclude or constrain timber-harvesting activity depending on the requirements of individual identified wildlife species or communities.

Government policy under the Code, which continues under FRPA, is to limit the timber supply impact of the IWMS to one percent. Impacts greater than this are possible if required to protect species at risk, but will require using tools such as land use objectives under FRPA (called higher level plans under the Code). Operational policy direction has been to initially allocate the one percent impact equally to each forest district with acknowledgement that this approach can be refined if warranted.

One WHA is currently established in the Cranbrook TSA, though others are in the planning stage. The approved WHA is 29.7 hectares for the Lewis' woodpecker and it is located outside of the timber harvesting land base area. The *Forest Planning and Practices Regulation* under FRPA also enables species at risk to be addressed as an objective set by government for wildlife provided MWLAP issues a notice. A notice was issued related to 5 of the 12 identified wildlife species which are found within the Rocky Mountain Forest District. I note that this notice was issued after the data package was completed and therefore was not considered in the base case. The five species listed in the notice are: Coeur d'Alene salamander, Rocky Mountain tailed frog, flammulated owl, Lewis's woodpecker and badger. The estimated effect on the timber harvesting land base of the notice is 1091 hectares.

The base case does not reflect the impact of the MWLAP notice for five species at risk in the Cranbrook TSA. Neither does it reflect the potential impact of future WHAs. I believe it is important to get WHAs in place to ensure proper stewardship under FRPA, and I believe it is reasonable that a TSA as biologically diverse as Cranbrook will ultimately require the full one percent timber supply impact. I discuss this further under 'Reasons for Decision'.

- *cultural heritage resources*

A cultural heritage resource is an object, site or location of a traditional societal practice that is of historical, cultural, societal or archaeological significance to the province, community or an aboriginal people. This can include archaeological sites, structural features, heritage landscape features and traditional use sites. Experience has shown that most archaeological and cultural heritage concerns can be addressed through changes to management practices. No land base exclusions were made specifically to account for cultural heritage resources. However cultural heritage resources are often situated near water bodies and can therefore be protected by using a riparian management area or wildlife tree patch both of which are accounted for separately in the timber supply analysis. In other cases these sensitive sites can be protected by using management practices such as machine-free zones or winter logging. Since cultural heritage resources can be protected through land base exclusions for other factors or through the timing

and/or location of management practices, no related adjustments were required relative to the base case timber supply projection.

- *woodlot licences*

The *Forest Act* requires AACs determined for TSAs to be exclusive of the areas and timber volumes allocated to woodlot licences. When woodlot licences are issued, the required volumes are first allocated from an appropriate apportionment under the AAC for the TSA. Then, in the next AAC determination for the TSA, the TSA land base is reduced by the area of Crown land in all the woodlot licences issued since the previous determination, and the total volume in the issued woodlot licences is excluded from contributing to the AAC for the TSA.

The existing woodlots in the TSA area are not included in timber harvesting land base and do not contribute in the analysis to meeting forest cover requirements. I am satisfied that the timber supply analysis addressed woodlots appropriately since existing licences were not part of the base case.

Existing forest inventory

- *current inventory*

The current inventory for the Cranbrook TSA was completed in 1992 based on air-photo interpretation. This 1992 inventory has since been converted to the Vegetation Resource Inventory (VRI) format. The VRI forest cover information was updated for harvesting disturbances and growth to January 2003 for use in the analysis.

Staff inform me there has been some additional harvesting of the Forest Service Reserve apportionment in 2004—i.e., subsequent to the updating of the forest cover information for harvesting. This has been largely due to salvage of wood from the 2003 fires, and small scale salvage of beetle infested wood, and as a result, timber supply may be slightly overestimated. The use of the VRI in the timber supply analysis employs the best available information and therefore I am satisfied its use is appropriate for this determination. The additional harvesting in the Forest Service Reserve reflects the increasing requirement to quickly salvage wood in this area of the province with rapidly increasing mountain pine beetle populations. I discuss this further in ‘Reasons for Decision’.

- *species and age considerations*

Lodgepole pine is the most prevalent commercial tree species in the TSA, being the leading species on 45 percent of the timber harvesting land base. Other commercial species present are Douglas-fir, western larch, hybrid spruce, sub-alpine fir and yellow pine. The timber supply analysis report provides information on current age class distribution for the Cranbrook TSA as well as projected distributions in the future.

The age class distribution in the TSA is not uniform. There is a higher proportion of lodgepole pine leading stands between the ages of 61 and 80 years compared to any other age class.

I accept the data provided to me on species and age as representing the best available information for use in this determination.

- *volume estimates for existing unmanaged stands*

In the timber supply analysis, estimates of timber volumes in existing unmanaged stands were projected using the VRI inventory attributes and the Variable Density Yield Prediction (VDYP) model version 6.6. In the analysis, stands older than 20 years are considered to be unmanaged.

For the purposes of the timber supply analysis, 23 analysis units were created based on dominant tree species, site index, and silvicultural regime. A yield curve was developed for each analysis unit using VDYP to assign current volumes and to project volumes in the simulation model until harvest. Natural stand volumes in partially harvested stands, such as areas with removal of pine trees infested with mountain pine beetle have been manually adjusted for the purposes of this timber supply analysis. This was necessary since the VDYP growth model used to simulate the growth of natural stands tends to over-predict the volume in partially harvested stands.

A 1997 audit showed acceptable levels of accuracy for the Cranbrook TSA mature natural stand inventory. The audit compared the inventory volumes of mature natural stands to field results. This comparison indicated a 5.5 percent overestimate of volume, however this overestimate is not statistically significant and I am comfortable with the accuracy of the inventory data.

District staff inform me that operational timber cruise volumes from the fire-maintained NDT 4 areas of the Cranbrook TSA are often only about half that shown in the inventory. The NDT 4 areas are in the hot, dry Rocky Mountain Trench area of the TSA and are composed generally of Douglas-fir/yellow pine leading stands. These areas make up the open forest and open range analysis units as well as NDT 4 managed forest stands.

Decades of wildfire suppression has led to overly dense stands on sites that once provided open forest and open range conditions in the Rocky Mountain Trench. Open range and open forest currently accounts for almost 15 percent of the timber harvesting land base area of the Cranbrook TSA. On average, the open forest and open range contribute 6.5 percent of the volume in the base case harvest forecast. Restoration of these sites is considered a priority in the Kootenay-Boundary Higher Level Plan Order and therefore occurs as forest licensees and government agencies have the opportunity to

enter these stands and reduce stand density. The partition for harvesting marginal stands outside of the timber harvesting land base (see *problem forest types*) was designed to capture incidental volumes on about 230 hectares annually from restoration treatments on areas outside of the timber harvesting land base.

Open range areas are assumed to be available for an initial harvest if they meet minimum harvest criteria (see *minimum harvestable age*). After the initial harvest, open range stands are removed from the timber harvesting land base. Open forest areas are assumed to have an initial harvest entry to reduce stocking levels to historic low densities. This initial harvest entry will be followed by periodic low volume harvests to maintain the open forest attributes for range and provide timber volume. The naturally regenerated stands resulting from the open forest treatment are modelled at slightly more than one-half of regular VDYP yields to account for the lower desired densities, shading effects from the remaining overstory on the regenerating stands and losses for roads.

Douglas-fir/yellow pine leading stands were sampled in the 1997 inventory audit and therefore the results contributed to the acceptable level of accuracy found in the audit. However it is unknown how many of the sampled audit plots were actually located in the NDT4 area and I acknowledge that there is some risk that NDT4 volumes were over-predicted.

A sensitivity analysis showed the impact of a zero timber yield from the open range and open forest areas. This analysis showed a drop in the mid-term harvest forecast of approximately 50 000 cubic metres and the drop in the mid-term harvest level starts two decades sooner than projected in the base case. However, based on a forest district assessment of cruise yields on NDT4 sites compared to inventory yields, a decrease in timber yield of 50 percent is more likely than a complete loss of timber yield.

I see the discrepancy between cruise information and inventory yields for the NDT4 sites as a potential downward pressure to timber supply. However, I am not overly concerned with this potential for a number of reasons. First, from a TSA perspective the 1997 audit shows that the Cranbrook TSA has a valid inventory and any discrepancy in NDT4 actual volumes is likely to even out considering the full inventory. In addition, the timber supply contribution from NDT4 stands—stands comprising ecosystems with frequent stand maintaining fires—is expected to decrease greatly after the first decade as the ecosystem restoration work on open range and open forest is completed. I therefore accept the assumptions regarding natural stand yields in the base case as reasonable but, as discussed in the 'Implementation' section, I request that further work occur on the NDT4 inventory validation prior to the next timber supply review.

Expected rate of growth

- *site productivity estimates*

Inventory data include estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber

that can be produced, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In the timber supply analysis for the Cranbrook TSA, site productivity estimates came from the VRI inventory. The average site index in the Cranbrook timber harvesting land base is 16.1 metres at age 50 years.

In general, forest stands between 30 and 150 years old provide the most accurate estimate of site index. Site indices from younger or older stands may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation as it does of site potential. In old stands which have not been subject to management of stocking density, the trees used to measure site potential may have grown under intense competition or may have been damaged, and therefore do not reflect the true growing potential of the site. One way to potentially improve site productivity estimates for existing and future managed stands is to use an ecologically-based site index adjustment using Predictive Ecosystem Mapping (PEM) and site index estimates for each biogeoclimatic ecosystem classification unit (i.e., using site index biogeoclimatic classification-SIBEC).

The potential impact of an ecologically-based site index adjustment was estimated using a PEM created to aid in development of ecosystem-based ungulate winter range (UWR) guidelines. Though this PEM is too coarse for the purpose of an accurate ecological site index adjustment, it is sufficient to indicate the general impact. The result was a 12 percent increase in the average site index on the timber harvesting land base-from 16.2 metres to 18.1 metres using the SIBEC for managed stands.

A sensitivity analysis used the SIBEC adjusted managed stand site index estimates to determine the potential impact on harvest levels. The analysis showed that an increase in the site index of managed stands (as estimated using the coarse PEM) would result in an increase to both the mid- and long-term harvest levels projected in the base case. Long-term harvest levels could potentially increase by 15 percent over that shown in the base case-resulting in a long-term harvest level of 967 000 cubic metres per year.

The sensitivity analysis demonstrates the large potential impact on timber supply of ecologically based site indices for managed stands. Licensees may want to further investigate the use of PEM of sufficient detail to allow for its use in a SIBEC assessment of managed stand site indices to be considered in the next timber supply review.

I have reviewed the information regarding site productivity estimates used in the base case and discussed it with Forest Service staff. I conclude that the estimates used in the timber supply analysis are based on the currently best available information and are therefore suitable for use in this determination.

- *volume estimates for regenerated managed stands*

In the analysis, the standard BC Forest Service growth and yield model Table Interpolation Program for Stand Yields or TIPSY (version 3.0h) was used to estimate the timber volumes for regenerated managed stands. The model was applied to all future regenerated stands and to all existing stands 21 years old or less.

TIPSY requires input information such as species composition, regeneration delay, density and site productivity that describes establishment conditions. Site productivity estimates were based on the VRI inventory as previously discussed. The regeneration assumptions were based on information from silvicultural records and interpretation of current management from the DFAM group. For modelling purposes, future managed stands are grouped into analysis units.

The TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition. However, certain operational conditions, such as a less than ideal distribution of trees, the presence of small non-productive areas, endemic pests and diseases, or age-dependent factors such as decay, waste and breakage, may cause yields to be reduced over time. Two operational adjustment factors (OAFs) are therefore applied to yields generated using TIPSY, to account for losses of timber volume resulting from these operational conditions. OAF 1 is designed to account for factors affecting the yield curve across all ages, such as small stand openings. OAF 2 accounts for factors whose impacts tend to increase over time such as pests, disease, decay, waste and breakage. In the Cranbrook TSA timber supply analysis, the standard provincial modelling reduction of 15 percent was applied for OAF 1. The standard reduction of 5 percent for OAF 2 was applied plus an amount to reflect losses from root disease such as *Armillaria*. *Armillaria* is a root disease that forms a component of most managed and natural forest stands in the southern third of BC, including those in the Cranbrook TSA. The OAF 2 increase for root disease was developed by the DFAM group. For sites at high risk for *Armillaria*, OAF 2 is increased by 5.8 percent to a total of 10.8 percent. For lower risk sites no reductions for *Armillaria* are applied.

I accept the volume estimates for regenerated stands as based on the best available information.

- *genetic worth*

Use of select seed with improved genetic traits can increase timber volumes of managed stands in the long-term and quicken the time for a stand to reach a green-up height or reach minimum harvestable age, thereby also having an influence on short- and mid-term timber supply. The quantity and quality (genetic worth) of select seed has increased in the past decade, and is projected to increase further, throughout the province including the Cranbrook TSA.

In the timber supply analysis, the volume gains expected at harvest age from the use of select seed were accounted for by modifying the TIPSY growth curves for regenerated stands. Historical use of select seed was obtained from the Forest Service Seed Planning and Registry System (SPAR) seed map summary reports. For existing managed stands, gains expected from the past use of the select seed are one percent for western larch and three percent for hybrid spruce.

The availability of select seed for future managed stands was also determined through SPAR. This availability and the assessment of genetic worth from 2003 data were the main drivers for the expected gains applied to the growth curves for those stands. For

future managed stands, the expected gains are 6 percent for western larch, 1 percent for lodgepole pine and 17 percent for hybrid spruce.

A sensitivity analysis which assumed no gain from select seed and also the expected gains as based on projections for 2013 seed was done. Compared to the base case assumptions for select seed, the analysis of zero gain from select seed showed a 5.9 percent and a 5.2 percent decrease in mid- and long-term timber supply respectively. The analysis assessing genetic gains as based on 2013 seed genetic worth also showed a one-decade extension to the initial harvest level projected in the base case, , no change in the mid-term timber supply, and only a 1.4 percent increase in the projected long-term harvest level. I note that the Forest Service Tree Improvement Branch, has developed summary seed use and genetic gain history reports which are readily available through a web-based SPAR application. I will look to these reports prior to the next timber supply review to assess the use of genetically improved stock.

Forest Service staff from Tree Improvement Branch have reviewed and verified the genetic gain assumptions used in the base case. I therefore conclude that the base case reasonably reflects the use of select seed in the TSA for the purposes of this determination.

- *minimum harvestable ages*

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

The following three criteria were applied to determine minimum harvestable age:

- minimum volume per hectare of 150 cubic metres per hectare or 100 cubic metres per hectare for lodgepole pine stands on slopes less than 40 percent,
- minimum piece size of 25 centimetres mean diameter at breast height (dbh) or 20 centimetres mean dbh for lodgepole pine stands on slopes less than 40 percent, and,
- age at which 95 percent of the culmination of mean annual increment is achieved.

In the analysis, some of the problem forest types were grown on extended rotations and had an additional 20 years added to the minimum harvest age.

Forest Service district staff initially expressed concern about the minimum volume of 150 cubic metres per hectare specified for steep slopes, believing it to be overly optimistic since there has been little harvesting of stands with such a low volume on steep slopes. However, on these sites, minimum diameter rather than minimum volume was the limiting criteria, meaning a higher minimum harvest age than what would have been determined based on minimum volume alone.

Sensitivity analysis that increases minimum harvestable ages by 10 years projects that the initial harvest level (i.e., 838 000 cubic metres per year) projected in the base case can be maintained for only one decade before declining eight percent to 767 000 cubic metres per year. The long-term timber supply would increase by 3.4 percent compared to the base case with the increased minimum harvestable age. In the sensitivity analysis, decreasing minimum harvestable ages by 10 years enabled pre-uplift harvest levels to be maintained for 5 decades with no impact on the mid- and long-term timber supply.

Having reviewed the assumptions used in the base case, and the results of the sensitivity analyses, I accept the minimum harvest ages as suitable for use in this determination.

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

Regeneration delay and impediments to prompt regeneration

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the timber supply analysis, a regeneration delay of one year was assumed for future planted stands. This one year delay reflects the current practice in the Cranbrook TSA to plant the year following harvest with one-year old stock. There are some sites that are not restocked this quickly due to plantation failures, seedling delays, or general logistics. Due to this small amount of area, the actual regeneration delay is expected to be somewhere between zero and one year. This prompt reforestation is supported by information from the silviculture reporting system which indicates average regeneration delay for planted stands over the last six years to be less than zero-indicating the presence of acceptable advanced regeneration on many sites.

The single exception to the one-year regeneration delay was on the open forest and Douglas-fir/yellow pine shelterwood analysis units. On these areas a ten-year regeneration delay was applied in the analysis to reflect the difficulty in regenerating Douglas-fir on these sites due to pressures from cattle, elk and ecological extremes.

A sensitivity analysis shows that an increase of regeneration delay to three years for all but the open forest and shelterwood analysis units will result in the current pre-uplift AAC being maintained for only one decade. Long-term timber supply would also be 3.3 percent lower than the base case due to a 3-year regeneration delay.

In reviewing the information presented to me by district staff, I accept for the purposes of this timber supply analysis the regeneration delay assumptions. Due to the sensitivity of timber supply to regeneration delay, I ask that licensees report to me at the time of the next timber supply review on their success in meeting an average one-year regeneration delay.

2003 fires

The fires in 2003 impacted 22 434 hectares of Crown forested land in the Cranbrook TSA with 11 313 hectares in the timber harvesting land base. A 70 000 cubic metre per year uplift was put in place after TSR 2 to facilitate salvage of mature fire-damaged timber

from the timber harvesting land base. The uplift is to stay in place for three years until the end of 2006.

The ongoing salvage was modelled in the base case by harvesting about 2000 hectares (about 300 000 cubic metres of merchantable timber) of fire-impacted areas in the first two years. Ten percent of the total fire area was assumed to become unproductive for the remainder of the planning horizon. The approximately 8000 hectares of burned and unsalvaged area, other than the sites assumed to be unproductive, are regenerated as natural stands on VDYP curves. District staff expressed concern that a portion of these stands (mainly lodgepole pine) are likely to experience repression and could become problem forest types if no stand level treatments are done. In addition, some areas will not naturally restock to become commercially viable stands without management intervention.

A sensitivity analysis explored the impact on timber supply if 70 percent of the unsalvaged 2003 fire area becomes overstocked, NSR, or non-productive (NP) and is deleted from the timber harvesting land base. This analysis resulted in a loss of about 6 500 hectares of timber harvesting land base. Such a loss does not impact the short-term harvest flow but would reduce the projected long-term harvest level by about one percent. As a one-time occurrence, such a long-term reduction is not severe. However, if the return period of major fires becomes more frequent, there is potential for a much larger impact to the timber harvesting land base and the need for silvicultural investments to maintain productivity of the sites will become more important. I note that the Forests for Tomorrow initiative may provide opportunities to rehabilitate unsalvaged burned areas.

District staff inform me that there has been significant progress in salvaging fire damaged timber. As of December 31, 2004, 330 000 cubic metres of timber was salvaged (British Columbia Timber Sales (BCTS) and non-replaceable forest licences) from the fire impacted stands with cutting permits in place for BCTS to salvage another 55 000 cubic metres.

I note that licensees have salvaged more timber from the fire-impacted areas than was modelled in the base case, suggesting that the timber supply projected in the base case may be slightly underestimated. However, I accept the base case which models 90 percent of the fire-disturbedareas eventually coming back to sawlog production (assuming that funding will become available to achieve this percentage of sawlog stands). I request that district staff monitor progress of the regenerating stands. The apparent increasing frequency of major fires in the Cranbrook TSA points to the potential need for silviculture investment to deal with repression and NSR issues and bring these areas to free growing.

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

Silvicultural systems

The silvicultural system predominately used in the Cranbrook TSA has been clearcutting with reserves such as wildlife tree patches for stand-level biodiversity, and shelterwood. There are also areas of small patch cuts-often used for salvage operations of beetle

infested timber. Open forests are typically selectively logged. In the base case all harvesting outside the open forest or open range was modelled as clear cut with reserve and a small area was modelled as shelterwood. These assumptions are appropriate, provided that licencees continue to manage this way in the future. As noted and discussed in the section 'wildlife tree retention', there are significant numbers of leave trees that have historically been left on-site following harvest.

I accept that the base case has adequately addressed silvicultural systems for this determination and request that licencees monitor actual practices during the period leading up to the next determination.

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

Utilization standards

Utilization standards define the species, dimensions and quality of trees that are harvested and removed from an area during harvesting operations. In the timber supply analysis, the standards applied were consistent with those listed for the interior in *the Provincial Logging Residue and Waste Measurement Procedures Manual*.

I accept the assumptions employed in the base case as a reasonable accounting of current management practices regarding timber utilization.

Decay, waste and breakage

The VDYP model used in the timber supply analysis to project volumes for existing unmanaged stands incorporated estimates of volumes of wood lost to decay, waste and breakage. These estimates of losses have been developed for different areas of the province based on field samples. As previously discussed in *volume estimates for regenerated managed stands,* OAFs were used in the timber supply analysis to account for decay, waste and breakage in volume estimates for regenerated managed stands. I am satisfied that the best available information was used in the base case timber supply analysis to account for decay, waste and breakage in the base case.

(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 Forest Service is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. The Forest Practices Code, the *Forest and Range Practices Act* and other legislation provide for, or enable, the legal protection and conservation of timber and non-timber values. 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 timber supply analysis has addressed some IRM objectives through reductions in the timber harvesting land base. I have accounted for these factors previously in the section 'Land base contributing to timber harvesting'. In this section, I account for IRM objectives where the land base continues to contribute to timber supply but is subject to various forest cover and adjacency constraints.

- *cutblock adjacency and green-up*

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

The Kootenay Boundary Higher Level Plan Order (HLPO) specifies green-up requirements within specific zones of the Cranbrook TSA. The Enhanced Resource Development Zone has a requirement for successful regeneration. The Integrated Resource Management Zone requires that no more than 33 percent of the area is covered by stands less than 2.5 metres in height. There is no green-up requirement for fire maintained ecosystems (open range and open forest).

Collectively, over the 250 year planning horizon projected in the base case, there is an average of about 12 percent of the Integrated Resource Management Zone that is less than 2.5 metres. Though individual areas may at times be closer to the maximum of 33 percent, this shows that the way that the green-up requirement was modelled for the Integrated Resource Management Zone does not limit timber flow. As licensees typically use patch size analyses to mimic natural disturbance patterns, I find that these modelling assumptions reasonably reflect current practice.

I therefore accept that the green-up requirements as specified in the HLPO were appropriately modelled in the base case.

- *visually sensitive areas*

Careful management of scenic areas (e.g., along important travel corridors) is an important IRM objective requiring that visible evidence of harvesting be kept within acceptable limits. The Code and FRPA enable scenic areas to be designated and visual quality objectives (VQOs) to be established to limit the amount of visible disturbance due to forest practices.

Visual landscape inventories are carried out to identify, classify and record those areas of the province that are visually sensitive, and appropriate visual quality classes (VQCs) are recommended. VQC and VQO often use categories like 'preservation,' 'retention,' 'partial retention,' 'modification', or 'maximum modification'—to identify levels of alteration appropriate to particular areas. Guidelines to meet the VQOs include setting a maximum percentage of a specified area or 'viewshed' that is allowed to be harvested

(i.e. level of alteration) at any one time. Guidelines also include setting a 'visually effective green-up' or 'VEG' height at which a stand of reforested timber is perceived by the public to be satisfactorily greened-up.

Scenic areas in the region, including the Cranbrook TSA, were designated in the Kootenay-Boundary Higher Level Plan Order. The district manager established new visual quality objectives in 2003. These objectives have been grandparented under the *Government Actions Regulation* of the FRPA and are required for use in forest stewardship plans.

In the base case it was assumed that the partial cutting analysis units (open forest, open range and the Douglas-fir - yellow pine analysis units) meet visual quality objectives due to the partial cutting and good visual design. Other areas with established VQOs had maximum disturbance limits set. These disturbance limits were developed by Forest Service Region and District staff and are consistent with current management of the visual resource in the TSA. Standard VEG heights were applied to each VQO polygon. An assessment of the timber supply implications shows that VQOs do not constrain the harvest forecast at any time during the planning horizon.

I note that there are provisions within the FRPA that allow VQOs to be relaxed for forest health and/or salvage situations. It is possible that this may become necessary during salvage of timber infested with mountain pine beetle. However, if that comes to pass it will be dealt with in future timber supply analyses. I accept that the timber supply implications of VQOs have been adequately modelled under normal conditions.

- *landscape-level biodiversity*

Old seral stage forest retention is an important aspect of landscape-level biodiversity. In the Cranbrook TSA, landscape units with biodiversity emphasis options and requirements for old and mature forest retention have been legally established and are specified in the Kootenay-Boundary Higher Level Plan Order. There were 240 landscape unit/ biogeoclimatic subzone combinations that made up the units for setting the old and mature forest cover requirements. All of these 240 units have old requirements, but as set in the Kootenay-Boundary Higher Level Plan Order (KBHLPO), only 12 have mature seral requirements. As described in the *Landscape Unit Planning Guide* there are three biodiversity emphasis options that can be applied to a landscape unit:lower, medium or higher. Lower biodiversity emphasis option landscape units have one-third of their old seral targets set in the first rotation, two-thirds in the second rotation and full old seral targets set at the third rotation.

Crown forested stands outside the timber harvesting land base contribute toward forest cover objectives, including old and mature forest retention. It is therefore important that the age-class distributions outside the timber harvesting land base remain consistent with natural processes and not be left to age indefinitely. The base case therefore modelled disturbance annually within each landscape unit and natural disturbance type combination outside the timber harvest land base. The amount of disturbance modelled annually was calculated by dividing the non-timber harvesting land base area within the grouping by the estimated rotation age (i.e. time between natural disturbances).

The base case modelled the old seral requirements from the KBHLPO and provincial policy guidance from the *Landscape Unit Planning Guide*. Initially stands retained to meet old and mature seral requirements were spatially identified to the target levels. In the analysis these old growth management areas were maintained for the first 80-year rotation. After 80 years, the spatially defined old growth management areas and mature seral areas outside of the area covered by the Southern Rocky Mountain Management Plan were released and broader seral objectives (i.e., percentage targets) were applied. Spatially defined old and mature forest areas within the Southern Rocky Mountain Management Plan area were not harvested in the model.

The East Kootenay Environmental Society was concerned with some of the policy decisions that were modelled in the base case regarding requirements for old and mature seral forests. In particular the Society was concerned that seral targets for mature and old forest should not move around the landscape over time. The recommendation of the East Kootenay Environmental Society is that the spatially located old growth management areas and mature management areas should not be released for harvest after the end of the first rotation. However, I note that the base case as modelled is consistent with current policy to minimize timber supply impacts and recognizes that mature and old reserves will inevitably die and be replaced by younger stands, necessitating re-deployment of these areas over the landscape over time in order to maintain old and mature seral requirements.

In the analysis, the full old seral targets were attained for 92 percent of the 136 landscape unit/biogeoclimatic subzone combinations by the end of the third rotation. The remaining eight percent of the units (total of eleven units) did not meet the full old seral target within that timeline. I note that of the eleven units that do not meet their full old seral target within three rotations, ten of them are in fire-maintained ecosystems located in the Rocky Mountain Trench. I am not overly concerned that these open range and open forest stands do not reach their full old seral targets in the analysis as management practices in these areas will tend to result in older stands than were modelled (i.e., age of residual stand following harvest has not been taken into account).

As noted previously in the section‘volume estimates for unmanaged stands’, open forest and open range sites are a priority for restoration. Open forests have an initial cut but are maintained with a lower density overstory. The initial cut for an open range site significantly reduces stand density. However veteran trees are maintained for both open range and open forest sites. The base case modelled the partial cutting of open range and open forest sites by setting the stand age to zero after the initial restoration cut. Since the partial cutting of open forest sites maintains an overstory and veteran trees when available, actual stand ages will in practice be older than were modelled in the base case. It is therefore likely that the model underestimates the contribution of open range and open forest to old seral targets. These areas in the Rocky Mountain Trench also maintain high biodiversity values-one of the ultimate goals of the old and mature targets.

I accept the base case modelling of the landscape level biodiversity requirements as reflecting current management as directed from the KBHLPO, the Southern Rocky Mountain Management Plan and the *Landscape Unit Planning Guide*.

- *recreation*

Recreation is an important use of the forest resource in the Cranbrook TSA given the proximity to a number of provincial and national parks, and ski facilities in the region. Recreation use includes such activities as backcountry and heli-skiing, downhill skiing, snowboarding, rock climbing, fishing and hunting.

In the December 2000 rationale, the chief forester requested that district staff refine information regarding management for the recreation resource for future timber supply reviews. In the previous analysis, the recreation resource was modelled based on defining three recreation zones with associated forest cover constraints. A new system of accounting for recreation management was used for TSR 3. The base case removed from the timber harvesting land base all recreation reserves (classified as Use, Recreation and Enjoyment of the Public orUREP) that were smaller than 100 hectares. District staff inform me that this process serves as a reasonable surrogate to account for recreational issues. There are not yet management plans to show the exact impact on timber supply for recreation features such as lakes and trails. However the complete removal of the smaller recreation reserves is reasonable since operational practices generally avoid smaller recreation areas but include some levels of harvesting in the larger recreation areas.

I accept the modelling of recreation areas in the base case. It reasonably accounts for current management practice associated with recreation sites.

- *ungulate winter range*

The Cranbrook TSA base case modelled the forest cover objectives for management of UWR as defined in the Kootenay Boundary Land Use Plan – Implementation Strategy (KBLUP-IS). These KBLUP-IS ungulate winter ranges were the standard of practice when the data package for TSR 3 was prepared. The KBLUP-IS forest cover objectives for moose, whitetail deer, mule deer and elk are the minimum percentages of area to be maintained above a minimum age. For example for moose in areas experiencing deep snow (biogeoclimatic zones other than Ponderosa Pine or Interior Douglas-fir), a minimum of 50 percent of the Crown forested areas within each landscape unit (other than open range or open forest areas) should be maintained as forest older than 120 years. The cover provided by the older forest allows for less snow accumulation on the ground and easier movement and access to forage by the moose.

In addition to the UWR management from the KBLUP-IS, a portion of the Cranbrook TSA within the Southern Rocky Mountain Management Plan had Predictive Ecosystem Mapping (PEM) done to define the application of forest cover objectives for UWRs. The PEM-based UWRs are a more spatially refined area of ungulate use and represent a more scientifically-based set of forest cover objectives compared to those in the KBLUP-IS.

In February 2005, UWRs in the Cranbrook TSA under FRPA were formally approved with the signing of the *Ungulate Winter Range Order U-4-006*. The approved UWRs are based on the PEM-derived UWRs for the Cranbrook TSA, rather than the KBLUP-IS UWRs. A sensitivity analysis was completed to assess the timber supply impact of the PEM-based UWRs versus the KBLUP-IS UWRs. The PEM-based UWR forest cover objectives apply to about 25 percent less timber harvesting land base than the KBLUP-IS

objectives. In addition, the PEM-based UWR forest cover objectives are significantly less constraining in the higher-elevation ecosystems than those of the KBLUP-IS objectives. The PEM-based UWR resulted in an increase in the timber supply in the mid - and long-term compared to the KBLUP-IS UWR that was modelled in the base case. The PEM-based UWR will likely result in a small decrease in the long-term timber harvest land base from the NDT 4 compared to the KBLUP portions of the UWR. With the signing of the Order for legal establishment, the PEM based UWRs became the standard for the Cranbrook TSA. I note that this methodology for deriving UWR is endorsed by the East Kootenay Environmental Society as a more accurate representation of UWR requirements compared to the previous methodology.

I accept that the sensitivity runs using the PEM-based UWRs are a more accurate portrayal of likely management practices than was modelled in the base case for UWR. The resulting upward pressure on timber supply I discuss in the section-'Reasons for Decision'.

- *caribou habitat*

The Cranbrook TSA includes the Purcell herd of mountain caribou – a red-listed species considered to be a 'species-at-risk'. The Purcell herd is a small declining herd of about 20 animals, relying on primarily higher elevation habitat in the western portion of the Cranbrook TSA. Management of caribou habitat is addressed in the Kootenay-Boundary Higher Level Plan Order (KBHLPO).

The base case timber supply analysis reflects the direction in the KBHLPO. The KBHLPO specifies caribou habitat management guidelines to be applied in mapped caribou habitat zones regarding the minimum area of older forest to be retained and the minimum ages that define older forests.

In response to the federal *Species at Risk Act*, the (then) Ministry of Water, Land and Air Protection has established multi-stakeholder recovery implementation groups. The intent is to propose actions or measures to recover an otherwise declining population.

Since the completion of the data package, new caribou guidelines based on habitat types were finalized and incorporated into the KBHLPO. A sensitivity analysis was conducted to show the impact on timber supply with the implementation of the new caribou guidelines. These new caribou guidelines impact five percent less timber harvesting land base than the previous version. The sensitivity analysis illustrates that the new caribou guidelines could result in a small increase in timber supply compared to the base case projection. The sensitivity analysis also showed that the post-fire uplift AAC could be maintained for an additional decade before declining and mid-term harvest levels would be increased by about two percent.

In recognition of the newly-confirmed caribou guidelines within the KBHLPO, I accept that the base case harvest forecast may be underestimated by a small amount as a result of their implementation. I discuss this further under 'Reasons for Decision'.

- *community and domestic watersheds*

The Kootenay Boundary Land Use Plan directs the management of community and domestic watersheds in the Cranbrook TSA. The main objective of the management is to maintain the water quality, quantity and timing of flow in the watersheds.

The base case used a forest cover requirement that approximates a 30 percent equivalent clearcut area (ECA). The requirement was that a maximum of 30 percent of the Crown forested area within each domestic and community watershed is less than 6 metres in height. This approximation of ECA for the purposes of timber supply modelling, was provided by the BCFS regional hydrologist. The same forest cover requirement was also modelled for the area around the Wigwam River that was identified by the District Manager as having a high value fisheries watershed for bull trout.

The intent of the base case is to model current management as best as possible, as reflected in the equivalent clearcut area (ECA) guidelines from the Kootenay Boundary Land Use Plan designed to protect water quality and quantity.

There were several other constraints modelled in the base case to account for current watershed management. Area was deducted from the timber harvesting land base to account for protection of water intakes as discussed in the section *environmentally sensitive areas*. The Mark Creek Watershed—the main community watershed for the town of Kimberley—has an Integrated Watershed Management Plan that limits harvesting to about 317 hectares over a five-year period. The base case reflected this by limiting harvesting in that watershed to a maximum of 63.4 hectares annually.

I accept this base case representation as adequately accounting for the slower rates of cuts that may be necessary for management of community and domestic watersheds.

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

<u>Other information</u>

- *harvest sequencing*

In timber supply analysis, the order in which eligible stands are assumed to be harvested can affect the projected timber supply in a number of ways. Any difference between the modelling assumptions made and the order in which stands are actually harvested in operational practice must be examined and accounted for.

In the last determination the chief forester requested that harvest sequence rules be developed for use in TSR 3 that approximate current practice better than the relative oldest first harvest rule used in TSR 2. The change to harvest rules for TSR 3 was based on guidance to licensees given out by the District Manager of the Rocky Mountain Forest District.

This guidance was to prioritize harvesting as follows:

1. salvageable dead timber
2. stands affected by forest health agents such as mountain pine beetle
3. stands susceptible to mountain pine beetle
4. fire maintained ecosystem restoration treatments and,
5. available old stands

Within each priority grouping licensees chose to apply an absolute-oldest first harvest rule. District staff advise me that the average harvest age in the Cranbrook TSA is about 110 years. The East Kootenay Environmental Society commented that they disagree with the absolute-oldest first harvest rule that is used within each ranked grouping due to a potential loss of biodiversity values from old-growth forests. I point out that the harvest rules are applied only after the target area for old forests is reserved from harvesting. The new harvest rules mean that the next several years of harvesting will focus on salvaging timber from fire and insects – and restoring open forests and open range stands. District staff tell me that is consistent with current operations.

I accept the harvest rules as modelled in the base case as reasonably reflecting operational practices.

- actual harvest level

The average AAC from 2000 to 2004 was 880 800 cubic metres. The actual annual harvest over this five year period averaged 1 033 067 cubic metres. This comparison shows that the AAC has been met or exceeded (as provided for under five-year cut controls) over this period. However, the five-year average from 2000 to 2004 overlaps two different cut-control periods and cannot be used to assess over or undercutting.

Based on this information, there is no reason for me to believe the AAC cannot be delivered based on past operational practices. I have taken this consideration into account in my determination.

- First Nations considerations

The member bands of the Ktunaxa Nation Council (KNC), formerly the Ktunaxa Kinbasket Tribal Council (KKTC), have asserted traditional territory in the Cranbrook TSA. The St. Mary's, Tobacco Plains, Lower Kootenay, and Akisq'nuk bands from within the Cranbrook TSA are members of the KNC. It is the Forest Service understanding that the Shuswap Band, previously part of the KNC is no longer affiliated with the council.

The KNC is proceeding through the BC Treaty Commission process of land claim negotiations. The KNC is currently at stage four of this six stage process and the entire Cranbrook TSA is located within these land claim areas. The Province has entered into an interim measures agreement with the KNC.

The timber supply analysis data package was sent by the DFAM group to the KNC and all member bands (including the Shuswap Band), along with a letter asking for

information on the nature, location and extent of aboriginal interests, and how those interests may be affected by the Cranbrook TSA AAC determination. No responses were received from the member bands. However, the KNC expressed an interest in meeting with licensees and government to discuss the data package. Two meetings were held in November of 2003 with representatives from the licensees, Forest Service and the KNC to discuss the timber supply analysis process and the data package for the Cranbrook TSA. Offers of follow-up meetings were made by the DFAM group to the KNC. The KNC subsequently sent a letter back to the DFAM group outlining their concerns– requesting that the KNC Accommodation and Consultation Policy be followed and informing government that they are developing a land use plan. Since the land use plan has not been completed it was not available for explicit incorporation in the timber supply analysis. I note that the Province and the Forest Service also have consultation guidelines that can assist in ensuring the First Nations are provided with opportunities to provide information on potentially affected interests. The consultation process for the Cranbrook TSA included opportunities for First Nations to provide information on potentially affected interests; meetings among the First Nations, government and licensee representatives from the Cranbrook TSA; and offers of further meetings. My review of the consultation process indicates that appropriate efforts were made to share information and consult with First Nations in the TSA.

Regional and District Forest Service staff are working with the KNC to develop a forest and range agreement that includes a consultation and accommodation protocol. Additional concerns raised by the KNC included an objection to having to send their comments to the DFAM consultant rather than directly to government, and the need for additional resources to meaningfully participate in the TSR process. The DFAM process has not been changed at this time, but the intent is to periodically review the process with the potential for future changes. While the DFAM licensee group assisted with information sharing regarding the TSR process and the timber supply analysis, all input sent by the KNC was summarized and forwarded to government by the DFAM group. As noted above, government staff also participated in meetings with the KNC. The Forest Service does not have the funds at this time to provide to First Nations to support involvement in consultation.

No site-specific information regarding aboriginal interests and how they might be affected by the AAC determination was provided in the KNC response. Both traditional use mapping and archaeology overview assessment mapping have been completed in the TSA and are being used to help protect cultural resources. A number of archaeological impact assessments have also been completed. Indian reserves within the TSA were excluded from the timber harvesting land base for purposes of timber supply modelling.

The KNC, via the Ktunaxa Kinbasket Development Corporation (KKDC), are actively involved in forestry within the TSA. The KKDC was given a non-replaceable forest licence to salvage wildfire killed wood from the 2003 fires. The KKDC also has a Community Forest Pilot Agreement over the Federal Government Lands in the Dominion Government Coal Blocks. There are also discussions underway with the KNC regarding a forest and range agreement. The forest and range agreements (FRAs) are interim agreements between the Forest Service and eligible First Nations designed to provide for workable accommodation of aboriginal interests that may be impacted by forestry

decisions during the term of the agreement until such time as those interests are resolved through treaty. FRAs offer the First Nation a direct award forest tenure and a share of forestry revenues.

As discussed under my 'Guiding principles for AAC determination', it is inappropriate for me to attempt to speculate on the impacts on timber supply that may result from decisions, such as treaties, that have not yet been made by government. Any decisions on treaty negotiations made in the future by government and First Nations can be reflected in future AAC determinations.

I recognize the need for appropriate consultation with First Nations within the DFAM model where licensees take a leading role in the TSA timber supply analysis. The meetings held with the First Nations, government and licensee representatives from the Cranbrook TSA, plus the offers of further meetings, assures me that ministry staff made appropriate consultation efforts with First Nations in the TSA. No information was made available during the consultation process that indicated the existence of downward or upward pressures on the timber supply as projected in the base case with respect to First Nations' aboriginal interests. Therefore I have not made any related adjustments in my AAC determination. Any conclusions in land claims negotiations will be addressed during future timber supply review processes.

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

Alternative harvest flows

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that short-term harvest levels are compatible with a smooth transition to medium and long-term levels. Timber supplies need to remain sufficiently stable so that there are no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

The base case harvest forecast for the Cranbrook TSA was developed subject to several assumptions. For example, the initial harvest level was set at the current allowable annual cut. This AAC includes the three year annual uplift volume of 70 000 cubic metres (until the end of 2006) to salvage timber damaged by the 2003 wildfires, 33 000 cubic metres from marginal stands outside of the timber harvesting land base, and 838 000 cubic metres of conventional timber. In addition to the base case harvest forecast, there are many possible alternative forecasts with different starting harvest levels and different trade-offs between short- and long-term harvest levels. The analysis report provided two alternative forecasts using the same forest management assumptions as the base case but different initial harvest levels.

The maximum non-declining even-flow alternate harvest flow was found to be 811 000 cubic metres per year. The highest initial harvest level alternative harvest flow was

found to be about 968 000 cubic metres per year. At this level, it is necessary to decrease the harvest level by approximately 100 000 cubic metres per decade for 3 decades until a mid-term harvest level of 680 000 cubic metres is achieved. After decade 9, the managed stands enable an increase to a long-term harvest level of 780 000 cubic metres which is about 80 000 cubic metres lower than the base case.

In making my AAC determination I have considered both of these forecasts, in addition to the base case forecast and the many sensitivity analyses provided in the analysis report, as well as recent and current actual harvest levels in the TSA.

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

This section of the *Forest Act* was repealed in 2003. [2003-31-2 (BC Reg. 401/2003)]

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

Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994 (attached as Appendix 3) and a memorandum dated February 26, 1996 (attached as Appendix 4).

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

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas in order to help maintain harvest levels. To encourage this the Minister suggested consideration of partitioned AACs.

District staff note that no commercial thinning has occurred in the TSA since the last determination and none was assumed in the timber supply analysis. The Cranbrook TSA currently has a partition for harvesting in marginal stands and I have noted the Minister's direction in considering the continuation of this partition.

The Minister's memorandum addressed the effects of visual resource management on timber supply, asking that the constraints applied to timber supply to meet VQOs not be allowed to unreasonably restrict timber supply. As noted in *scenic areas*, the timber supply analysis limited timber supply impacts from visual resource management by assuming the upper limit of alteration for each visual quality class. I am satisfied this approach addresses the objectives expressed by the minister and that the overall

assumptions applied to scenic areas in the base case also reflects government's management objectives for the area as provided by the KBHLP Order.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. Public input was received from the East Kootenay Environment Society, the Rocky Mountain Trench natural Resources Society, and the Ktunaxa Nation Council.

Some of the key considerations raised in these public comments include:

- the Cranbrook TSA is within the traditional territory of the Ktunaxa Nation Council,
- a large and rapidly expanding mountain pine beetle outbreak may have significant impacts on the future forest,
- ecosystem restoration in the Rocky Mountain Trench is a priority for many interests.

I acknowledge these public comments and have accounted for and discussed them in the appropriate sections of this rationale.

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

Unsalvaged losses

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

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

The timber supply analysis assumed annual unsalvaged losses of 77 241 cubic metres. This average was derived from the same information used in TSR 2. The average of unsalvaged loss from mountain pine beetle, one component of the losses, has been updated since the completion of the TSR 3 data package. This new average is based on data from 1978 through until 2004. With the new data the average losses from mountain pine beetle damage declined from 43 661 cubic metres per year as used in TSR 2, to a new average of 40 490 cubic metres per year. I note that on the surface this reduction seems incongruous in the face of the current beetle infestation. However, the decrease in mountain pine beetle average unsalvaged losses is due to an average which now includes several more years of lighter beetle infestation compared to the heavy beetle infestation concentrated in the Flathead area in the early 1980s. It is only the 2004 data that is again approaching these levels.

The TSR 2 data for unsalvaged losses incorrectly included 4048 cubic metres for non-catastrophic in-block blowdown or snowpress. These losses are already accounted for by volume removals associated with residual volume in cutblocks.

Recent information indicates that the unsalvaged losses used in the timber supply analysis were overestimated by 7149 cubic metres per year. This could result in a small increase in timber supply compared to the base case projection, and I have discussed this further in my 'Reasons for Decision'.

Mountain Pine Beetle Infestation

The interior of British Columbia is being severely impacted by the mountain pine beetle infestation which is now encroaching on the Cranbrook TSA. Tracking of the beetle infestation shows an exponential increase in infested area within the Cranbrook TSA that started in 2001. By 2004 this exponential increase in infestation had resulted in over 7500 hectares of timber harvesting land base infested with mountain pine beetle—a level that had not been reached since the beetle infestation of the early 1980s.

District staff advise me that currently 66 percent harvest in the Cranbrook TSA AAC is comprised of lodgepole pine-however with over 27 million cubic metres of mature pine leading stands on the timber harvesting land base, it will take more than 30 years to harvest that volume. Pine-leading stands make up over 45 percent of the TSA's timber harvesting land base. In addition, pine is often found as a minor species in the remaining 55 percent of the area.

There are 38 beetle management units within the Cranbrook TSA. Beetle management units are mapped areas-set up as a planning and reporting unit for operational beetle management. There are four potential beetle management strategies that can be assigned to a beetle management unit-dependent on the stage of the outbreak and the potential for effectiveness of selected treatments. In the Cranbrook TSA, as a result of expanding beetle populations, 12 beetle management units were recently downgraded from a suppression/prevention strategy to a holding strategy. A suppression prevention strategy is where an aggressive strategy of targeting harvest to beetle infested trees can keep a light beetle infestation under control. A holding strategy is where beetle populations are too large to deal with using single tree treatments or where access is poorly developed for harvesting-this is essentially a delaying strategy until adequate resources are available-to, for example, improve access.

A sensitivity analysis was conducted to assess the impact on timber supply if 50 percent of the pine stands older than 60 years were killed at the start of the next decade. Salvage of the killed stands was allowed to continue for 10 years. The volume from any unsalvaged stands existing after 20 years was assumed lost and these stands were regenerated as natural stands. I note that some of the assumptions made in this analysis were likely optimistic. For example it is unlikely that dead pine stands will retain economic value for up to 10 years-licensee staff suggest that under current drought conditions beetle infested trees may only be viable for salvage for 2 to 5 years after attack. In addition, the analysis did not start the pine mortality from the beetle until 10 years in the future-when evidence in the field today shows the mortality starting now. However, the analysis does show one possible scenario due to mountain pine beetle-a 29

percent drop in harvest starting 20 years from now-and a 2.3 percent decrease in long term harvest levels.

Subsequent to the completion of the timber supply analysis data package, both the DFAM group and BCFS district staff have provided me with further information on this evolving infestation. Local surveys of beetle infestation have been compared to the BCFS Research Branch cumulative kill projections for mountain pine beetle. This provincial level projection has proved to be a very useful tool to both help answer and help define questions regarding management of the beetle outbreak. Since it is at the provincial scale-it is reasonable to expect refinement of the projection at a local scale. For the Cranbrook TSA the provincial projection for 2005 beetle kill is 20 percent higher than has been found locally. Rather than an overall decrease in the beetle infestation for the Cranbrook TSA-this likely indicates a delay in the infestation.

A beetle monitoring plan has been developed and included as a component of the Cranbrook TSA forest health strategy. The comprehensive monitoring plan will assist in determining if current harvest levels are adequate to manage beetle populations.

My helicopter flight of the district showed me the dispersion of beetle-kill on a small part of the TSA. The beetle killed trees I saw were in small patches on the ridges. There were also drainages such as the Gold and Joseph drainages that appeared uninfested -likely due to previous single-tree treatments. This is certainly different from the widespread kill seen in the Cariboo and further north, although I understand that some other parts of the Cranbrook TSA not flown, have more significant levels of infestation. I am aware that the green-to-red ratio of infected pine is increasing in this district; for each of those red pine I saw on the ridges, there are likely three or four green infested trees. I am encouraged that recent survey work has shown that the Cranbrook TSA likely has a little more time than previously expected before the full effect of the beetle infestation hits. I am also encouraged that a comprehensive monitoring strategy is being implemented.

It is important that sufficient AAC be available to allow for appropriate levels of harvesting the infected and susceptible pine trees in this TSA and I discuss this further in ‘Reasons for Decision’.

Reasons for Decision

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

The 2004 timber supply analysis base case projection shows a harvest forecast beginning at 908 000 cubic metres per year to allow the completion of the 3 year uplift for salvage of fire impacted wood. This decreases to a post-uplift harvest level of 838 000 cubic metres per year that is maintained for 3 decades and then declines to a mid term harvest of 767 000 cubic metres per year. A long term harvest level of 841 000 cubic metres per year is reached by decade 11. A 30 000 cubic metre partition for harvesting in marginal stands and a 3000 cubic metre partition for harvesting incidental volumes from NDT4 areas are not included in the base case projection as these volumes come from outside of the timber harvesting land base.

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

In my considerations, the following factors were identified as reasons why the timber supply as projected in the base case may have been underestimated:

- *Non-forest and non-productive sites:* 6713 hectares of recent logging were incorrectly labelled as non-productive. The correct inclusion of those hectares in the timber harvesting land base would have likely increased the timber supply by 1.6 percent, or approximately 13 400 cubic metres per year in the long-term.
- *2003 fires:* There have been more hectares of fire-impacted stands salvaged on the land base than were modelled in the base case. I noted that approximately 1000 hectares should have been modelled as managed stands using a short regeneration delay. This could result in a small increase in the long-term timber supply when these stands come ready for harvest earlier as managed stands rather than natural stands. This represents a potential increase of 2500 cubic metres per year in long-term timber supply.
- *Ungulate winter range:* In February 2005 the Deputy Minister of (then) Ministry of Water Land and Air Protection signed the Order for Ungulate Winter Range U-4-006 for the Cranbrook TSA. This newly confirmed winter range is based on predictive ecosystem mapping (PEM), rather than the forest cover objectives for management of ungulate winter range as defined in the Kootenay Boundary Land Use Plan - Implementation Strategy (KBLUP-IS) and modelled in the timber supply analysis. The sensitivity analysis using the PEM-based UWR is therefore a more accurate prediction of UWR management than the scenario modelled in the base case. A sensitivity analysis suggested that the short- to mid-term timber supply depicted in the base case may be underestimated by about 9 percent (25 000 cubic metres) while long-term timber supply may be underestimated by up to 3 percent (about 75 500 cubic metres).
- *Caribou:* Since the completion of the data package, new caribou guidelines based on habitat types were finalized. These new caribou guidelines impact five percent less timber harvesting land base than the caribou management modelled in the base case. I estimated that timber supply was underestimated by 2.1 percent (about 17 600 cubic metres) in the mid-term and 0.8 percent increase (about 6700 cubic metresin the long-term.
- *Unsalvaged losses:* Since the completion of the data package, there has been two improvements to the list of unsalvaged losses as modelled in the timber supply base case. Updated data on unsalvaged losses due to mountain pine beetle, and an elimination of duplication of in-stand windthrow losses, suggested that the base case

was underestimated by about 7150 cubic metres per year throughout the planning horizon.

Though I am not accounting for an underestimation of timber supply estimates compared to using new site index estimates of managed stands-I do note that results of a sensitivity analysis using SIBEC-adjusted managed stand site index suggests that the potential long-term harvest level may be 15 percent greater than indicated by the base case. Other Southern Interior management units have successfully developed predictive ecosystem mapping of sufficient accuracy to support the case for using SIBEC-adjusted managed stand site index, and resulting in increased timber supply.

The following factors have been identified as reasons why the timber supply projected in the base case may have been overestimated:

- *Wildlife tree retention:* There has been substantial in-block retention levels left on harvested blocks in the Cranbrook TSA. Several assumptions were made and applied in the base case that project much lower levels of wildlife tree retention in the future. Rather than accept these significantly lower predicted levels of retention, I prefer to have a stronger correlation of future performance with past performance. Therefore I conclude that timber supply may be overestimated by between 1.7 percent and 5.9 percent (approximately 14 250 to 49 500 cubic metres) throughout the planning horizon.
- *Identified wildlife management strategy:* in consideration of the highly diverse ecosystems of the Cranbrook TSA, I have considered it likely that there will eventually be a need to use the full one percent timber supply impact allowed for implementation of the identified wildlife management strategy. This could result in a 1 percent downward impact on timber supply over the entire planning horizon-potentially 8400 cubic metres.

The above list of factors identifies seven specific areas of under- and over-estimation in the base case projection that must be considered in this determination. My AAC decision regulates the level of timber harvesting in the short-term however it needs to consider timber supply implications throughout the forecast horizon to avoid both excessive changes from decade to decade and significant timber shortages in the future.

In reviewing the potential for under- or over-estimating timber supply in the short-term, I note that the main upward pressure on timber supply is due to the change in guidance associated with ungulate winter range and caribou habitat management. The magnitude of this underestimation in the mid-term is expected to be about 11 percent. A smaller under-estimation of timber supply comes from the new information on unsalvaged losses which suggested that timber supply was underestimated by about 1 percent.

The over-estimations of timber supply come from the uncertainty I have in the wildlife tree retention estimation and the potential for an eventual one percent timber supply impact due to establishment of wildlife habitat areas for identified wildlife. The 1 percent timber supply impact for identified wildlife would apply throughout the planning horizon as would the 1.7 percent over-estimate of the wildlife tree retention.

The upward and downward pressures that I have listed above balance out to a short-term timber supply overestimation of about 1.7 percent (1 percent due to unsalvaged losses minus 2.7 percent due to IWMS and WTR). Mid-term timber supply underestimation is about 9.7 percent (12 percent due to UWR, caribou and unsalvaged losses minus 2.7 percent due to IWMS and WTR). I note that the potential mid-term underestimation in timber supply largely due to UWR could provide significant flexibility for bringing some of this volume forward.

I am also mindful of the potential increases in timber supply that may result from better predictive ecosystem mapping and utilization of SIBEC estimates of site index. This information should reduce existing uncertainties in short- and mid-term timber supply that can be reflected in subsequent AAC determinations. In the meantime, using the best available information, I see no undue short-or mid-term risk to timber supply relative to the base case in my examination of upward and downward pressures.

After carefully examining each of the relevant factors under section 8 of the *Forest Act* for the Cranbrook TSA, the assumptions made in deriving the base case harvest projection in the timber supply analysis, and factors that may have over- or under-estimated timber supply in the short-, mid- and long-term, it is my determination that the current post-fire uplift AAC of 838 000 cubic metres can be increased by 33 000 cubic metres per year to 871 000 cubic metres per year.

Due to increased flexibility in the short-term timber supply given by the newly confirmed current practices surrounding UWR and caribou habitat management, I believe a small increase in AAC is possible and warranted. A portion of this increased AAC, totalling 20 000 cubic metres will be targeted at the NDT4 types in the Rocky Mountain Trench to facilitate ecosystem restoration activities, while the remaining 13 000 cubic metres will be used to account for small scale salvage. The small scale salvage tool to quickly manage small beetle infestations has become increasingly important in this district. I consider it appropriate to officially acknowledge this importance and allow more volume to be used to suppress beetle infestation. The fire uplift of 70 000 cubic metres should be kept in place until January 2007.

I have considered the mountain pine beetle infestation which is intensifying in this management unit. I note that a very large part of the harvesting effort in the Cranbrook TSA is already being used to address the infected and susceptible pine trees. There are uncertainties regarding the timing of the peak in beetle infestation-though it appears the timing will be later than predicted in the provincial projection of mountain pine beetle impacts. Rather than impose a large increase in harvest at this time, I prefer that licensees and BCTS continue their efforts and monitor the impact of the beetle for a potential uplift if necessary at a later date.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties in the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years and that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the TSA by establishing an AAC of 974 000 cubic metres. This AAC includes an increase of 33 000 cubic metres over the previously set AAC. My reasoning for this increase is to allow for ecosystem restoration of fire maintained ecosystems and to facilitate the district small salvage program. I am also maintaining the 33 000 cubic metres per year partitions for marginally economic wood outside of the timber harvesting landbase as described in the timber supply determination of January 1, 2001. Therefore the AAC of 974 000 cubic metres includes:

- 70 000 cubic metres are for the salvage of fire damaged timber;
- 33 000 cubic metres are for harvest of marginally economic wood outside of the timber harvesting land base as determined during TSR 2;
- 33 000 cubic metres increase in AAC since last determination;
- 838 000 cubic metres to come from conventional harvesting within the timber harvesting land base.

This determination is effective November 1, 2005, and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination.

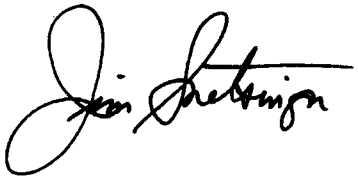
If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

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

- *Site productivity estimates on managed stands*: The sensitivity analysis comparing the inventory derived site indices to potential SIBEC derived site indices for managed stands demonstrates the large potential impact on timber supply of the ecologically based managed stand site indices. Licensees may want to put more work into developing predictive ecosystem mapping of sufficient detail to allow for its use in a SIBEC assessment of managed stand site indices to be considered in the next timber supply review.

- *Fire regenerated stand inventories:* District staff have informed me that operational timber cruise volumes from the fire maintained NDT 4 areas of the Cranbrook TSA, are often only about half that shown in inventory. Though this does not impact my decision on timber supply-due to my confidence in the overall inventory-I do recommend that licensees refine their inventories specific to the NDT 4 areas. These fire maintained areas of the TSA are important ecologically-as confirmed by public review comments received on the data package. Considerable effort is being put into restoration.
- *Reporting on regeneration delays achieved*: A sensitivity analysis shows that a two-year increase of regeneration delay results in the current pre-uplift AAC being maintained for only one decade rather than the three decades as modelled in the base case. Due to the sensitivity of timber supply to regeneration delay, I ask that licensees report back to me at the time of the next timber supply review on their success in meeting an average one-year regeneration delay
- *Regeneration and stocking on unsalvaged 2003 fire areas*: I ask that District staff monitor the regeneration and stocking on unsalvaged 2003 fire areas to both assess areas that may be coming back in a repressed state due to overstocking and areas that have insufficient stocking.
- *Future tildlife tree retention:* The collection of operational information about future wildlife tree retention levels is needed to allow for a better accounting of this factor in future timber supply analysis. I request that licensees report on this prior to the next timber supply review.
- *Disturbance in stands outside the timber harvesting land base:* A more refined methodology for disturbing and regenerating the non-timber harvesting land base will assist in assessing if landscape level biodiversity objectives are being met. I ask that Forest Analysis and Inventory Branch-with the assistance as necessary of staff from other branches, take on this task. This is important as these stands contribute to the achievement of forest cover requirements and thereby affect the timber supply availability of stands within the timber harvesting land base.
- *Cable Ground*: I request that licensees report on their harvesting performance on cable ground.
- *Silvicultural Systems:* I request that licensees monitor their use of various silvicultural systems and the associated growth and yield implications.



Jim Snetsinger
Chief Forester

October 12, 2005

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, c. 157
Consolidated to October 21, 2004, reads as follows:

Allowable annual cut

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

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

(b) each tree farm licence area.

(2) If the minister

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

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (2) or (3),

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

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

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

(3) If

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

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

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

(3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester

(a) by written order may postpone the next determination under subsection (1) to a date that is up to 10 years after the date of the relevant last determination, and

(b) must give written reasons for the postponement.

(3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

(a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and

(b) must give written reasons for setting the earlier date.

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

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

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

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

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

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

(7) The regional manager or the regional manager's designate must determine a an allowable annual cut for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

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

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

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

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

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

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

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

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

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

(c) Repealed [2003-31-02]

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

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

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

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

Purposes and functions of ministry

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

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

Documents attached:

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

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

File: 10100-01

JUL 28 1994

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

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

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

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

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

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

.../2

Province of British Columbia
Minister of Forests
Parliament Buildings
Victoria, British Columbia
V8V 1X4

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

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

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

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

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

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

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

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

.../2

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

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

Andrew Petter
Minister of Forests

Appendix 5: List of Public Submissions Received on Analysis Report and Data Package

First Nations
Ktunaxa Nation Council

Government agencies
Ministry of Water Land and Air Protection

Non-government organization
Rocky Mountain Trench Natural Resources Society
East Kootenay Environmental Society