

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Kalum Timber Supply Area

**Rationale for
Allowable Annual Cut (AAC)
Determination**

Effective January 1, 2000

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Objective of this Document

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

Description of the TSA

The Kalum TSA lies within the Prince Rupert Forest Region and is administered from the Kalum Forest District office in Terrace. The Kalum TSA comprises a total of 539 319 hectares centred on the community of Terrace. The TSA is bordered by the Nass, Kispiox, North Coast and Bulkley TSAs, as well as two Tree Farm Licences (TFL 1 and TFL 41). Adjacent to the TSA are several parks, including the Nisga'a Memorial Lava Bed Provincial Park, the Lakelse Lake Provincial Park, the Exchamsiks River Provincial Park and the Gitnadoix River Recreation Area.

Of the 539 319 hectares in the TSA, 36 213 hectares or approximately 6.7 percent are not managed directly by the British Columbia Forest Service (BCFS), including parks, ecological reserves, private land and various special use permit areas. An additional 305 698 hectares or approximately 57 percent are non-productive areas which include rock, swamp, alpine areas and water bodies. Productive forest land managed by the BCFS totals 197 408 hectares or roughly 37 percent of the total area. Further reductions applied to the productive forest land base result in 98 256 hectares or approximately 50 percent of the productive forest land considered to be available for timber harvesting. Hemlock species dominate in stands on about 76 percent of the area, balsam dominates on 8 percent, spruce on 6 percent and lodgepole pine on 5 percent.

The Kalum TSA has a variety of terrain, ranging from the valley bottoms of the Skeena, Kitimat, Nass, Lakelse and Kitsumkalum rivers through rolling lower slopes and steep upper slopes, to alpine meadows. The climate is transitional and has both coastal and interior influences. The highly productive Coastal Western Hemlock (CWH) zone extends along the valley bottoms and lower slopes of the Kitimat, Skeena and Kitsumkalum rivers and their tributaries. The Mountain Hemlock (MH) zone is adjacent to and upslope of these areas. The Interior Cedar Hemlock (ICH) zone occurs at lower elevations in the Nass valley and similarly along the Skeena River, at the eastern edge of the TSA boundary. The majority of the productive forest land base is in the CWH and the MH zones. The forests in the Kalum TSA contain an abundance of wildlife, ranging from large mammals through invertebrates and birds to extensive fish stocks.

The population of the Kalum TSA is approximately 33 471, with more than seventy-five percent of the residents living in the communities of Terrace and Kitimat. Other small communities within the TSA include Gitlakdamix, Gitwinksihlkw, Kitamaat Village, Kitsumkalum, Kitselas, Rosswood, Thornhill and Usk.

Forestry employment is supported by harvesting and silviculture activity, and the processing of wood products at three area mills: Skeena Cellulose and West Fraser sawmill operations in Terrace, and the Eurocan pulp and paper operation in Kitimat. A cedar pole mill has operated for many years but is now scheduled to be closed. A custom sawing and dry kiln operation and a cedar shake and shingle mill are also located in the Terrace area. Most of the timber harvested in the Kalum TSA is transported to the mills in the area, while a very small portion of timber is shipped to the Vancouver area or to mills in adjacent TSAs.

A number of First Nations traditional lands are within the Kalum TSA. The Nisga'a have negotiated a treaty which covers a portion of the Kalum TSA. The treaty has been ratified by the Nisga'a Nation and the provincial government. It is yet to be ratified by the federal government. The Haisla, Tsimshian, Carrier Sekani and Wet'suwet'en Nations are in the process of treaty negotiations, and the Gitksan are conducting bilateral negotiations with the provincial government.

History of the AAC

In 1995, the area originally known as the Kalum TSA was split into the two separate timber supply areas thereafter known as the Kalum TSA (previously Kalum South) and the Nass TSA (previously Kalum North). The AAC for the Kalum South area from 1986 until 1995 was 480 000 cubic metres. This was reduced during the previous Timber Supply Review by approximately three percent to 464 000 cubic metres, effective January 1996.

The harvestable volume for the area is currently apportioned by the Minister of Forests as follows:

Apportionment	cubic metres/year	percentage
Forest Licences – replaceable (3)	375 476	80.9
Small Business Forest Enterprise Program	75 120	16.2
Timber Sale Licences	2 404	0.5
Forest Service Reserve	4 500	1.0
Woodlot licences	6 500	1.4
Total	464 000	100.0

New AAC determination

Effective January 1, 2000 the new AAC for the Kalum TSA will be 459 684 cubic metres. This volume excludes all volume allocated to woodlot licences, which totals 4 316 cubic metres. This AAC will remain in effect until a new AAC is determined, which must take place within five years of the present determination.

Information sources used in the AAC determination

Information considered in determining the AAC for the Kalum TSA include the following:

- *Kalum Timber Supply Area (TSA) Data Package and Information Report*, BCFS, January 1998;
- *Kalum TSA Analysis Report*, BCFS, March 1999;
- *Kalum TSA Public Discussion Paper*, BCFS, March 1999;
- *Kalum TSA Summary of Public Input on Data Package and TSA Analysis Report*, BCFS, June 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;
- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the BCFS, including the AAC determination meeting held in Terrace, July 7 and 8, 1999;
- *Site index adjustment for old-growth coastal western hemlock stands in the Kalum Forest District*, Nigh, G.D. and B.A. Love. BCFS, Res. Br. Working Paper 27, 1997.
- *Kalum South Timber Supply Analysis*, BCFS, June 1994;
- *Kalum South Socio-Economic Analysis*, BCFS, November 1994;
- *Kalum TSA Rationale for AAC determination*, BCFS, January 1996;
- *Forest Practices Code of British Columbia Act*, consolidated to June 1999;
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, consolidated to June 1999;
- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP;
- *Biodiversity Guidebook*, Province of British Columbia (B.C.), September 1995;
- *Riparian Management Area Guidebook*, B.C., October 1996;
- *Community Watershed Guidebook*, B.C., October 1996; and
- *Nisga'a Final Agreement*, initialled by the Government of Canada, Province of B.C., and the Nisga'a Nation, August 4, 1998.

Role and limitations of the technical information used

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

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

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

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

Statutory framework

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

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires consistency when addressing these changes and associated uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it is necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

- (i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and
- (ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

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

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

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

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

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions. However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent decisions in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Kalum TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. I am aware of the current treaty process involving the Nisga'a Tribal Council and the federal and provincial governments and have discussed this later in the rationale under *Nisga'a Lands*.

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

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine 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 judgment to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

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

The role of the base case

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

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

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

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

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

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

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgment and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgments that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an

AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Base case for the Kalum TSA

The base case harvest forecast incorporates the best available information on current forest management, land base and timber yields for the Kalum TSA. It includes specific assumptions about the TSA which are discussed in detail in the considerations presented later in the document. In overview, they include the following:

- the Code, including provisions for both stand- and landscape-level biodiversity has been represented (the Code was not fully in effect during the previous determination);
- inventory information has been updated, including the shifting of all mapsheets for the TSA from NAD 27 to NAD 83;
- the results of an inventory audit for the Kalum TSA, conducted since the last determination, have been taken into account;
- adjustments have been made to site productivity estimates for hemlock in the CWH biogeoclimatic zone as a result of Old Growth Site Index studies;
- an updated timber supply model (new version of FSSIM) has been used to consider management guidelines and produce timber supply forecasts;
- an updated analytical approach was taken including a more explicit assessment of how non-contributing lands (outside the timber harvesting land base) contribute to achievement of resource objectives such as biodiversity;
- a minimum harvestable age for stands based on minimum merchantability criteria was used, rather than the biological rotation age assumed during the first timber supply review.

With these changes and other appropriate factors incorporated, a 'base case' was generated and submitted for public review. The base case harvest forecast indicates that the harvest can be maintained at the current AAC level of 464 000 cubic metres for another three decades before declining in two steps to 387 000 cubic metres by decade five. The harvest remains at this level for 110 years when it rises to the long-term harvest level of 431 500 cubic metres per year. The base case did not incorporate a reduction to the initial harvest level to reflect volumes allocated to woodlot licences; my consideration of this is discussed later in this rationale under *woodlot licences*.

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 harvesting

- general comments

The total area of the Kalum TSA, as estimated from the 1997 inventory data, is 539 319 hectares. Of this, 197 408 hectares are productive forest land managed by the Ministry of Forests.

As part of the process used to define the timber harvesting land base (i.e. the land base estimated to be economically and biologically available for harvesting), a series of deductions are made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for harvest for economic or ecological reasons. In the Kalum TSA, the deductions result in a timber harvesting land base of 98 256 hectares, or approximately 50 percent of the productive forest land.

My consideration of these deductions is as follows:

- economic and physical operability

Those portions of the TSA which are not physically accessible for harvesting, or which are not feasible to harvest economically, are categorized as inoperable and are excluded when deriving the timber harvesting land base. In the timber supply analysis for the Kalum TSA, 70 897 hectares or 35.9 percent of the productive forest area was determined to be inoperable.

1) operability lines

District staff note that operability lines were delineated some years ago, prior to the emergence of terrain stability mapping which has now been completed for approximately 17.5 percent of the productive forest land in the Kalum TSA. The information available to date was incorporated into the base case reductions for unstable soils, as is discussed in greater detail under *environmentally sensitive areas*. Terrain stability mapping, once it has been completed for the Kalum TSA, also has the potential to provide better information about operability, and can be used to determine if the existing operability lines are appropriate. District staff point to interim results from terrain assessments which indicate that the Fiddler Creek area contains more operable land than assumed in the analysis. The assumptions in the analysis were 17 000 hectares of gross area in the Fiddler landscape unit with only 1 200 hectares within the timber harvesting land base. The terrain assessments tentatively indicate between 2 400 and 4 800

hectares of operable land in that landscape unit, which even after the reductions are applied for riparian and other constraints would indicate a significant increase to the timber harvesting land base. As discussed later in this rationale under *environmentally sensitive areas*, a portion of this disparity might be attributable to the reductions applied in the analysis to account for unstable soils, but it is likely that a portion of it can be attributed to increased operability as well.

I have considered the information presented regarding the operability data, and in particular that related to the Fiddler Creek area. Given that terrain stability mapping is not yet complete for the Kalum TSA, it is premature to speculate about the impact this new information will have on the size of the operable land base. I accept that there is potentially an upward pressure on the area available in the Fiddler Creek landscape unit, which will be discussed later in this rationale under *local and resource use plans*. For the rest of the productive forest land, I accept that the operability data used in the analysis is the best available information and suitable for the purposes of this determination. I encourage district staff to complete the terrain stability assessments for the remainder of the TSA prior to the next analysis, such that the new information can be used to produce a better estimate of the operable land base. When the terrain stability mapping is completed, operability lines should be reviewed and where appropriate revised in relation to the terrain stability mapping.

2) *helicopter operability*

District staff also note that the operability data was determined using criteria for ground based harvesting systems which do not include helicopter logging. A small amount of helicopter logging has occurred in the Kalum TSA in the last few years.

The previous determination included the following instruction: '*Encourage and monitor industry performance in non-conventional and inoperable areas*'. District staff have observed that forest development plans continue to propose some skyline operations (in operable areas) and helicopter operations (in areas classified as inoperable areas). The viability of helicopter logging is dependent on many criteria (largely economic) which include a minimum stand volume of 700 cubic metres per hectare. In the timber supply analysis, this criterion was used to locate suitable stands for helicopter logging; 4 450 hectares of inoperable land was located which could be suitable and potentially added to the timber harvesting land base. Sensitivity analysis shows that including this area could increase mid-term timber supply by 15.6 percent and long-term could be increased by 3.7 percent over the base case forecast.

District staff note that, in addition to the stand volume criterion used to define helicopter-operable areas for the sensitivity analysis, suitability of stands is dependent on other factors such as their location in the TSA (i.e., whether the stands are scattered or proximal to one another) and whether a specific minimum seasonal volume is attainable (40 000 cubic metres per season). Public comment from Skeena Cellulose further asserts that sawlog content and maximum ferrying distance are critical considerations in the evaluation of suitable areas.

I have considered this information and conclude that there is too much uncertainty to include the 4 450 hectares of potential area in the timber harvesting land base at this time. The extent to which these currently inoperable stands might contribute over time requires further review in

order to better quantify the information. Since the sensitivity analysis shows a potential for mid-term and long-term timber supply to be significantly more stable than presented in the base case, I recommend that BCFS district staff continue to monitor this factor to determine if the operability information could be further refined to include areas suitable for helicopter logging. It may be appropriate to quantify the economic criteria and undertake some field and map based review to locate the stands and evaluate their suitability. In any event, as there is no impact to timber supply in the short-term and as short-term supply is relatively stable, there is low risk associated with taking the time to analyze the land base to find these stands and overlay economic criteria to evaluate their suitability.

- environmentally sensitive areas

An environmentally sensitive area (ESA) is an area identified during a forest inventory that is sensitive to disturbance and/or is significantly valuable for fisheries, wildlife, water and recreation resources. The ESA ratings for the Kalum TSA were established in 1976 and revised in 1989. ESA mapping includes: soils (Es), recreation (Er), regeneration (Ep - areas where regeneration will likely be difficult), avalanche (Ea), wildlife (Ew), and watersheds (Eh). ESA information is used to identify land to exclude from the timber harvesting land base where more specific or detailed information is not available about a particular forest resource.

In the base case for the analysis, reduction factors were applied for soil, recreation, regeneration and avalanche ESAs. There were no reductions applied to wildlife ESA areas as the areas were small and not representative of the range of wildlife issues. The values for wildlife were instead addressed in the analysis through riparian management areas and through the constraints for landscape level and stand level biodiversity. Likewise, there were no reductions applied for watersheds as the majority of land is accounted for under the Deep Creek community watershed. Riparian areas, stand and landscape level biodiversity, and community watersheds are discussed in more detail later in the rationale.

In the analysis, a percentage of those forest polygons with environmental sensitivity ratings of high (1) or moderate (2) was assumed to be unavailable for timber harvesting. These values were: soils - 50 percent for Es1 and 30 percent for Es2; recreation - 100 percent for Er1; regeneration - 100 percent for Ep1 and 50 percent for Ep2; avalanche - 100 percent for Ea1. A total of 4 836 hectares was removed from the productive forest land base to account for environmentally sensitive areas.

Terrain stability mapping is a process of identifying the type and distribution of surface materials and then interpreting the stability of these materials for resource management purposes. Approximately 17.5 percent of the productive forest in the Kalum TSA has been mapped for terrain stability. The terrain stability mapping provides a more accurate assessment than the ESA ratings but has not been completed for the entire TSA. In order to obtain the best information available, district staff compared the available terrain mapping within the operable land base against the Es1 and Es2 values in the inventory data. The comparison showed that over 80 percent of Es1 areas were not found to be terrain class V, and 12 percent of Es2 areas were not found to be terrain class IV. The results indicate that the ESA inventory data

significantly overestimates unstable (class V) and potentially unstable (class IV) areas in the operable land base for the area studied.

District staff confirmed that these results were consistent with operational findings. For the purposes of the analysis, the Es1 netdown factor was reduced to 50 percent from the more typical 100 percent in an attempt to account for the incorrect classification. The value of 50 percent was conservative (given that 80 percent of areas classified as Es1 were not found in the mapping to be unstable) but determined to be appropriate, given that terrain stability mapping has not been completed for the entire TSA.

As discussed *under economic and physical operability*, one area of the TSA where it has been noted that there is a potential underestimation of the timber harvesting land base assumed in the base case is the Fiddler Creek area. It is possible that this underestimation can be partly attributed to the reduction factors applied for Es1 areas; the deduction of 50 percent of the Es1 classified areas, instead of the 20 percent indicated by the preliminary results of the terrain stability assessments, might cause more of the operable land base in this area to be removed for unstable soils than should be the case.

I acknowledge that there is some uncertainty associated with the netdown factors applied to Es1 areas, but I note that the methodology is sensible and is a reasonable attempt to correlate Es values to terrain stability mapping. While at the same time recognizing that the majority of the TSA has not yet been terrain mapped and may not follow the pattern noted to date, I am satisfied that this factor has been appropriately modelled for this determination. It is apparent that the terrain stability results are interim, and therefore it would be inappropriate to apply a smaller reduction to the area under the Fiddler Creek landscape unit at this time. I recommend that the district continue to examine industry performance in Es1 areas over time to confirm if the assumptions in the base case continue to reflect operational practices. Should the terrain stability mapping be completed for the entire TSA before the next determination, it would be appropriate to include the new information in the next analysis.

With respect to the reductions applied to account for recreation, regeneration and avalanches using the ESA mapping, the information is considered by district staff to be the best available at the current time. I therefore accept that the assumptions used in the base case are a reasonable reflection of current practices and are appropriate for this determination.

- problem forest types

Problem forest types are typically defined as stands which are physically operable and exceed low site criteria and yet are not currently utilized or have marginal merchantability. These types are either wholly or partially excluded from the timber harvesting land base for the analysis.

In the analysis for the Kalum TSA, most areas with low site indices were removed as part of the problem forest type exclusions. The remainder of such areas were removed as discussed later in the rationale under *sites with low timber growing potential*.

1) *deciduous stands*

In the Kalum TSA, there is no demonstrated market currently for birch, alder or aspen, species which constitute a minor component of the forest in the area. In this analysis, all stands dominated by these three deciduous species were excluded from the timber harvesting land base, for a total of 4 041 hectares or 2 percent of the productive forest land base. In addition, all birch, alder and aspen volume in predominately coniferous stands was excluded.

Cottonwood does have a fluctuating but ongoing market and harvesting history within the TSA. Therefore, stands with cottonwood as a leading species and cottonwood volume in other stands were not excluded from the analysis. Approximately 4 000 hectares or 4 percent of the timber harvesting land base is occupied by cottonwood leading stands.

Although there is some uncertainty around whether it is appropriate to include all of cottonwood leading stands in the timber harvesting land base, these stands contribute only a small amount towards timber supply and therefore their inclusion does not introduce a great deal of risk to the assumptions in the base case. I am satisfied that this was modelled appropriately in the analysis for the purposes of this determination. Nevertheless, since my determination incorporates an assumption that cottonwood will contribute to timber supply, cottonwood types must be utilized if they are to continue to contribute to the timber harvesting land base for future determinations.

2) *unmerchantable stands*

For all species except for alder, birch and aspen which were wholly excluded as outlined above, specific merchantability criteria were derived. These criteria define stand characteristics which make the stands uneconomical to harvest. A total of 7 090 hectares or 3.6 percent of the productive forest land base were excluded to account for unmerchantable stands. The following stand types were 100 percent excluded in the analysis:

- all stands which were greater than 100 years of age that had not achieved a stand height of at least 22 metres;
- all stands greater than 60 years of age which had crown closure of less than 25 percent;
- all stands greater than 100 years of age which had a stand volume of less than 250 cubic metres per hectare.

Public comment from Bell Pole indicated that they believed the volume limits to be inappropriate, given that some harvestable stands achieve volumes of 250 cubic metres per hectare after age 100. District experience indicates that such marginal stands are not targetted for harvesting to any extent that warrants an expectation of consistent contribution to timber supply. BCFS staff therefore believe it appropriate to exclude these stands for the purposes of the analysis.

During the previous AAC determination I instructed district staff to '*encourage and monitor industry performance in poor quality sites and height class 3 stands*', as the modelling assumptions for the analysis at that time included the majority of these stands in the timber harvesting land base. At that time, I indicated that harvesting performance in these stands would

be reviewed at the time of this determination, and that a partition would be considered for these stands if warranted.

BCFS district staff have monitored performance and have found that height class 3 stands are only harvested as part of the timber profile when they occur as additional volume within a larger harvest unit. The modelling assumptions for the 1999 analysis included derived merchantability criteria which incorporated data from licensees as well as the district observations and attempted to model current harvest practices as closely as possible. BCFS staff believe that this analysis, as compared to the previous one, more accurately reflects current practices and does not assume excessive contribution from stands which are not targeted for harvest.

I have reviewed the information provided by the district on problem forest types. I conclude that the limits applied for merchantability are likely reflective of current operational practices and do not believe that there are risks posed to timber supply as a result of the assumptions used in the analysis. I encourage BCFS district staff to continue to monitor trends in this regard, so that the future timber supply analyses can incorporate the most current information for these forest types. Finally, I will state that a partition is no longer necessary to consider for these forest types, although I will not rule out the possibility of considering one at a future time should it be necessary to encourage harvesting in these areas in order to ensure continuous timber supply in the Kalum TSA.

- sites with low timber growing potential

In order to determine the timber harvesting land base, sites with low productivity as a result of inherent site factors such as nutrient availability, exposure, excessive moisture, or that are not fully occupied by commercial tree species are removed from the productive forest land base. In the analysis for the Kalum TSA, all sites with a mean annual increment (MAI) of less than 1 cubic metre per hectare per year were determined to be low sites. This MAI value was converted to a site index value for each species, and then the site index criterion was used to identify and remove these stands. Site index is expressed as metres in height at age 50 and the minimum criterion varied by species and for coastal versus interior sites. There was a total of 808 hectares or 0.4 percent removed from the productive forest land base. As mentioned under *problem forest types*, this removal was in addition to those sites removed during the deductions for unmerchantable and deciduous stands.

Public comment from Skeena Cellulose indicates that they believe the site index limits to be too low, i.e., the site index threshold below which harvesting does not occur is actually higher than that used in the analysis. This concern seems legitimate, given that the translation of this minimum site index criterion would indicate, for example, that harvesting would occur in sites with site index values of 3 metres or 5 metres for spruce, and managing such stands for timber production in this TSA should be inappropriate. However, the following points should clarify and alleviate the concern:

- the exclusion of the 808 hectares of sites with low timber growing potential using these site index limits was merely one reduction applied during the analysis. The reduction for

problem forest types was also applied to the productive forest land. As discussed previously under problem forest types, criteria for minimum stand height, crown closure and volume were used to remove 7 090 hectares of unmerchantable forest types. The problem forest types exclusion was applied before that for low timber growing potential, and therefore the majority of sites with low timber growing potential were removed at that stage. The problem forest types exclusion effectively removed most stands between the low site productivity limits and a site index value of 9 metres, which based on BCFS district staff experience could be considered a more reasonable threshold.

- following the various reductions applied to the productive forest land base, there is only a very small proportion of marginal stands remaining. Less than 1 percent of the timber harvesting land base is occupied by sites which fall between the minimum site index criterion used in the analysis, and a site index value of 9 metres. Therefore, the impact on the timber harvesting land base is very small, even if the minimum height and volume criteria were not applied and the modelling had considered all sites with such marginal site indexes as harvestable.

I have considered the information as presented and conclude that, although there is some uncertainty about actual minimum site index threshold, the reductions applied in the analysis for sites with low timber growing potential do not introduce an unacceptable level of risk into this determination. The uncertainty in the size of the timber harvesting land base with respect to this factor is represented by only a very small area of much less than average productivity and as such its contribution to timber supply is insignificant. Having stated this, I recommend that the minimum site index thresholds used to exclude low productivity sites be reviewed prior to the next analysis.

- roads, trails and landings

In the analysis, a percentage of the productive forest considered available for harvesting is removed to account for the loss of productive forest land as a result of the construction of roads, trails and landings. Separate estimates are made for existing roads, trails and landings, and future roads, trails and landings, to reflect both potential changes in road building practices and road network requirements over time, and the access that the existing network of roads will provide for future harvesting operations. Estimates account for the area that is permanently removed from the timber harvesting land base and are applied as percentages of area to be excluded from specified age classes.

The reduction factors for the analysis were revised following the release of the data package and information report, in response to public input, including that from Skeena Cellulose, Bell Pole and Ministry of Environment, Lands and Parks all of whom contended that the values in the data package (8.8 percent) were too high. The new values were derived by district staff using a revised methodology based on data and analysis provided by Skeena Cellulose, as well as other considerations.

A reduction of 7.5 percent was applied to all stands less than or equal to thirty-five years of age to account for all existing roads, trails and landings. The application of this reduction resulted in 3 815 hectares being removed from the productive forest land base.

A reduction of 6.5 percent was applied to all stands greater than thirty-five years of age to account for future roads, trails and landings. This factor was applied after stands were harvested for the first time in the simulation model, and resulted in 4 076 hectares of the timber harvesting land base becoming non-productive over time.

I have reviewed the methodology used for both existing and future road loss estimates and believe the assumptions applied in the analysis to be reasonable and reflective of current practice.

- timber licence reversions

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

There are currently 3 312 hectares of TL areas in the Kalum TSA. The base case assumed that 2 406 hectares of this area would be harvested within the next 5 years and revert to the timber harvesting land base within the next 10 years.

The remaining 906 hectares are from a TL within the Humphrey's landscape unit which will be combined with a 177 hectare parcel of Crown land and added to TFL 41. This transfer is in compensation for a portion of TFL 41 which was surrendered to the Crown to accommodate for the expansion of Kitamaat Village. In the analysis, the 906 hectares were removed from the productive forest land base of the TSA.

District staff note that the 177 hectare portion of Crown land described above will in fact be removed from the Kalum TSA, and this was inadvertently not factored into the analysis. However, I note that uncertainties of this scale are small with respect to the level of precision of the inventory, and I will therefore view the impact of the inadvertent inclusion of the 177 hectares as negligible, and will make no adjustments. Once it has been actually removed from the TSA, it can be appropriately reflected in a future analysis.

I am confident that the reversion schedule as modelled in the base case is appropriate and that the assumptions are appropriate. Even if the reversion schedule were to differ slightly from that expected, the land base involved is relatively small and in any event only long-term harvest levels would be affected. Therefore, these assumptions provide negligible risk to the short-term timber supply.

- *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 initially issued, the required volumes are first allocated from an appropriate apportionment under the AAC for the TSA which geographically contains the woodlot. 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.

There are four existing woodlot licences in the Kalum TSA which comprise 1 816 hectares of land and have associated AACs of approximately 4 316 cubic metres.

In the timber supply analysis these woodlot licence allocations were only partly accounted for, in that a reduction of approximately 748 hectares was applied to the gross TSA area. A further 1 068 hectares held in woodlots were not removed from the total area. No volume attributable to the issued woodlot AAC was excluded for the base case.

I have reviewed the information on woodlots as presented and am satisfied that the following will adequately address the issue:

- in order to account fully for the area allocated to woodlot licences, the timber harvesting land base assumed in the analysis must be further reduced by 1 068 hectares;
- in order to fully account for the allowable harvest attributable to woodlot licences, the base case initial harvest level must be reduced by 4 316 cubic metres per year.

The removal of the woodlot AAC volume from the base case harvest level appears to be a downward pressure on the timber supply but in reality is an administrative detail which does not actually affect the available volume outside of woodlots with respect to the current AAC.

In my determination, as noted later in this rationale under 'Reasons for Decision', I have accounted for a further reduction of 1 068 hectares to the timber harvesting land base, and for a volume deduction of 4 316 cubic metres to fully account for allocated woodlot licences in the Kalum TSA.

- *protected areas*

Government released the document *A Protected Areas Strategy for British Columbia* in 1993, which describes the policies and process to protect 12 percent of the province. The strategy has two goals: representativeness (Goal 1) which protects viable examples of the natural diversity of the province, representative of the major terrestrial, marine and freshwater ecosystems, the characteristic habitats, hydrology and landforms, and the characteristic backcountry recreational and cultural heritage values of each ecosection, and; special features (Goal 2) which protect the special natural, cultural heritage and recreational features of the province, including rare and endangered species and cultural habitats, outstanding or unique

botanical, zoological, geological, and palaeontological features, outstanding or fragile cultural heritage features, and outstanding outdoor recreational features such as trails.

The Protected Area Strategy for the Kalum TSA is being addressed through the Kalum Land and Resource Management Planning (LRMP) table. There are thirteen protected area candidates under consideration by the table; one is a Goal 1 area and twelve are Goal 2 areas. None of these areas has been established by Order in Council (OIC) and similarly there have been no other protected areas established by OIC since the previous timber supply analysis was undertaken.

The Goal 1 area under consideration is the Gitnadoix Recreation Area, which includes 57 626 hectares of Crown land. District staff advise me that this area is expected to be officially established as a protected area through the Kalum LRMP process. It was not included in the timber harvesting land base for the timber supply analysis; it is currently excluded from the Kalum TSA as it is classified under several ownership classes including provincial park equivalent or reserve. The twelve other protected area candidates, which are Goal 2 areas and total 2 306 hectares, were included in the timber harvesting land base for the purposes of the analysis.

District staff note that four of the twelve Goal 2 protected area candidates are not considered to be likely candidates for logging, as they are comprised of marshlands or non-productive forest. Seven of the remaining Goal 2 areas are either Cabinet approved study areas under the Protected Areas Strategy with interim management guidelines that prohibit logging or are constrained by riparian or other requirements. District staff indicate that pending the results from the LRMP table, they are currently implementing a log around strategy for one Goal 2 area of approximately 131 hectares near Nalbeelah Creek, which contains productive forest land and would otherwise be considered as suitable to harvest.

I have reviewed the assumptions in the analysis and am satisfied that they were appropriate. It is appropriate to exclude the Gitnadoix Recreation Area as it is not currently considered part of the Kalum TSA, and I note that this was also the case for the previous timber supply analysis. The twelve Goal 2 areas appropriately do contribute to the timber harvesting land base (to the extent that they contain merchantable timber and operable terrain) given that they are currently not protected areas. It is inappropriate to speculate which of these areas may or may not be approved in the future. I anticipate that any future downward pressure on the timber supply is likely to be small considering the relatively small size of the areas involved, the fact that only a portion of these areas is actually productive and operable forest land, and the consideration that these areas are subject to other constraints such as those for riparian protection within the analysis. If any of these areas are ultimately approved and it is appropriate to remove them from the timber harvesting land base, it will be reflected in a future determination.

Existing forest inventory

The inventory used for the timber supply analysis is based on a forest inventory completed in 1989 for all of the Kalum TSA except for the Kitimat Valley portion, which dates back to 1976. These inventories were updated to 1997 to account for growth, disturbances such as

harvesting and fire, and silviculture treatments. All mapsheets in the Kalum TSA have been shifted from NAD 27 to NAD 83 since the last timber supply analysis.

To address uncertainties in the last AAC determination, I directed BCFS staff to complete an inventory audit prior to the next analysis, which has been done. The audit reviewed:

- the mature component of the inventory, assessing differences between the existing inventory's estimate of mean mature volume per hectare for the TSA and a new estimate obtained from the audit samples;
- the immature component, testing site index assignment; and
- the non-forest component, testing the non-forest classification assignment.

The results of the audit for the mature component of the inventory suggest that the inventory volumes are acceptable. Subsequent analysis of the data also showed a similar level of acceptability for the mature volume inventory estimates in the operable forest land base. For the immature component of the inventory, the audit results suggest that the heights and ages, and hence the assignment of site indices for young stands may not be accurate. The audit assessment also found the non-forest classification in the Kalum TSA did not meet provincial standards due to overestimation of alpine type areas. However, district staff note that this inaccuracy in non-forest classification does not impact on the timber harvesting land base used for the analysis, as although the classification of the non-forest area appears inaccurate, the area is still non-forest, and would be excluded from the timber harvesting land base. I have discussed some aspects of the audit further in the rationale under *volume estimates for existing stands* and *regenerated stand volumes and site productivity estimates*.

The Vegetation Resources Inventory is an improved inventory process for assessing the quantity and quality of BC's timber and other vegetation resources. The project is ongoing in the Kitimat Valley portion of the TSA and is expected to provide much more detailed and updated information for the forested land base, including forest openings. It is anticipated that it will be completed prior to the next timber supply analysis, at which time any improved information can be factored into a future determination.

Comparison of the gross TSA area used in the previous timber supply analysis and that used in this timber supply analysis showed a reduction of 10 443 hectares. This reduction is consistent with other changes provincially as a result of the NAD shift and I am confident that it can largely be attributed to the more accurate information we have for this analysis. Any remaining variation not attributable to the NAD shift can be attributed to the area revisions and boundary changes resulting from the splitting of the Nass and Kalum TSAs which was conducted following the previous timber supply analysis.

I have considered the information regarding current forest inventory and believe that the assumptions used in the timber supply analysis reflect the best information available.

- age-class structure

Age class structure data is extracted from the inventory file and used in the analysis to project forest stand conditions over time. Assumptions about age classes can impact timber supply at any point in the analysis horizon since they form the basis against which minimum harvestable ages, green-up requirements and other forest cover constraints are applied.

The age class structure in the Kalum TSA has not changed significantly since the previous timber supply analysis. Approximately 42 percent of the timber harvesting land base within the TSA is represented in age classes 1-3 (ages 0 to 60 years) and a further 45 percent is in age classes 7, 8 and 9 (ages 120 years or more). Approximately 32 percent of the stands are older than 250 years of age. Almost 46 percent of stands are at or above their minimum harvestable age as defined for the analysis.

Timber harvesting and silviculture activity within the Kalum TSA has a history of approximately five decades, and this is reflected in the age class structure present in the TSA. I have considered the information as presented and do not have any concerns regarding the assumptions made in the analysis.

- species profile

The species structure in the Kalum TSA has remained constant since the previous timber supply analysis. Hemlock species dominate in stands on about 76 percent of the timber harvesting land base, with balsam dominating in 8 percent, spruce in 6 percent, lodgepole pine in 5 percent, cottonwood in 4 and cedar in 1 percent. After harvest, most stands are expected to regenerate through planting to hemlock or pine, depending on site conditions. Natural regeneration of hemlock, balsam and deciduous species is also expected to contribute to stand composition in the future.

I have reviewed the species profile information and am confident that the timber supply analysis has adequately addressed current field conditions with respect to species composition.

- volume estimates for existing stands

Two growth and yield models were used to estimate timber volumes for the Kalum TSA analysis. The Table Interpolation Program for Stand Yields (TIPSY), developed by Research Branch of the Ministry of Forests was used to estimate yields for coniferous managed stands. Managed stand volume estimates will be discussed in the next section of this rationale.

Existing natural stand volumes were estimated and projected using forest inventory attributes and the Variable Density Yield Prediction (VDYP) model (version 6.4a), which was developed by Resources Inventory Branch of the Ministry of Forests. This model was used for estimating volumes for older existing coniferous stands (in which species and stocking have not been managed) as well as existing natural and managed deciduous stands. Once a coniferous stand was harvested for the first time in the analysis, future growth and yield was projected using estimates from managed stand yield tables.

During the previous timber supply analysis, district staff expressed concern that the VDYP model used in the timber supply analysis (and for assigning volumes to the inventory file) overestimated existing stand volumes. Overestimation of existing stand volumes has the potential to significantly impact short- and mid-term timber supply. At that time, I recommended an audit to provide an indication of the accuracy of the inventory volumes.

The audit has since been completed. It reviewed the mature component of the inventory, assessing differences between the existing inventory's estimate of mean mature volume per hectare for the TSA (as determined using VDYP) and a new ground sampled estimate obtained from the audit samples. The audit results were post-stratified into operable and inoperable samples, since for the purposes of timber supply the operable forested area is most applicable. For the thirty-one audit samples located within the operable forest area, the mean audit volume was 545 cubic metres per hectare, as compared to a mean inventory volume of 554 cubic metres per hectare. These values are net merchantable volumes per hectare, defined as stem volume inside bark of living trees, excluding a top down to a 10-cm diameter inside bark, a 30 cm high stump, and decay (as estimated from Ministry loss factors). They do not include reductions for waste and breakage. The small difference between the two values is not statistically significant. I am satisfied that the results of the audit confirm the validity of the inventory volume estimates, from which the VDYP yield model derives its values used in the timber supply analysis.

Based on discussions leading up to this determination I am aware that district staff still have some discomfort with the inventory volume estimates, despite the results of the audit. I am aware of the district concern but I cannot validate it. I am confident that the inventory data is the best information available from which to determine volume estimates and, given the validation provided by the audit, there is low risk associated with projecting timber supply based on these values. I have requested that the Timber Supply Branch analyst work with district staff to perform some disaggregation of the audit samples to attempt to isolate the source of the district concern; the results of this will be discussed under 'Reasons for Decision'. Beyond that, I can only request that Resources Inventory Branch continue to work with the district staff to isolate the source of the concern at some future date. For the purposes of this determination, I accept that the information as used in the analysis represents the best information available.

Expected rate of growth

- regenerated stand volumes and site productivity estimates

Inventory data include estimates of site productivity for each forest stand, expressed in terms of a site index. Timber supply analysis depends heavily on values for site index as it is used to estimate years to green-up, size of the timber harvesting land base, minimum harvestable age, yield of regenerated stands, and growth of existing stands. The impact of each of these factors on timber supply is discussed in detail in various sections within this rationale.

The site index is based on the stand's height as a function of its age and is species specific. 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 Kalum TSA, approximately 75 percent of the sites in the timber harvesting land base are currently classified as having good or medium site productivity, which is expressed as having site index of greater than or equal to 13 metres at age 50.

To estimate regenerated stand volumes for managed stands, the BCFS uses the Table Interpolation Program for Stand Yields (TIPSY). Managed stands in the Kalum TSA were defined to include thirty percent of stands harvested between 31 and 40 years ago, seventy percent of stands harvested between 21 and 30 years ago, all stands harvested over the last 20 years and all those that will be harvested in the future.

TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases and significant brush competition in the stand. Operational Adjustment Factors (OAFs) are applied to account for losses of timber volume due to stand openings for unproductive areas like small swamps and rock outcrops (OAF1), as well as for age-dependent factors such as pests, disease, decay, waste and breakage (OAF2). In the BCFS analysis, the provincial standard reductions of 15 percent for OAF1 and 5 percent for OAF2 were applied.

A recent paired plot study in the Kalum TSA investigated the reliability of estimated site indices from old growth hemlock stands. This study found that site index estimates for hemlock-leading stands greater than 140 years of age within the CWH biogeoclimatic zone (measured site index between 8 and 18 metres) were 10 metres lower than those for adjacent managed stands on the same ecological sites. The findings were included in the base case for the Kalum TSA to better reflect the productivity of regenerated stands on the appropriate sites. In the base case, the site index adjustment was applied after the old growth stands (older than 140 years) in the CWH biogeoclimatic zone were harvested. The adjustment applied to approximately 11 468 hectares or 11.7 percent of the timber harvesting land base. While the Kalum paired-plot study involved extensive field sampling and data assessment, the results are a reflection of potential site productivity, and some uncertainty still remains about the degree to which stands will achieve this potential in practice.

Two other site index studies point to underestimations of site productivity. A provincial veteran study had results which indicate that site index in other old growth stands (i.e. not just those within the CWH zone) may also be underestimated. To evaluate the impact of the results of this study on the base case harvest forecast, sensitivity analyses were done to determine the potential impact on timber supply. The analysis showed that, if the remaining stands greater than 140 years of age in the Kalum TSA were eligible for a site index adjustment, both the mid-term and long-term harvest forecast would increase substantially. Mid-term harvest levels would be approximately 423 000 cubic metres, which is 9.3 percent greater than the base case, while

long-term harvest would be approximately 489 000 cubic metres or 13.3 percent greater than the base case.

Further, an inventory audit done in the Kalum TSA found inventory inaccuracies may lead to underestimation of site index of stands aged 20 to 60 years by up to 3 metres. A sensitivity analysis was also conducted to determine the impact of increasing the site index for these stands by 3 metres. It showed that the mid-term level would be 435 500 cubic metres or 12.5 percent higher than in the base case and the long-term level would be 450 500 cubic metres or 4.4 percent higher than in the base case. Given the small sample of immature stands in the audit, I can view the indicated site index error only as a general indication of a trend, rather than as a precise result.

There were no sensitivity analyses done which evaluated the effect of applying the results of these two studies simultaneously, but I can only assume that the combined effect would most likely be a greater increase on both mid- and long-term timber supply than when the adjustments are applied separately.

I am satisfied that a greater degree of certainty surrounds the applicability of the Kalum paired-plot site index adjustments than those of the veteran study and audit. The veteran study includes data from outside the Kalum TSA, and inventory audit involved a small sample of immature stands. Based on their experience in the area, Kalum Forest District staff are confident that second growth site productivity is currently underestimated, but they cannot confirm the magnitude of that underestimation. As the oldest second growth stands in the Kalum TSA are approximately 45 years of age, it is difficult to know with certainty by how much the values should be adjusted.

Declining funding levels for intensive silviculture work contribute to the uncertainty around whether future management practices will enable the realization of full site productivity. The Nisga'a Tribal Council contended that it was inappropriate to include the site index adjustments for the hemlock sites in the base case for the analysis. They point to the paragraph on page 12 of the report, *Site Index Adjustment for Old-Growth Coastal Western Hemlock Stands in the Kalum Forest District*, which states that 'the site index adjustments apply only in particular areas [and] under management regimes that largely eliminate factors that hinder tree growth, such as competition from pests and other [vegetation]'.

While I acknowledge the uncertainty related to the ultimate performance of stands relative to their potential, the paired-plot study clearly demonstrated that actual stands are growing at a much faster rate than would be expected based on the standing old growth inventory. Given existing silvicultural requirements, it is reasonable to expect that most stands will be fully stocked, and managed to minimize losses to pests and competing vegetation. Therefore, while the exact productivity increase is not certain, I believe it is highly reasonable to expect that most second-growth stands will grow more quickly than productivity estimates from old-growth stands would suggest, and therefore that a site index adjustment was appropriate for the analysis.

I encourage district staff to continue to monitor and compare the site productivity estimates as derived from the inventory database with the site productivity values determined in the field. As managed stands continue to grow, better information can be obtained and this can be incorporated into future timber supply analyses.

Weighing all of this information, I am satisfied that site productivity is underestimated within this TSA and that the mid- and long-term harvest levels could be somewhat higher than presented in the base case, and will account for this under 'Reasons for Decision'.

- minimum harvestable ages

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

The minimum harvestable ages assumed in the timber supply analysis were derived using three criteria. The criteria were determined from a review of minimum merchantability constraints in stands currently being harvested. In the analysis, stands needed to meet all three criteria in order to be considered harvestable. The criteria used were:

- (1) the age at which forest stands reach a minimum volume of at least 250 cubic metres/hectare;
- (2) the age at which the tallest 250 trees in a stand reach an average of 25-centimetre diameter at breast height (dbh);
- (3) the age at which stands reach a minimum height of 22 metres.

These criteria were applied to all stands within the timber harvesting land base except for those stands with cottonwood as the leading species, where a minimum harvestable age of 60 years was applied. Applying the criteria indicated that minimum harvestable ages for managed coniferous stands ranged between 55 years for good and medium sites and 160 years for poor sites. It was found that the most limiting of the three criteria was the height requirement.

In the previous timber supply analysis, a biological rotation age was used to determine the earliest age at which stands could be harvested. This rotation age was determined to be 95 percent of the age at which maximum mean annual increment occurs. Switching to a technical rotation for this analysis, using the minimum harvestable age criteria, increases the flexibility for the district and is a better reflection of operational constraints (i.e., it is not realistic in the short- or mid-term to assume that all stands can or will be harvested at their biological rotation). The analysis determined that currently almost 46 percent of stands are at or above their minimum harvestable age.

Public input requested sensitivity analyses to measure the impact of applying minimum diameters at breast height of 20, 30 and 35 centimetres. Analysis indicates that the limiting factor for minimum harvestable age was height, i.e., it took longer for stands to reach a height of 22 metres than it took for them to reach the minimum diameter criteria. As such, changing the minimum diameter criteria had little impact on timber supply in the analysis. Furthermore, sensitivity analyses showed that increasing or decreasing the minimum harvestable age by 10 years had very little impact on timber supply.

As I have noted in other determinations it is often difficult to assess future minimum harvestable ages with precision. I have reviewed the assumptions made in the timber supply analysis and find them to be reasonable. Minimum harvestable ages are dependent on future technology and market conditions which are difficult to predict, although historical trends would indicate greater utilization will be possible in the future. I note that changing from biological rotation to technical rotation in the analysis has resulted in an overall reduction in minimum harvestable ages since the last analysis, which increases mid-term timber supply, and increases the flexibility allowed for harvest scheduling of individual stands.

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

Expected time to regenerate stands

- regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. In the timber supply analysis, regeneration delays of three years for good and medium sites and six years for poor sites were assumed.

In the previous timber supply analysis I asked the district to determine the actual regeneration delay periods occurring in the field and to explore options for reducing them further. District staff have evaluated this and found a trend towards shorter regeneration delays. The trend has been partly driven by the relatively high brush hazard on harvested areas in the Kalum TSA which has generated an effort to establish crop trees sooner and thus lessen the need for heavy brushing.

District observations are supported by the figures related to current not-satisfactorily-restocked (NSR) areas, which are discussed in more detail later in this rationale. Current NSR within the Kalum TSA is shown to be approximately 2 000 hectares. If regeneration delays were truly 3 years for good and medium sites and 6 years for poor sites as modelled in the analysis, then the amount of the land base in current NSR would likely be at least 4 000 to 6 000 hectares. Given that it is approximately 2 000 hectares I am confident it is appropriate to consider shorter regeneration delays.

I have considered the district staff comments regarding reduced regeneration delays, as well as the comparison of NSR and harvested areas, and can say with reasonable certainty that shorter

regeneration delays than presented in the base case reflect current practices. Reduced regeneration delays in any event show only a small upward pressure on long-term or mid-term harvest levels, with no impact on short-term timber supply. I also requested some further analysis on shortened regeneration delay periods and the results of this will be discussed later in the rationale under 'Reasons for Decision'.

I encourage district staff to continue to monitor the trend with the goal of attaining more quantifiable information for the next timber supply review.

- impediments to prompt regeneration

Evaluation of the impediments to prompt regeneration provides an assessment of the uncertainty in the values used in the timber supply analysis for regeneration delay and free growing.

Brush competition is the main impediment to regeneration in the Kalum TSA. The conservative regeneration delays used in the analysis factored in a high brush hazard. However, district staff believe that these regeneration delays are reduced by managing the brush competition through more immediate planting following harvest. Earlier planting of stands also leads to a reduction in the number of areas which need brushing to reduce the competition as there is a window of time following harvest when there is little brush hazard and the seedlings, if planted, have an opportunity to become established.

District staff note that recent reductions to silviculture funding have caused the district to reduce manual brushing activities. However, the district believes that a more aggressive chemical brushing program may be possible in the future, which is generally more cost-effective than manual techniques. Further, the increased emphasis on earlier establishment of plantations has reduced the amount of brushing required.

A secondary impediment to regeneration involves localized challenges with vole damage in plantations. Research on this issue has been limited by the availability of funding. District experience to date indicates earlier planting following harvest, as well as avoiding plantation establishment in peak population years, are two means of mitigating the problem. Vole populations follow a predictable seven year cycle and are at the time of this determination at the low point of that cycle. If opportunities for research arise, improved knowledge of population dynamics and seedling protection options will give further direction on the most effective management tools to minimize losses.

I have reviewed the information related to brush competition and do not foresee any risk to the assumptions in the base case as a result of impediments to prompt regeneration. As mentioned previously under *regeneration delay*, there is a potential in the Kalum TSA for the regeneration delay period to be reduced and the information presented on impediments does not indicate that this potential could not be achieved.

- not-satisfactorily-restocked areas

Not-satisfactorily-restocked (NSR) areas are those areas 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. Where a suitable stand has not been regenerated and the site was harvested prior to 1987, the classification is 'backlog' NSR. All other NSR is considered 'current' NSR.

The Kalum TSA has 4 431 hectares of backlog NSR and 2 062 hectares of current NSR. The base case in the timber supply analysis assumed that all current NSR would be restocked within the regeneration delay time limits, and that the backlog NSR would be restocked within the next twenty years.

Since the timber supply analysis was done it has become apparent that complete elimination of all backlog NSR is unlikely. Rapidly declining funding for backlog reforestation, combined with a realistic assessment of costs and benefits lead district staff to conclude that there are areas which are economically infeasible to continue to treat. These areas are likely to ultimately be reclassified to a lower stocking class although it may take ten years or more to evaluate the growth pattern on the sites. District staff believe that approximately 1 500 hectares of the backlog NSR areas will remain not sufficiently restocked. This translates to an overestimation of the timber harvesting land base in the analysis of approximately 1.5 percent.

I have reviewed the issues with respect to NSR with the district staff. I conclude that the 1 500 hectares, although not sufficiently restocked with commercial coniferous species will have some level of stocking present. This would be the case even if these areas were left largely untreated in the future. I therefore conclude that these areas would place something less than 1 percent downward pressure on the long-term timber supply, and will take this into account under my 'Reasons for Decision'.

I encourage the district to clarify the management objectives with respect to these areas prior to the next timber supply analysis. It would be desirable to have better information regarding the anticipated forest cover (i.e., species, stocking) for these areas in order to quantify how they might contribute to future timber supply in the Kalum TSA.

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

Silviculture treatments to be applied

- silvicultural systems

The main silvicultural system used in the Kalum TSA is clearcutting. A small amount of partial cutting has been conducted in the past through the small business forest enterprise program but this has amounted to less than 100 hectares per year.

In the analysis, it was assumed that all harvesting would be by clearcutting. Other requirements under the Code for riparian reserves and wildlife tree patch areas, as well as forest cover constraints such as green-up and adjacency restrictions were factored into the analysis.

In the previous determination I recommended that the district staff '*encourage and monitor the use of alternative silvicultural systems to reduce areas constrained in future by visual quality objectives*'. Staff observe that clearcutting will continue to be the predominant system

except where other resource values preclude its application. There are some areas within the TSA which are constrained heavily by other values and partial cutting will be required if harvesting is to occur in these areas. For example, the small business forest enterprise program has developed a plan for partial cutting to achieve visual quality objectives within the Fiddler total resource plan area. Likewise, Skeena Cellulose has developed a plan, which includes partial cutting, for the Hatchery Creek area on the east side of Lakelse Lake, also with the goal of meeting visual quality objectives. However, the areas involved are small and do not present any risk to the assumptions in the base case that clearcutting systems are used exclusively within the TSA.

Public input from the Kitamaat Village Council stated that the timber supply analysis should have included the use of partial cutting systems. District staff contend that this would not be appropriate, given that it would not reflect current operational practice. For the purposes of this determination I accept that current practice has been adequately reflected in the timber supply analysis.

- incremental silviculture

Incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning, fertilization, and genetic improvement that are beyond the silviculture activities required to establish a free-growing forest stand.

There is no fertilization outside of research trials currently occurring in the Kalum TSA and none was assumed in the analysis. There is minimal pruning activity of approximately 90 hectares annually, which was not factored into the analysis. Given that the area involved is very small, and that pruning has not been shown to affect timber supply significantly, not including it in the analysis does not pose a risk to timber supply.

1) genetically improved seed

Requirements under the Code include the direction to use genetically improved seed orchard seed (class A seed) for regeneration where available. In the Kalum TSA, the planting program depends largely on hemlock species, with minor reliance on balsam, pine and spruce. Due to the limited availability of hemlock and balsam seed from orchards, there has been very little use of class A seed within the TSA. There fortunately has been a large stock of wild seed available due to historically large seed collection programs and the district has been able to draw on these stocks for regeneration programs. Approximately 5 percent of the area is regenerated to pine and class A seed has been used for this where available.

The base case for the timber supply analysis assumes no use of genetically improved seed in the TSA. Given that the amount of class A seed actually in use is so small as to have a negligible impact on timber supply, I am confident that the assumptions used in the analysis are appropriate. For the future, I note that there is a significant potential to improve mid- to long-term timber supply through the use of genetically improved seed. I encourage the district to monitor the direction of provincial seed orchard capacity with respect to the applicable seed

planning zones and required species (e.g., hemlock). If better information is available for the next timber supply review then the gains can be factored into the analysis at that time.

2) *juvenile spacing*

Juvenile spacing is the cutting of undesirable trees within a young stand to reduce competition among the residual trees for water, nutrients and sunlight. Trees cut during juvenile spacing are not usually removed from the site. Spacing can have many potential benefits, including meeting biodiversity or wildlife habitat objectives, maintaining or enhancing forest health, managing species composition and stand structure, increasing stand value and offering opportunities for small operators. There has been a steady program of juvenile spacing in the Kalum TSA over the last twenty years with an average of 500 hectares spaced each year. Between 1993 and 1997, the program included approximately 1 300 hectares spaced annually. There are currently 10 000 hectares of stands in the TSA that have been juvenile spaced.

The base case for the analysis assumed that all stands on good and medium sites would be juvenile spaced at 15 years of age. Spacing density varied according to species and site index from 700 to 1 000 stems per hectare.

District staff note that these assumptions for juvenile spacing likely overestimate the amount of area which will be juvenile spaced in the future. The funding for spacing and all other intensive silviculture work in the TSA has been recently reduced and future activities will be guided by a resource management plan under FRBC funding covering the Kalum and Nass TSAs as well as TFLs 1 and 41.

Sensitivity analysis during the modelling showed that even if no juvenile spacing is conducted in the TSA there is no impact on current or future timber supply. Given the analysis results, I conclude that there is no risk posed to timber supply at this time by any inaccuracies in the assumptions for juvenile spacing.

3) *commercial thinning*

Commercial thinning is a partial cutting silvicultural system where some volume is removed from an immature stand after components of the stand have reached a merchantable size. Timber removed during the commercial thinning is sold and can therefore contribute to timber supply.

The planning and implementation of the commercial thinning program within the Kalum TSA has been supported by the juvenile spacing program. District staff have used juvenile spacing to reduce the time required for stands to produce merchantable stems eligible for commercial thinning, thus providing an opportunity to maximize the economic return on the spacing investment. Over the past twenty years, 10 000 hectares of stands have been juvenile spaced, and staff estimate that 70 percent or 7 000 hectares of these are suitable for commercial thinning.

In the base case for the analysis it was assumed that all balsam and hemlock sites with site index of at least 24 metres at 50 years of age would be eligible for commercial thinning. During the analysis these sites were commercially thinned between ages 40 and 50 with 35-40 percent of

the basal area being removed. A total of 2 150 hectares were assumed to be commercially thinned over the analysis horizon, with 114 hectares being thinned in the first decade.

District staff contend that the inventory significantly underestimated the number of stands suitable for commercial thinning. Within the TSA, district staff estimate that there are currently 7 000 hectares of stands available for commercial thinning, although the availability of some of these stands in the future will be dependent on the funding available for additional juvenile spacing.

District staff strongly believe that stands which are economically appropriate to thin should be thinned as a forest management strategy which contributes to good forest stewardship and management of resources such as biodiversity. They believe that commercial thinning has the potential to partially offset the reduction to a lower mid-term harvest level. I respect the importance placed by the district staff on the commercial thinning program and encourage them to continue to monitor the benefits provided by the program. However, I also caution them to ensure that their incremental silviculture strategy is subjected to an ongoing, rigorous economic analysis to ensure that the cost of continuing with the program is offset by the benefits provided. I further note that, as discussed later in the rationale under *proposed facilities*, there is a shortage of facilities within the local area for the small piece sizes available from commercial thinning and any evaluation of the program should include a realistic assessment of the marketability of the products.

I would suspect that the source of the underestimation of suitable stands during the analysis is potentially linked to the underestimation of site index for immature stands, since the inventory site index assignments were used to define eligible stands. In any event, the analysis indicated that timber supply in the Kalum TSA is not sensitive to the presence or absence of commercial thinning. I am therefore satisfied that for the purposes of this determination, any uncertainty surrounding the area subjected to commercial thinning poses no risk to current or future timber supply. I applaud the diligent efforts of the district staff in planning for and managing the commercial thinning program, and I look forward to reviewing the ongoing evaluations and refinements of their stand management strategies.

- (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:**

Timber harvesting

- utilization and compliance

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. In the timber supply analysis, the utilization standards assumed in the base case for most species were a minimum 17.5-centimetre diameter at breast height (dbh) with a 30-centimetre maximum stump and 10-centimetre minimum top inside bark. For cottonwood stands, the minimum dbh standard used was 22.5 centimetres.

I note that the minimum utilization standards for pine should be 12.5 centimetre dbh to reflect current provincial requirements. However, pine is a very small component of the inventory in the Kalum TSA at approximately 5 percent, and therefore this change to utilization would have a negligible impact on timber supply. The remaining assumptions in the base case regarding utilization are reflective of current practice.

- decay, waste and breakage

The VDYP model used to project volumes for existing stands incorporates estimates of volume of wood lost to decay, waste and breakage. Decay losses are built into the volume estimates, while standard waste and breakage factors were incorporated into the analysis when developing VDYP yield curves. These estimates of losses have been developed for different areas of the province based on field samples.

For regenerated stands, as previously discussed (see *regenerated stand volumes and site productivity estimates*), the TIPSYP model incorporates OAFs that account for anticipated decay, waste and breakage.

I am satisfied that what was used in the base case for the analysis represents the best information available. I note that a province-wide study into decay estimates is being conducted in response to some concern in other management units regarding the soundness of the current estimates. When the results of this study become available they may be incorporated into future timber supply analyses.

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

Integrated resource management objectives

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

To manage for resources such as water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

- *cutblock adjacency/green-up*

Objectives for forest cover and cutblock adjacency guide harvesting practices in order to address resource values such as wildlife, water, and visual quality. The adjacency objectives modelled in the analysis address minimum green-up height required before an adjacent area may be harvested, and the maximum area permitted to be less than the minimum green-up height.

The FSSIM timber supply analysis model does not represent the adjacency constraints explicitly. Rather, in the analysis these constraints were modelled implicitly by limiting the amount of area on which trees may be below a specified green-up height. Specific constraints were developed for each resource emphasis within the Kalum TSA. It is important to note that forest outside the timber harvesting land base can still be expected to contribute towards some forest cover requirements in some portions of the TSA.

In visually sensitive areas, the restrictions for green-up were applied to the entire productive forest, as the restrictions on development in visual areas include visible disturbance in the entire viewscape, regardless of operability. Green-up height in those areas was 5 metres; the restrictions applied will be discussed separately under *visually sensitive areas*.

In the Thunderbird Special Management Area, which comprises a total of 21 642 hectares, the restrictions were also applied to the productive forest land base. In this area, at least 12 percent of the productive forest was required to be above 140 years of age. In the Deep Creek community watershed area, the restrictions were again applied to the entire productive forest. Both of these factors will be discussed individually later in this rationale.

In the integrated resource management zones, the restrictions were applied to the timber harvesting land base only, as these zones tend to be contiguous areas of primarily operable forest. The minimum green-up height used in the base case was 3 metres and stands were found on average to achieve this height at 15 years of age. No more than 35 percent of the timber harvesting land base in the integrated resource management portion of each landscape unit could be less than 3 metres in height at any one time.

The timber supply analysis showed that within the integrated resource management zone, cutblock adjacency was not constraining to timber supply. A sensitivity analysis conducted which reduced the amount of area which could have trees less than 3 metres tall, from 35 percent to 25 percent found no significant impact on timber supply. The sensitivity analyses suggested that within the range tested, any uncertainty regarding the application of the forest cover guidelines used in the model to represent adjacency requirements does not affect timber supply.

I am aware of research and analysis that suggests rigidly applied adjacency restrictions can substantially reduce timber supply. However, there is uncertainty about the degree to which modelled adjacency restrictions accurately reflect field practices which may allow for some operational flexibility. In addition, analysis has shown that rigidly applied adjacency restrictions may lead to landscape level fragmentation and loss of high quality, contiguous habitat. These uncertainties, in combination with indications from the timber supply analysis that there is limited short-term sensitivity to uncertainties about modelled adjacency, suggest that there is little risk posed to short-term timber supply as a result of the assumptions incorporated into the analysis.

I accept that the analysis adequately reflect the impacts of current stand-level adjacency restrictions, and that no adjustments are required. I will continue to monitor ongoing research and analysis, and future findings on these issues will be incorporated in future determinations as they become available.

For the purposes of this determination, I have considered the assumptions regarding green-up and cutblock adjacency and find them to be reasonable. I am confident that any uncertainties regarding the assumptions pose no significant risk to timber supply in the Kalum TSA.

- riparian habitat

Riparian habitats occur along streams and around lakes and wetlands. The Code requires the establishment of riparian reserve zones that exclude timber harvesting, and riparian management zones that restrict timber harvesting in order to protect riparian and aquatic habitats. For each stream, lake or wetland, the riparian management zone and riparian reserve zone make up the entire riparian management area. Stream classes (e.g., S1) described in the *Riparian Management Area Guidebook* are determined for each stream based on presence of fish, occurrence in a community watershed and average channel width criteria. The stream class is used to estimate the area needed in riparian reserve zones and riparian management zones.

Since the previous timber supply analysis, all S1, S2 and S3 streams in the TSA have been classified by a fisheries biologist. The district staff then digitized maps for six representative watersheds and applied the width values for riparian reserve zones and riparian management zones to the streams within those watersheds. This information was extrapolated to the remainder of the productive forest by biogeoclimatic variant to obtain an estimate of the area associated with riparian reserve zones and riparian management zones. The estimates were applied to riparian areas which were not already accounted for by other factors such as operability or environmentally sensitive areas, and were applied to S1, S2 and S3 streams only.

District staff state that current practice is 100 percent retention of trees in riparian reserve zones and 10 percent retention in riparian management zones. For the purposes of the analysis, 100 percent of the area determined to be in riparian reserve zones, and 10 percent of the area determined to be in riparian management zones were removed from the productive forest land base. In summary, 4 625 hectares or 2.3 percent of the productive forest land base was excluded to account for protection of riparian areas.

Public input from Skeena Cellulose indicated that they believed the percent reductions were appropriate but that the riparian management zone reduction of 10 percent should also have been applied to the S4, S5 and S6 streams. The district staff note that current practices indicate no retention on these stream classes and thus the assumptions made in the base case were appropriate.

I have reviewed the assumptions made in the base case regarding riparian areas and am confident that the netdowns are based on the best information available.

- community watersheds

Community watersheds are defined under the Code as the drainage area above a stream that provides water for human consumption and that is licensed under the Water Act for a waterworks purpose or a domestic purpose, assuming the drainage area is not more than 500 square kilometres and the water licence was issued before June 15, 1995. This definition accounts for the majority of community watersheds in existence when the Code came into effect. Community watersheds not covered under this definition can be designated as such by the appropriate regional manager and a designated environmental official.

In the Kalum TSA, community watersheds comprise approximately 1 815 hectares or 1.8 percent of the timber harvesting land base. The majority of the area designated as community watershed is in the Deep Creek community watershed. In the analysis, this watershed had a specific forest cover constraint applied, whereby no more than 30 percent of the productive forest could be covered by trees less than 5 metres in height at any one time. A review by a regional research hydrologist concluded that this cover constraint was appropriate given the relatively gentle topography within the watershed. Very minor harvesting has occurred to date in the area, and watershed plans and assessments are currently being prepared to determine a harvest plan for the next five year period.

Based on the observations of the hydrologist I conclude that the assumption in the base case for management within the community watershed is appropriate. However, I note that no significant development has yet occurred in the watershed, and that the analysis assumes that the watershed area will contribute to timber supply. There is thus an assumption that harvesting operations, to the extent that they adequately protect water quality, will at some time occur in the area. I encourage district staff to complete the watershed plan so that any necessary adjustments to the assumptions used to date can be incorporated in future analyses.

- visually sensitive areas

Careful management of scenic areas along travel corridors and near recreational sites is an important IRM objective. The Code enables the management of visual resources by providing for scenic areas to be identified and made known, and by providing for the establishment of visual quality objectives (VQOs). To achieve this, visual landscape inventories are carried out to identify, classify and record those areas of the province that are visually sensitive.

To achieve VQOs, limits are placed on the amount of visible disturbance that is acceptable in visually sensitive areas. Guidelines to meet VQOs include setting a maximum percentage of a landform allowed to be in a disturbed state at any one time, and setting visually effective green-up targets that must be achieved before additional harvesting is permitted. Visually effective green-up refers to the stage at which a stand of forested timber is perceived by the public to be satisfactorily greened-up from a visual standpoint. The green-up height and associated age within visually sensitive areas therefore might be different than the green-up height applied to non-visually sensitive areas.

In the analysis, the constraints were applied as the maximum percentage of area in the productive forest land base that could be occupied by stands less than 5 metres in height. These restrictions for green-up were applied to the entire productive forest land base, since restrictions on development in visual areas include visible disturbance in the entire viewscape regardless of operability.

In the analysis, the percentage of the productive forest area which could be less than 5 metres in height was as follows:

- for the retention VQO zone, no more than 5 percent of the area;
- for the partial retention VQO zone, no more than 15 percent of the area;
- for the modification VQO zone, no more than 25 percent of the area.

There were only 82 hectares in the preservation zone in the Kalum TSA and so for the purposes of the analysis this area was modelled with the retention zone. I note that areas with preservation visual quality objectives are generally not available for timber harvesting and are normally removed from the productive forest land base. However, given the small area involved I am satisfied that there is negligible risk associated with how this was handled in the analysis.

Public input from Skeena Cellulose requested sensitivity analysis for using green-up heights of 3 metres rather than the modelled 5 metres in the VQO zone. Since it was determined that stands reach 5 metres in height at approximately 20 years of age, this was modelled by reducing green-up ages by 5 years. The sensitivity analysis showed no impact to short-term and long-term harvest levels, and a very small impact of 0.5 percent to the mid-term timber supply.

The analysis also evaluated the sensitivity of timber supply to the application of these forest cover requirements by modelling the mid range for each VQO zone, instead of the maximum of the range (e.g., for partial retention allowing only 10 percent of the area to be covered with trees less than 5 metres in height, instead of 15 percent). The results showed that the current harvest level could be maintained for 3 decades, as in the base case, without causing future timber supply disruptions. Mid-term harvest levels would be 1.3 percent lower and long-term harvest levels would be 2 percent lower than the base case. The forest cover requirements needed to meet VQOs have only a small effect on mid- and long-term timber supply, primarily because in the base case only the retention VQO zone consistently constrains harvesting and this zone covers only 1.9 percent of the timber harvesting land base.

Following the previous timber supply analysis in the Kalum TSA, I released a report entitled 'Forest Practices Code: Timber Supply Analysis' which determined that the impact of the Code on first decade timber supply was 8 percent provincially. The report suggested that this impact could be reduced to 6 percent if visual resources were managed differently so as to increase timber supply provincially by 2 percent or by 1 500 000 cubic metres annually over the next decade. As a result of my report all forest districts were encouraged by the Assistant Deputy Minister of Operations to develop a strategy to address this issue.

Districts were presented with six potential approaches that would increase timber supply while maintaining visual quality. These were:

- re-evaluate and refine the boundaries of known scenic areas;
- implement visual landscape design;
- encourage use of alternative silvicultural systems;
- identify and take advantage of visual rehabilitation opportunities;
- use minimum visually effective tree heights where possible;
- re-evaluate current management of recommended visual quality classes (rVQC's) or established VQOs.

In January 1997, scenic areas were made known and VQOs were established in the Kalum TSA by the district manager. Prior to the letter being released regarding the scenic areas, the district manager reviewed the assignment of VQOs which resulted in some of the classifications becoming less restrictive. District staff feel that this adjustment will make more wood available from the visual zone. I accept their assessment.

Overall, I have reviewed the assumptions used in the analysis regarding visual quality objectives and determine them to be appropriate.

In the rationale from the previous allowable annual cut determination, I suggested that district staff '*encourage and monitor the use of alternative silviculture systems to reduce areas constrained in future by visual quality objectives*'. District staff note that the Small Business program as well as Skeena Cellulose are currently proposing partial cutting strategies in some visually sensitive areas to achieve visual quality objectives. At this time, I encourage the district staff to continue to monitor and encourage the use of alternative silviculture systems to meet the operational constraints posed in visually sensitive areas.

- recreation

As noted under *environmentally sensitive areas*, there was a 100 percent reduction applied in the analysis to areas typed as Er1 (having a high risk of disruption to recreation values as a result of timber harvesting).

In addition to the areas classified as Er1, the inventory data file contained approximately 80 hectares with a recreation management class code of 1. These were determined to be predominantly visually sensitive areas in which some harvesting was expected to occur and were modelled by applying the forest cover constraints for visual quality objectives. Other considerations such as riparian and operability reductions caused most of the remaining management class 1 areas to be unavailable for timber harvest. District staff note that there are a small number of hectares associated with recreation trails which were not accounted for in the analysis.

I have reviewed the assumptions in the base case and found them to adequately represent the values associated with recreation. Any possible overestimation of the timber harvesting land base related to the outstanding recreation trail areas is so small as to be insignificant and therefore has a negligible impact on timber supply.

- cultural heritage resources

Cultural heritage resources include archaeological and traditional use sites. Archaeological sites contain physical evidence of past human activity. There are a number of recorded archaeological sites within the Kalum TSA, primarily occurring along major waterways. Most of the sites are outside of the timber harvesting land base in urban areas, parks or within riparian zones. To help manage for unrecorded sites, archaeological overview mapping has been conducted to assign high, moderate or low ratings for archaeological potential within the TSA. A total of 2 512 hectares was identified as having high archaeological potential, and in most cases culturally modified trees (CMT) are the primary archaeological site feature. Archaeological impact assessments are conducted where cutblocks are proposed in high archaeological potential sites and the district manager is satisfied that the assessment is necessary to adequately manage and conserve archaeological sites. Boundary amendments or wildlife tree patches are utilized in some cases to properly manage identified archaeological resources.

There was no separate reduction applied to account for archaeological sites during the timber supply analysis. I am satisfied from discussion with the district staff that these resources are in most cases outside the timber harvesting land base. Where this is not the case, protection of the sites is handled during operational planning. The area within the timber harvesting land base that may be comprised of archaeological sites is not known, but based on the information available is most likely very small. For this determination, I will make no adjustments to the base case timber supply projection to account for this factor; however, further operational experience may provide more information that can be incorporated into future determinations.

Traditional use sites may not necessarily contain historical physical evidence and may be indicated by current use by a First Nation. Traditional use studies are one method of assessing management strategies for such sites. Only one such study has been completed to date in the Kalum TSA. It is expected that more studies will be available for the next timber supply review, and that management strategies and potential impacts to timber supply will be better quantified at that time.

I note that the Kitamaat Village Band Council has requested that results of impact assessments and traditional use surveys be incorporated into the timber supply review. I am confident that the consideration of these areas is being conducted appropriately at the operational planning level, and to date there is no evidence to indicate any impacts on timber supply related to the presence of traditional use sites.

- pine mushrooms

The pine mushroom is considered the most economically significant mushroom species in the province. It can occur along the coast and interior mountain ranges of British Columbia, usually in stands of trees between 100 and 200 years of age. Recent studies have indicated that maximum productivity of pine mushrooms occurs in younger mature stands of between 60 and

160 years of age, and that harvesting of older forests to create a stream of young maturing stands may increase habitat potential for pine mushrooms.

The Nisga'a Tribal Council expressed concern that the management of the pine mushroom resource had not been addressed in the timber supply analysis. Pine mushrooms are found in the ICH and CWH biogeoclimatic zones and prefer drier sites with well-drained, coarse textured and nutrient poor soils. District staff indicate that there is currently limited pine mushroom harvesting opportunities within the Kalum TSA. Their observations are supported by the data on the age class structure of the timber harvesting land base, which indicates that 42 percent of stands are less than 60 years of age and a further 32 percent of stands are over 250 years of age, age classes which are not generally considered optimal habitat for pine mushrooms. Furthermore, approximately 75 percent of the sites in the timber harvesting land base are classified as good or medium in site productivity which again would indicate low occurrence of suitable habitat.

Given the research to date on the preferred habitat for this species, it is likely that the land base reductions applied in the analysis including those for operability and low productivity, adequately address habitat concerns for the pine mushroom in the Kalum TSA. Therefore, while pine mushroom management was not incorporated explicitly into the analysis, for the purposes of this determination I accept that the land base definition process used in the analysis has reasonably accounted for this resource. Should better information become available over time, such as through the Kalum Land and Resource Management Plan process or other planning processes, it can be incorporated into future analyses.

- wildlife

'Identified wildlife' refers to species at risk (red and blue listed) and to regionally significant species which have not been adequately accounted for with existing management strategies, such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints.

The Identified Wildlife Management Strategy (IWMS) was released in February 1999 and details several species which occur or potentially occur within the Kalum TSA, and which require future consideration, including bull trout, tailed frog, trumpeter swan, northern goshawk, marbled murrelet, fisher, grizzly bear and mountain goat. These species will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures, or through other management practices specified in higher level plans. Specific wildlife habitat areas or management strategies for identified wildlife species have not yet been established in the Kalum TSA. Government has limited the impact of management for identified wildlife over the next two years to a maximum of one percent of the short-term harvest level for the province.

The 1999 timber supply analysis did not account for identified wildlife in the base case, which reflects that no wildlife habitat areas have yet been established. For the short term, it was assumed that identified wildlife could be largely accounted for by applying the riparian management area and other forest cover constraints.

When wildlife habitat areas are established, and general wildlife measures are implemented, the impacts of management for identified wildlife will be much clearer. In addition, measures will be assessed over time to determine if they are sufficient to adequately protect identified wildlife species. The identified wildlife strategy and associated timber supply impact thresholds may be changed after an evaluation, but I cannot reasonably speculate on the outcome of such a process. In addition, I cannot speculate about decisions that may be made during future land and resource management planning processes with respect to identified wildlife. Any future changes to the required measures for identified wildlife species which result in impacts to timber supply, either under the identified wildlife management strategy or according to approved plans, will be incorporated into future analyses.

For this determination, it is not possible to specify the exact location or precise amount of habitat area that will be required within the timber harvesting land base to implement the Identified Wildlife Management Strategy. However, given the Province's commitment to implementing the IWMS, and given the policy decisions and projected one-percent impact—and noting the expected occurrence of identified wildlife in this TSA—it is necessary and appropriate to account for an expected but not fully quantified impact on the timber supply.

After reviewing the assumptions from the timber supply analysis, and the contents of the identified wildlife management strategy, I conclude that it is reasonable to expect a future downward pressure on timber supply as a result of the establishment of wildlife habitat areas. The reduction is expected to be less than or equal to one percent, although at this time the exact impact is uncertain. Although no specific sensitivity analyses were conducted to evaluate the impact of this reduction, other results, such as from the analysis of the uncertainty in the size of the timber harvesting land base, indicate that there is not likely to be any impact to short-term timber supply due to this factor alone. For the purposes of this determination, I am mindful of the downward pressure and will account for it under 'Reasons for Decision' later in this rationale.

- stand-level biodiversity

Biodiversity is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems and the evolutionary and functional processes that link them. Under the Code, biodiversity in a given management unit is assessed and managed at both the stand and landscape levels. Stand level biodiversity management includes retaining reserves of mature timber, or wildlife tree patches (WTP), within or adjacent to cutblocks to provide structural diversity and wildlife habitat.

The *Biodiversity Guidebook* makes recommendations for percentages of area to be retained in wildlife tree patches, based on specific assumptions about the land base. In the Kalum TSA, district staff made the following assumptions: that 70 percent of the timber harvesting land base in the IRM/VQO zones was harvested without the recommended wildlife tree patch retention, and; that 50 percent of the productive forest area in the IRM/VQO zone is actually available for harvest (e.g., not constrained in riparian areas or by operability, etc.). Using the guidelines in

the *Biodiversity Guidebook*, these assumptions lead to a recommendation to retain 9 percent of the cutblock area in wildlife tree patches.

Additionally, district staff concluded that 75 percent of wildlife tree patch requirements would be accounted for from the non-contributing land base, i.e., areas which are already removed from the timber harvesting land base for such considerations as riparian protection or operability. The remaining 25 percent would be met from the integrated resource management and modification VQO zones in the timber harvesting land base, as only these areas require some management activity to retain stand structure. The overall impact on the timber harvesting land base was then assumed to be 25 percent of the 9 percent figure, or approximately 2 percent. Portions of each stand were removed in the analysis to reflect the wildlife tree patch requirements, for a total of 1 359 hectares.

Public input from Skeena Cellulose disputed the assumption that 70 percent of the area has been harvested without the recommended wildlife tree patch retention; they believed that 50 percent would be a more realistic figure. Further, they believe that 75 percent of the wildlife tree patch requirements could be met from outside the timber harvesting land base only if a 10 percent retention were applied to riparian management zones along class S4, S5, S6 streams.

District staff have considered these comments and believe that the assumptions in the analysis were an appropriate reflection of operational practices and constraints. I accept their assessment of this and for the purposes of this determination, I am satisfied that the requirements for stand-level biodiversity were adequately accounted for in the Kalum TSA timber supply analysis.

- landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species that are dependent on or are strongly associated with old-growth forests. Although some general forest management practices can broadly accommodate the needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved.

Natural disturbance types (NDTs) are defined according to the frequency of natural disturbance, ranging from recurrent wildfires in the dry interior regions to rare stand-initiating events such as windstorms in the wetter coastal regions. In the Kalum TSA, natural disturbance patterns are described by NDT 1 (ecosystems with rare stand-initiating events occurring approximately every 250 years) and NDT 2 (ecosystems with infrequent stand initiating events occurring approximately every 200 years).

The delineation and formal designation of 'landscape units' is a key component of a sub-regional biodiversity management strategy. A landscape unit is an area established by the district manager, generally up to 100 000 hectares in size, based on topographic or geographic

features such as a watershed, or series of watersheds, to manage biodiversity and other forest resource values. In the Kalum TSA, interim landscape unit boundaries were established by the district manager and approved by the designated environmental official in October 1997. These draft landscape unit boundaries were used in the analysis because the official establishment of the boundaries was believed to be imminent when the analysis was initiated. At the time of this determination, they have not yet been officially established for the TSA.

The Forest Practices Code of B.C. Biodiversity Guidebook outlines three biodiversity emphasis options (BEOs)-lower, intermediate and higher-which may be employed when establishing biodiversity management objectives for a landscape unit. If a reasonable distribution of options is maintained across the land base, it is generally considered that biodiversity can be adequately maintained in conjunction with the timber harvesting objectives. Draft BEO assignments for the landscape units in the Kalum TSA were available and were used in the base case, again because official establishment of BEOs was believed to be imminent.

The forest cover requirements for old seral forest were applied at the biogeoclimatic variant level within each landscape unit as a minimum percentage of the productive forest land base which must be retained in stands at least 250 years of age. Depending on the natural disturbance type and biogeoclimatic unit, the minimum area to be retained varied in the lower and intermediate BEO areas between 9 and 19 percent, and in the higher BEO areas between 13 and 28 percent.

The impacts to the timber harvesting land base were as follows: the lower BEO was applied to 43 314 hectares or approximately 44 percent of the timber harvesting land base, the intermediate BEO was applied to 36 376 hectares or 37 percent of the timber harvesting land base, and the higher BEO was applied to 18 566 hectares or approximately 19 percent of the timber harvesting land base.

The current provincial policy direction provided by the chief forester for assignment of BEOs is to follow guidance provided in the *Biodiversity Guidebook*. The guidebook outlines the proportions of each subregional planning area that should be assigned to each of the three BEOs. The proportions in lower and intermediate biodiversity emphasis can range from 30 to 55 percent, but the average is approximately 45 percent of the area in lower, 45 percent in intermediate, and 10 percent in the higher BEO. This distribution is believed to provide a balance between social and economic impacts and risk to biodiversity. The policy generally followed for timber supply analyses when landscape units and BEOs have not been established is to model the distribution of BEOs using a weighted average forest cover requirement.

For the Kalum TSA, sensitivity analysis was used to evaluate the impact of modelling these requirements instead of the draft BEO percentages used for the base case. The sensitivity analysis found that applying weighted average forest cover requirements to represent changing the percentage of the land base in each BEO to the levels indicated in policy had no impact to timber supply.

Sensitivity analysis also found that applying the early seral and mature plus old requirements rather than just the old seral requirements as in the base case, had no impact to short- and long-term timber supply and only a 0.8 percent impact to mid-term timber supply.

District staff note that current operational planning does not consider landscape level biodiversity requirements because the landscape unit objectives have not yet been officially established. Public input from Skeena Cellulose requested clarification on the requirements for landscape level biodiversity given the uncertainty surrounding management objectives. It is expected that objectives will be established in the Kalum district by early 2001.

District staff also note that the final approved landscape unit for the Fiddler area may have a higher BEO assignment than that assumed in the base case for the analysis, because of the recommendations arising from the Fiddler Total Resource Plan. This will be discussed separately in this rationale under *local resource use plans*.

In any event, the analysis shows that timber supply is fairly insensitive to different applications of the biodiversity emphasis option constraints, primarily due to the large amount of forest outside of the timber harvesting land base which can meet the landscape level biodiversity objectives. Upon review of the modelling assumptions used in the analysis, I conclude that, with the possible exception noted above for the Fiddler area, they appropriately represented the best information available for the TSA at the time of the analysis, and recognizing the uncertainties about final boundaries and objectives, cover the likely range of application of landscape biodiversity requirements in the area. Noting the insensitivity to varying analysis techniques, I accept that landscape biodiversity requirements are well accounted for in the analysis and I am making no further adjustment on this account.

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

Other information

Strategic plans establish the broader context for operational plans, providing objectives that determine the mix of forest resources to be managed in a given area. There are several types of planning processes which are described as strategic in relation to operational planning processes. Distinction must be made between higher level plans as defined by the Code and strategic land use planning processes such as regional or subregional planning (land and resource management planning). Portions of plans arising from strategic planning processes may be declared as higher level plans under the Code. A higher level plan defined under the Code establishes government's social, economic and environmental objectives, thereby setting the resource management context for developing subsequent operational plans.

Many strategic plans, such as local resource use plans, once signed off by the district manager or another appropriate authority become policy direction but are not legally binding under the Code. Portions of these strategic plans can be declared as higher level plans and be enabled through Part 2 of the *Forest Practices Code of B.C. Act* and at that time become binding under the Code. Higher level plans include objectives for resource management zones (established by the three Code ministers); objectives for landscape units, sensitive areas,

interpretive forest sites, recreation sites and recreation trails (all established by the district manager, subject to direction from the Chief Forester).

In the Kalum TSA, strategic planning processes consist of two local resource use plans and the Kalum Land and Resource Management Plan (LRMP).

- local resource use plans

A local resource use plan is a plan usually approved by the district manager for a portion of the provincial forest that provides area-specific resource management objectives for integrating resource use in the area. These plans were prepared pursuant to section 4 (c) of the *Ministry of Forests Act*, which states that the Ministry of Forests is to plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector. The Kalum TSA has two local resource use plans: the Thunderbird Integrated Resource Management Plan and the Fiddler Total Resource Plan. The recommendations from the Thunderbird plan are expected to be addressed through the Kalum LRMP process, and the Fiddler plan requirements are expected to be addressed through the landscape unit planning process.

The Thunderbird Integrated Resource Management Plan was approved by the district manager in 1992. The Thunderbird Special Management zone was delineated during the 1999 timber supply analysis in order to incorporate the recommendations arising from this plan, and separate forest cover constraints were applied to the area. A minimum of 12 percent of the productive forest in the zone was to be covered with trees of at least 140 years of age. District staff state that the analysis assumptions appropriately represent management objectives outlined in the plan and further note that the recommendations from this local resource use plan will likely be addressed through the Kalum LRMP process. I am satisfied for the purposes of this determination that the requirements for the Thunderbird Integrated Resource Management Plan area were adequately addressed in the timber supply analysis.

The Fiddler Total Resource Plan (FTRP) was approved by the district manager in December 1995. It was noted during the data accumulation process for the analysis that the forest cover requirements described by the FTRP were very similar to those outlined in the *Biodiversity Guidebook*. As a result, the Fiddler area was not subjected to separate requirements during the modelling but rather the landscape level biodiversity requirements from the draft landscape units were applied and assumed to represent implementation of the FTRP recommendations.

District staff note that the base case assumptions for the area under the FTRP—which included the lower BEO assignment for the Fiddler landscape unit area—may be inaccurate. The forest cover requirements indicated by the FTRP reflect the substantial discussions which have taken place regarding First Nations interests in the area, and are more in line with those for intermediate or higher BEO assignments. However, since it is not yet an approved plan, it is uncertain which BEO assignments will be represented in the final approved landscape unit.

Furthermore, the analysis, consistent with current provincial policy, modelled only the old seral stage forest cover requirements, and the FTRP contains recommendations for the mature plus old and early seral stages as well. In summary, it is anticipated that the plan area will be more heavily constrained in the future than assumed in the analysis.

Sensitivity analysis which was conducted for the entire TSA area showed that timber supply is only very slightly affected by the application of early seral and mature plus old seral requirements (less than 1 percent impact to mid-term harvest levels). However, there is uncertainty as to whether this would also apply to just the Fiddler Creek area.

I have assessed the impacts on timber supply indicated by the possible underestimation of forest cover constraints for the FTRP area and believe that the downward pressure to timber supply would be very small, given that the area currently contributes only 1 200 hectares or 1 percent to the timber harvesting land base, and that the sensitivity analysis showed a less than 1 percent impact - and only to the mid-term harvest levels - if the entire TSA were subjected to increased forest cover constraints.

As mentioned under *economic and physical operability*, and under *environmentally sensitive areas*, district staff note that interim results from the terrain stability assessments conducted to date show that the Fiddler Creek area contains significantly more operable land than assumed in the analysis. However, I note that there is currently too much risk associated with applying a lower reduction for unstable soils to just the Fiddler area, given the interim nature of the terrain stability results. At this time, I can only surmise that any potential downward pressure on timber supply would be more than offset by the increased size of the timber harvesting land base suggested by the terrain stability analysis.

At any rate, there is no risk posed to short-term timber supply by any uncertainty around these assumptions. For the purposes of this determination, I have assumed that no adjustments are required to account for the Fiddler area, and will discuss this under 'Reasons for Decision'.

I acknowledge that there is still uncertainty around how the forest cover constraints will be implemented in the Fiddler area which will hopefully be quantified for the next timber supply analysis. I also encourage district staff to evaluate the terrain stability assessment results in order to better estimate the timber harvesting land base for the next analysis.

- land and resource management plans

Land and Resource Management Planning (LRMP) is an integrated sub-regional process requiring public participation that produces a land and resource management plan for review and approval by government. The plan establishes direction for land use and specifies broad resource management objectives and strategies. The Kalum LRMP is one of eighteen strategic land use planning processes currently underway in British Columbia. Once completed, this plan will provide a set of recommendations and strategies that will direct management activities on all Crown land within the Kalum planning area for the next ten years.

The Kalum LRMP recommendations are expected to be submitted to Cabinet for final approval in late 2000. The government may declare portions of the Kalum LRMP as a higher level plan under the Code. Forest management activities are subject to any land use designations and management objectives included in a higher level plan.

Currently, the Kalum LRMP table has reached Agreement in Principle on the objectives and strategies for the plan and is in recess while resource assessments are completed by government. Some outstanding issues are expected to be clarified by these resource assessments which have a potential impact on timber supply. Such issues include:

- Seral stage requirements for grizzly bears - the plan states 'in watersheds greater than 10 000 hectares ensure that less than 30 percent of the forested land base is between 25 and 100 years old';
- Habitat requirements for mountain goats - the plan states 'establish a no timber harvesting zone of 400 metres on the old growth surrounding the identified and mapped winter escape terrain;
- visual quality objectives from the rail line upstream along the Skeena River from Terrace, which is on the opposite side of the river from the highway.

At the time the timber supply analysis was initiated, the Kalum LRMP table had not yet reached an Agreement in Principle. Therefore, the analysis did not include consideration of the Kalum LRMP recommendations. At this time, the plan is not yet signed off and the impact of the recommendations are unknown. I am aware of the potential risk to timber supply posed by the implementation of recommendations arising from the plan but note that it is inappropriate to speculate about what the exact impact will be. Once the Kalum LRMP is approved, it will be appropriate to reflect the results in future analyses.

- forest development plans and constraints

Licensees in the TSA annually prepare forest development plans (FDPs) which present a realistic timber harvesting and forest development strategy for the upcoming five year period. In the Kalum TSA, the district manager has approved forest development plans for major licensees and the small business program which show locations for harvesting and road building for the next five years.

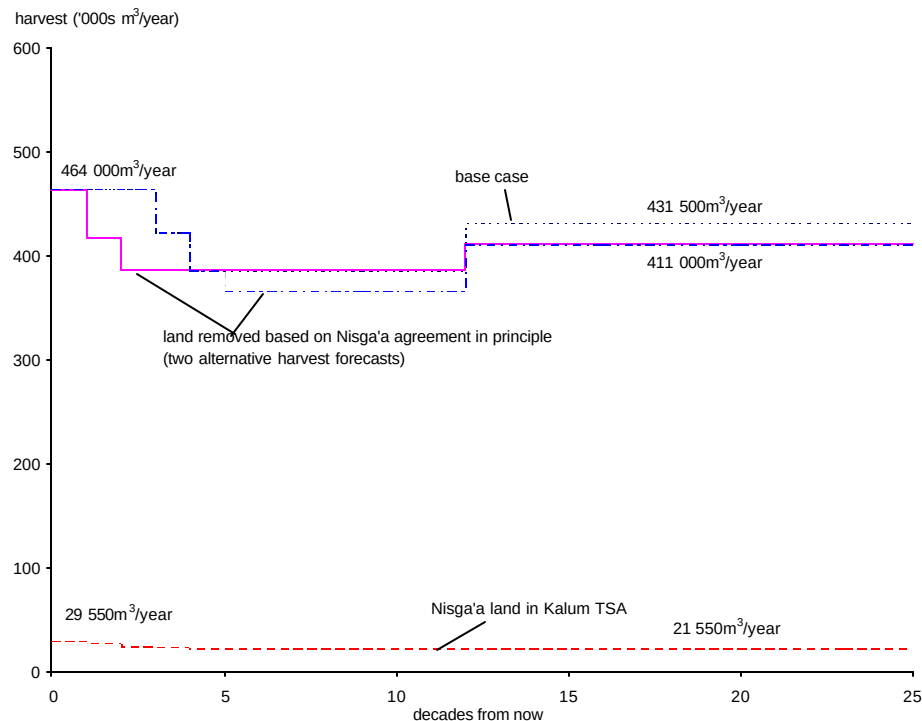
District staff have reviewed the information from the timber supply analysis which illustrated the percentage of harvesting from each landscape unit during each decade of the analysis period. Staff conclude that the distribution reasonably reflects the approved forest development plans as well as likely future development in the TSA.

No significant concerns regarding access to timber supply have been identified at the operational planning level. The forest development plans provide me with confidence that the initial harvest level proposed in the base case can be achieved within the current management regime, including providing for protection of non-timber values.

- Nisga'a Lands

The Kalum TSA contains areas identified in the Nisga'a Final Agreement (NFA). The NFA was initialled jointly by the Government of Canada, the Province of British Columbia and the Nisga'a Tribal Council on August 4, 1998. The NFA includes provisions on forest resources, wildlife, fisheries and access as well as environmental assessment and protection on 'Nisga'a Lands'. When the agreement is ratified, the Nisga'a will own all forest resources on Nisga'a Lands, an area which includes lands within the Kalum TSA as well as the North Coast and Nass TSAs and TFL 1.

I note that completion of the NFA would require the deletion of 32 286 hectares from the Kalum TSA, approximately 4 700 hectares of which are within the timber harvesting land base. The timber supply analysis projected two possible harvest flows if the land outlined in the NFA were removed from the TSA. In the example simulation (depicted following), similar harvest flow criteria were applied to the non-Nisga'a component of the TSA as were used in the base case.



In one possible harvest flow, the current AAC could be maintained for three decades, after which it would decline in three steps of approximately 8 percent each to 366 000 cubic metres per year before rising in decade 12 to a long-term harvest level of 411 000 cubic metres. The second harvest flow indicates it would be possible to maintain the current AAC for one decade, before declining in two steps to the same mid-term level as the base case and then rising in decade 12 to the long-term level of 411 000 cubic metres. In both scenarios, the long-term level is 4.8 percent lower than in the current base case.

I note that only two possible harvest scenarios were shown for the area that the Kalum TSA will encompass in the future. The appropriate level is a function of many variables including the existing composition and structure of the forest, current and future management objectives, harvest flow alternatives, and socio-economic considerations. While many alternative combinations of harvest flows are technically achievable, this analysis does provide me with some information about the potential impact on timber supply of withdrawing the Nisga'a Lands from the TSA. However, while I am aware that other harvest flow options exist, it is inappropriate for me to speculate until the Agreement is concluded on the final outcome of the decision and related harvest levels following the withdrawal of Nisga'a Lands from the Kalum TSA.

I respect the Nisga'a people's desire to see the Final Agreement fully ratified. As described previously in my 'Guiding Principles', the AAC I determine for this TSA should in no way be construed as limiting the Crown's obligations with respect to the eventual conclusion of this treaty process. Moreover, neither this timber supply analysis nor my associated determination prescribes a particular pattern of harvesting activity in the Kalum TSA, including the area defined as Nisga'a Lands.

I acknowledge the intentions of both the federal and provincial governments to conclude the treaty in the near future. When all settlement legislation is passed and the final agreement is effective, I will consider re-evaluating the AAC for the Kalum TSA.

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

Alternative harvest rates

- harvest flow/socio-economic implications

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short-term, the presence of large timber volumes in older forests often permits harvesting above long-term levels without jeopardizing future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

In the base case for the Kalum TSA, the harvest forecast suggested that the current AAC of 464 000 cubic metres could be maintained for the next 30 years before declining by 8.8 percent and then by a further 8.5 percent in the following decade, before rising to the long-term harvest level of 431 500 cubic metres in decade twelve. A non-declining alternative forecast modelled an immediate decline to 408 500 cubic metres, which could be maintained until decade 12

before rising to the same long-term level as the base case. Another alternative showed the initial harvest level dropping from the current AAC after the first decade in two steps to a mid-term level of 401 400 cubic metres, which is 3.7 percent above the base case mid-term level.

In the base case analysis, BCFS staff applied harvest flow guidelines developed for timber supply reviews, which seek to maintain the current AAC while allowing gradual declines in future harvest levels and assuring the attainment of maximum long-term harvest levels. In reviewing the alternative harvest flows presented, I note that none of the alternatives is either clearly inferior or superior to the base case. They illustrate some of the trade-offs between the short, medium and long terms, indicating that the base case allows for short-term stability, and does not involve unreasonable mid-term timber supply deficits, or adversely affect the long-term harvest level.

- community dependence on the forest industry

The socio-economic analysis for the Kalum TSA details the impact of timber supply adjustments on local communities and the provincial economy. During the analysis, the level of forestry activity currently supported by timber harvesting in the TSA was compared to the level of activity that can be supported as the timber supply moves toward the long-term harvest level.

The current AAC of 464 000 cubic metres can support 353 person years of direct employment and 200 person years of indirect/induced employment within the TSA, and an additional 84 person years of direct employment and 261 person years of indirect/induced employment outside of the TSA. Annual provincial revenues associated with this AAC including provincial income tax, stumpage and rent total approximately 10 million dollars. A drop in harvest level to 423 000 cubic metres, which occurs in the base case in the fourth decade, would translate to approximately 50 person years lost within the TSA and a further 28 person years lost outside the TSA, given current employment-to-harvest relationships. Reductions to Crown revenues would be \$.9 million. The drop in the base case harvest level to 387 000 cubic metres in the fifth decade would result in loss of another 40 person years inside the TSA, 20 person years outside the TSA, and a further \$.8 million reduction in Crown revenue.

Public input from the City of Terrace contends that the economic profile used during the analysis understates the importance of forestry to the region and particularly to the community of Terrace, where 18 percent of the labour force is directly employed in the forest industry. The input also expressed the opinion that the figures for indirect and induced jobs were extremely underestimated, noting that the usual multiplier is 2.

I have reviewed the socio-economic analysis in consideration of these comments and conclude that it has used a sound methodology, applied in other timber supply units to evaluate the community dependencies for the Kalum TSA. The multipliers to determine indirect and induced forestry employment were used appropriately. The multiplier of 2.05 was used to determine the economic impact provincially (i.e., indirect and induced provincial employment) of the direct forestry activity within the Kalum TSA. Within the Kalum TSA itself, the multiplier for indirect and induced jobs was 1.43 to reflect that most of the indirect and induced jobs actually exist outside the timber supply area.

The socio-economic analysis indicates to me that the communities within the Kalum TSA do have strong dependencies on the timber supply from the TSA, and that the mid-term reductions to timber supply will have an impact on these communities. I am mindful of this and note that this consideration has been factored into the base case through the choice of a harvest flow which maintains the current AAC for as long as possible without jeopardizing long-term harvest levels.

- difference between AAC and actual harvest

Most licencees have some flexibility in their annual rate of cut during a five year period referred to as the cut control period. The volume harvested must be within 50 percent of the allowable annual volume in each year, and also within 10 percent of the allowable volume for the five year period.

In the Kalum TSA during the 1992-1996 cut control period, major forest licence holders undercut by 145 567 cubic metres or 7.5 percent of the allowable volume. During 1997-1998 the volume cut within the forest licences has been 59 percent of the AAC for those tenures. These reduced production trends are attributable to the downturn in the Asian hemlock lumber market and weak pulp markets. In addition, Skeena Cellulose has been involved in restructuring which has impacted on their operations over the past two year period.

The Small Business Forest Enterprise Program is expected to achieve 82 percent of the AAC for the 1996-1999 period. The program has experienced some development delays but there is high demand for local small scale salvage opportunities and no problems in meeting cut control requirements are expected.

The current undercut trends in the Kalum TSA reflect the depressed economy and restructuring efforts within the TSA rather than an absence of timber supply. Historically, AAC cut control requirements have always been met in the TSA and there is no indication that this will not be the case for the future. Recent trends indicate some small improvements in the markets for hemlock and pulp quality logs.

I have reviewed the information presented regarding the AAC and current harvest levels in the Kalum TSA and conclude that there are no areas of concern which would impact on this determination.

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

Timber processing facilities

- harvest profiles for mills

The dominant log profile in the Kalum TSA is mature, large piece size, poor quality hemlock. The majority of this product as well as other products harvested in the TSA is processed within the TSA. The processing facilities in the Kalum TSA also rely on other TSAs, TFLs, woodlots and private lands for their timber supply.

Skeena Cellulose operates a large sawmill in Terrace with an annual capacity of approximately 600 000 cubic metres. The Kalum TSA contributes approximately 15 percent of the total timber capacity for this facility. Logs not suitable for primary breakdown at the Terrace sawmill are chipped under an agreement with West Fraser Mills. The chips are then shipped to pulp mills in Kitimat or Prince Rupert. West Fraser operates a large sawmill in Terrace with an annual capacity of approximately 650 000 cubic metres. The Kalum TSA contributes about 5 percent of its annual requirement.

Bell Pole has closed their post and pole facility within the TSA. Terrace Pre-Cut conducts custom drying of Skeena Cellulose lumber. Forwest operates a small scale, high quality veneer facility which gets its supply largely from Vancouver Island because the timber in the Kalum TSA is not of suitable quality or species for this facility. There are also a number of other small manufacturing facilities within the TSA.

District staff note that the Small Business Program has an ongoing problem with locating facilities to process the small piece size products harvested under these licences. Annually, 10 000 cubic metres of wood harvested in the Kalum TSA consists of small piece sizes which are unsuitable for processing at local mills and must be transported to Smithers for processing. I have noted my recommendations regarding this concern below under *proposed facilities*.

I have reviewed the information presented regarding timber processing facilities and conclude that there is a high level of demand for the majority of the timber harvested in the Kalum TSA, notwithstanding that the bulk of the timber products are pulp quality logs. I do not foresee any issues which pose a concern to timber supply.

- proposed facilities

Currently, work is underway in Prince Rupert to restart Skeena Cellulose's 'B' mill with an expected fall 1999 restart date. Although the mill is outside the TSA, the reactivation would have a positive effect within the TSA on pulp log utilization, pulp log purchases by Skeena Cellulose, and community stability. West Fraser Mills recently converted one shift at their Terrace mill to pulp log merchandising and whole log chipping, and has agreed to process small logs into wood chips for the Skeena Cellulose mill in Terrace. Classic Doormart has been

issued a 250 000 cubic metre value added timber sale and plan to build a local chop line, finger jointing facility to supply products to their Richmond facility.

District staff note that there is a local need for a facility able to utilize small tops and commercial thinnings. Regional staff confirm that this is a need that is not confined to the Kalum TSA and currently small logs originating in the neighbouring Kispiox TSA are also shipped to Smithers for processing. I recommend that regional staff continue to monitor supply and demand across the timber supply units in the region for these small wood products. As discussed earlier under *commercial thinning*, timber supply in the Kalum TSA is not sensitive to the presence or absence of commercial thinning and therefore the absence of a local facility does not pose a risk to timber supply, although it should be considered during any economic analysis of incremental silviculture programs.

For the purposes of this determination, I am satisfied that there are no issues identified with respect to proposed facilities that would impact timber supply for this determination.

- pulpwood facilities

Skeena Cellulose operates a large kraft pulp mill in Prince Rupert which employs six hundred and fifty people. The plant produces 285 000 tonnes of northern bleached softwood kraft from its 'A' mill. The 'B' mill, which is not currently in operation, increases the total production to 450 000 tonnes.

Eurocan Pulp and Paper Company Limited, a subsidiary of West Fraser, operates a large kraft mechanical pulp plant in Kitimat. The plant employs seven hundred people. The plant produces over 300 000 metric tonnes of linerboard and more than 100 000 metric tonnes of kraft paper every year.

This information confirms for me that there is high demand locally for the pulp quality logs which are the main product from the Kalum TSA.

- (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;**

Economic and social objectives

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

The Minister stated in his letter of July 28, 1994, that “any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.” He

placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the potential impacts of commercial thinning on the timber supply in the Kalum TSA and this has been discussed in detail under *commercial thinning*. I have also reviewed the opportunities for harvesting in previously uneconomical areas and, as discussed under *economic and physical operability*, there is potential in the future for increases in timber supply should the opportunities for helicopter logging be better quantified. I have included some instruction to district staff for the purposes of future determinations. Given the current level of uncertainty, a partition associated with helicopter harvesting would not be appropriate at this time.

Another possible application of partitioning within the Kalum TSA would be to partition between the old growth and second growth areas in order to require commercial thinning harvests. I note that I consider such a partition appropriate only if I foresee difficulties in attaining the cut level without ensuring that harvesting is occurring in both types of areas. This is not the case in the Kalum TSA. Analysis also illustrates to me that the timber supply is not sensitive to the presence or absence of commercial thinning in this TSA. I am supportive of the district's management choices regarding commercial thinning, and in particular am supportive of the diversity of activity and possible benefits to be derived. However, I continue to encourage economic analysis of the return on investment and am unwilling to influence activity one way or another at this time.

- 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.

There were public responses received to both the information report and data package, and to the timber supply and socio-economic analyses. The summary of public input is reproduced in full as Appendix 5. I am mindful of the public input received and where possible in this rationale, I have attempted to respond briefly to specific concerns. This section addresses only specific comments related to the social and economic implications of the AAC.

Both the City of Terrace and the Regional District of Kitimat-Stikine support the maintenance of the AAC at its current level and emphasize the importance of better information with respect to factors such as site productivity, given the potential large impact on timber supply of this information. Site productivity was discussed in detail previously in this rationale, and I acknowledge that improved estimates of site productivity could indicate the likelihood of substantially increased future timber supply. As better information becomes available it will be used to assist future determinations.

As discussed under *community dependence on the forest industry*, the City of Terrace expressed concern that the analysis understated the importance of forestry to the region. I have reviewed their concern and conclude that the analysis used the best information available regarding the socio-economic dependence of communities on the harvest levels in the Kalum TSA. Regardless of the exact employment and revenue figures, I recognize that declining harvest levels will have an impact on communities such as Terrace which are dependent on the forest industry. Inherent in any timber supply analysis is the objective that 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. I am confident that the analysis modelled these objectives appropriately and that the base case harvest forecast presents an appropriate balance among short-, mid- and long-term timber supply.

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

Abnormal infestations and salvage

- unsalvaged losses and salvage program

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

Estimates for unsalvaged losses account for epidemic (abnormal) infestations that are not incorporated into yield estimates used in the analysis. 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. Losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted under *regenerated stand volumes and site productivity estimates*.

The timber supply analysis for the Kalum TSA assumed 2 500 cubic metres per year unsalvaged loss due to fire. The loss due to wind was assumed to be 14 000 cubic metres per year, 7 000 cubic metres of which remains unsalvaged. These windthrow and fire estimates were derived from district records and past experience with salvage within the TSA. The figures constitute the best available information and I am satisfied that these factors were adequately accounted for in the timber supply analysis.

Reasons for Decision

Some of the factors discussed previously in the rationale can be grouped into those which indicate the timber supply as projected in the base case is overestimated and those which indicate it is underestimated. Further, I have grouped them according to whether these factors can be quantified (i.e. I know a hectare, volume or percentage value with reasonable certainty), or are currently unquantifiable (i.e., I am aware of only the approximate order of magnitude for the impact).

At present, there are no quantifiable factors which indicate the timber supply as projected in the base case may be underestimated.

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

- **Site index/site productivity:** There is a strong likelihood that site index/site productivity estimates are low within the Kalum TSA. Sensitivity analyses which tested upward adjustment of inventory site index estimates for 20-60 year old stands, as well as interim adjustment factors for the remaining old growth (not just the hemlock within the CWH zone that was included in the base case) illustrated a significant upward pressure on both mid-term and long-term timber supply. If it is appropriate to adjust regeneration growth performance by the amounts suggested by the studies, then mid-term and long-term timber supply increase significantly relative to the base case. However, there is some uncertainty about the applicability to the Kalum TSA specifically of the site index adjustments developed using samples from around the province. In addition, the small immature stand sample size in the inventory audit can be used appropriately only as an indication of a trend, not as an accurate prediction of future performance. I am confident that site productivity is underestimated in the Kalum TSA beyond the adjustments applied in the base case, but cannot say with certainty exactly how much it should be adjusted or how management practices will allow us to attain these maximum rates of productivity. I am weighing this into my decision in that I have reasonable confidence that there is an upward pressure. As better information becomes available the impact of site productivity will hopefully be more quantifiable for future analyses.
- **Regeneration delay:** The analysis modelled regeneration delays of 3 years for good and medium sites and 6 years for poor sites. District staff note that there is a trend towards reduced regeneration delays throughout the Kalum TSA but the impact of this on timber supply has not been quantified. I requested additional sensitivity analysis around this factor subsequent to the determination meeting and this will be discussed below.

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

- **Woodlot licences:** To account for issued woodlot licences, a reduction of 4 316 cubic metres annually must be applied to the base case initial harvest level and continued throughout the analysis horizon. In addition, 1 068 hectares must be permanently removed from the timber harvesting land base.
- **Backlog NSR:** There are 4 431 hectares of backlog NSR which were assumed in the base case to be rehabilitated and returned to the timber harvesting land base. District staff note that 1 500 hectares of this backlog NSR are marginally productive areas which are not economically feasible to rehabilitate and the hectares will remain not sufficiently restocked. I note that these hectares, while not fully restocked with coniferous species will support some level of stocking (e.g., 400 to 500 stems per hectare) and thus will still contribute to timber

supply for the TSA, but at a somewhat reduced level. Although the removal of 1 500 hectares from the timber harvesting land base would infer a downward pressure of approximately 1.5 percent, in reality I approximate this to be an impact of less than or equal to 1 percent downward pressure on the long-term timber supply. There is no impact expected on short-term timber supply.

The following factors have been identified as indicative of a potential overestimation of the timber supply to degrees that currently cannot be quantified with accuracy.

- **Identified Wildlife:** To account for the impact of implementation of the Identified Wildlife Management Strategy, in accordance with provincial direction I have accepted an overestimation of up to one percent of the timber supply throughout the forecast period in the analysis. This factor is unquantified because wildlife habitat areas and associated practices have not been implemented, and I cannot know with certainty their exact impact.
- **Volume estimates for existing stands:** The inventory audit conducted since the last determination has confirmed the statistical validity of inventory volumes in the Kalum TSA, but district staff are still concerned that operational volumes are on average lower than those indicated by inventory data. These concerns were expressed at the time of the last determination and the audit was thereafter conducted to address the concerns. Since the audit validated the inventory, I am thus confident at this time that the inventory is accurate, and can only weigh the potential risk into my determination. To attempt to alleviate the district concern, I requested that some further analysis be done of the inventory audit results, which will be discussed below.

I instructed BCFS staff to undertake some further analysis of regeneration delay and volume estimates for existing stands, in an attempt to provide a better assessment of the timber supply implications of the additional information which was presented in the determination meeting for these two factors. I have incorporated the information from the additional analysis into my determination, as described below:

- **Regeneration delay:** I requested that additional sensitivity analysis be conducted to determine the effect of reducing regeneration delays from 3 years to 2 years for good and medium sites and from 6 years to 4 years for poor sites. This resulted in an increase to the mid-term harvest level of approximately 2.7 percent or to 397 500 cubic metres per year from 387 000 cubic metres per year. There was no impact to short-term or long-term timber supply. These results indicate timber supply is potentially slightly more stable than presented in the base case.
- **Volume estimates for existing stands:** Some further analysis was done to attempt to pinpoint any possible discrepancies in the inventory audit data. The analysis separated the audit plots into coastal and interior plots to evaluate if there was a noticeable difference between the two. The analysis showed no difference between the coastal and interior plots. Within each grouping (coastal and interior), the analysis further isolated those plots in stands greater than 140 years of age from those in stands less than 140 years of age. Within the old growth stands, there was no noticeable difference between coastal and interior plots.

Within the younger stands, the small number of plots at this level of disaggregation curtailed any ability to draw conclusions about the data.

In reaching my AAC determination for the Kalum TSA, I have considered all of the factors presented above, and I have reasoned as follows.

The small upward pressure (approximately 1 percent) of the improved regeneration delay performance is essentially offset by the equivalently small downward pressure (approximately 1 percent) as a result of the non-rehabilitated backlog areas. Both of these pressures affect timber supply in the mid- to long-term only.

I am confident that timber supply is more stable than shown by the base case, particularly in the mid- to long-terms, as a result of the likelihood that site productivity estimates for the TSA are too low. This significant upward pressure on timber supply offsets the impact of the Integrated Wildlife Management Strategy and possibly a large part of the inventory concern even if it were to be validated at some time in the future.

I acknowledge the district concerns with respect to existing stand volumes, but note that the results of the inventory audit demonstrate the overall accuracy of the inventory volumes, and therefore there is a limited degree of risk that I can reasonably assign to the existing volume concerns. Given a limited degree of risk, it is reasonable to expect that higher stand volumes in the mid-term as a result of the higher site productivity than modelled is large enough to offset any reduced existing stand volumes in the short- and mid-term. Although timber supply was shown to be sensitive to uncertainties in existing stand volumes, in any event there is no risk posed to supply during the first decade of the analysis, nor during the five year period for which this determination is effective. I am confident that there is minimal risk associated with the existing stand volume concern, and am not prepared to give it any further weight for the purposes of this determination.

There is also the issue of the Fiddler Creek area, which contributes approximately one percent of the timber harvesting land base and which was assigned in the analysis a biodiversity emphasis option which is lower than that expected to be assigned to the final landscape unit. The analysis shows that there is a less than 1 percent impact to the mid- term timber supply should the entire timber harvesting land base be assigned more constraining BEOs. As discussed earlier in this rationale, I consider this downward pressure to be of negligible impact on short-term timber supply, and further that it is likely in the future to be more than offset by the potentially higher operability present in that area. I have therefore made no adjustments to account for this factor.

I have considered all the factors discussed in this rationale and conclude that, even though there is always some uncertainty, the remainder of the base case assumptions appropriately represent current management, or contain such small uncertainties as to require no adjustments. I believe the analysis to be a reasonable reflection of operating conditions in the TSA.

In consideration of all of this information, there is no compelling reason to adjust the AAC at this point, other than to remove the volume associated with issued woodlots to reflect the removal of

that area from the land base of the TSA. This associated reduction in the AAC is in reality an administrative step which will result in no net change locally to timber supply.

In addition to the information above which has been factored into the determination, there is another factor which is not being fully weighed into my decision but which does cause me to have some optimism for future timber supply in the Kalum TSA. The potential for helicopter logging, as discussed in full elsewhere in this rationale, requires further study in order that better and more quantifiable information can be factored into future analyses.

Furthermore, there are two processes which will impact on future determinations. In the case of the Nisga'a Final Agreement, I will be required to revisit the Kalum TSA determination once the Agreement has been fully ratified and the treaty becomes effective. This is likely to occur sooner than five years from now. It is also possible that results from the Kalum LRMP process will be available at that time such that I can factor outputs from this process into the new determination.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the Kalum TSA by establishing an AAC of 459 684 cubic metres.

This determination is effective January 1, 2000, 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. I again acknowledge the Nisga'a Final Agreement and the potential future impact on the Kalum TSA should it be implemented. When the Final Agreement is concluded and implemented, I am prepared to revisit the AAC for the Kalum TSA.

Implementation

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

- undertake a comprehensive review of helicopter operability;
- perform surveys to obtain better information about the extent of backlog NSR. BCFS staff should make clear the management objectives with respect to those areas which will not be

rehabilitated, and obtain more quantitative information about the productivity of these sites for the next timber supply review (i.e., a more accurate description of the expected forest cover);

- evaluate and monitor seed orchard capacity with respect to seed planning zones for coastal hemlock;
- continue ongoing development of the commercial thinning program while refining the investment strategy by subjecting it to rigorous economic analysis;
- undertake further work in cooperation with Resources Inventory Branch to attempt to isolate concerns regarding operational timber volumes for existing stands.
- work with Research Branch staff to assess the degree of applicability of provincial site index adjustments to the Kalum TSA, as well as the indications that inventory inaccuracies have led to underestimation of site productivity in 20- to 60- year old stands.

A handwritten signature in dark ink, appearing to read "L. Pedersen", followed by a horizontal line.

Larry Pedersen
Chief Forester
November 9, 1999

Appendix 1: Section 8 of the *Forest Act*

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

8. Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for
 - (a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest agreement 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 a result set out under section 39 (1) (a) to (d),

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

- (c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and
 - (d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.
- (3) If
 - (a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and
 - (b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

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

- (4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).
- (5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to
 - (a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area,
 - (b) different types of timber and terrain in different parts of private land within a tree farm licence area, and
 - (c) gains in timber production on Crown land that are attributable to silviculture treatments funded by the government of British Columbia, the federal government, or both.
- (6) The regional manager or district manager must determine a volume of timber to be harvested from each woodlot licence area during each year or other period of the term of the woodlot licence, according to the licence.

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

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

Purposes and functions of ministry

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

Documents attached:

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

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

Appendix 5: Summary of Public Input

- (7) The regional manager or the regional manager's designate must determine a volume of timber to be harvested from each community forest agreement area during each year or other period, in accordance with
 - (a) the community forest agreement, and
 - (b) any directions of the chief forester.
- (8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider
 - (a) the rate of timber production that may be sustained on the area, taking into account
 - (i) the composition of the forest and its expected rate of growth on the area,
 - (ii) the expected time that it will take the forest to become re-established on the area following denudation,
 - (iii) silviculture treatments to be applied to the area,
 - (iv) the stand of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
 - (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
 - (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,
 - (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
 - (c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,
 - (d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and
 - (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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File: 10100-01

JUL 28 1994

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

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

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

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

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

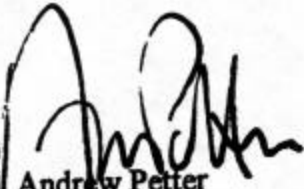
Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time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

.../2

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

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

Yours truly,



Andrew Petter
Minister



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

Larry Pedersen
Page 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

Kalum Timber Supply Area Timber Supply Review

Summary of Public Input

BC Ministry of Forests
Kalum Forest District
200-5220 Keith Avenue
Terrace, BC
V8G 1L1

November, 1999

This is a summary of the public input received on the Timber Supply Review in the Kalum Timber Supply Area. This summary does not assess the feasibility or validity of the input or whether it relates to the clearly defined mandate of the chief forester in the allowable annual cut determination.

Kalum Timber Supply Area

Background

As part of the review of timber supply in the Kalum Timber Supply Area, two opportunities were provided for public input. The first followed release of the Kalum Timber Supply Area *Data Package* and *Information Report* in January 1998. The *Information Report* was a non-technical summary of the draft data and management assumptions that were to be applied in reviewing the timber supply for the Kalum Timber Supply Area. A 30-day review period, ending February 26, 1998, was provided for the public to comment on these documents.

On March 31, 1999, the British Columbia Forest Service released the *Kalum Timber Supply Area Analysis Report* and *Public Discussion Paper*. The public was encouraged to review and comment on the accuracy of the information in these documents and to provide additional information during the 60-day review period that ended May 31, 1999.

This report summarizes the input received during both public review periods. This information was provided to the chief forester for his consideration when he reviewed the allowable annual cut for the Kalum Timber Supply Area. The first section of this summary outlines the public review process implemented by the Forest Service, and describes the types of public input received. The second section summarizes the public input in sufficient detail to indicate the range of input received. The original submissions (with personal identifiers removed in accordance with the *Freedom of Information and Protection of Privacy Act*) can be reviewed at the Kalum Forest District office in Terrace.

Public Review Process and Response

Kalum Forest District staff actively solicited public input on the Timber Supply Review in the Kalum Timber Supply Area through the following actions:

- direct mail-out of the *Information Report*, *Data Package* and *Public Discussion Paper* to 31 key organizations in the Kalum Timber Supply Area or adjacent timber supply areas.
- the *Data Package* and the *Kalum Timber Supply Area Analysis Report* were available at the district office and the Terrace and Kitimat public libraries.
- meetings regarding both the *Data Package* and *Analysis Report* were held with representatives from local government, the forest industry and other interest groups, as well as individuals.
- two meetings were held with the local newspaper to encourage articles.

As Table 1 shows, 54 individuals attended the information sessions. The Kalum Forest District also received seven written submissions on the *Data Package* and six submissions on the *Timber Supply Area Analysis Report* (see Appendix 1).

Activity (No. of participants)	Date
Information sessions	
<u>Local government</u>	
Terrace City Council (16)	Feb. 1998 & May 3, 1999
Kitimat Village Council (14)	Feb. 1998 & Apr. 26, 1999
Regional District of Kitimat-Stikine staff (3)	Feb. 1998 & Apr. 27, 1999

Continued

Kalum Timber Supply Area

Activity (No. of participants)	Date
<u>Interest groups</u>	
Skeena Cellulose (5)	Feb. 1998 & May 4, 1999
West Fraser Mill (4)	Feb. 1998 & May 4, 1999
Nisga'a Interim Protection Measures Committee (12)	11-May-99

Table 1: Participation in public information activities

Public Input

In this section, public input on the information presented in the Timber Supply Review documents for the Kalum Timber Supply Area is summarized under the following headings:

- Data Package (and Information Report)
- Timber Supply Area Analysis Report (and Public Discussion Paper)
- Other comments

Data Package

Land Base Factors

Several submissions comment on factors that affect the size of the timber harvesting land base.

Skeena Cellulose says sawlog content and maximum ferrying distance are more critical than merchantable volume for identifying areas suitable for helicopter logging, and requests a sensitivity analysis that includes those two factors. Bell Pole expresses support for an analysis of potential impacts of heli-logging in areas currently considered inoperable, noting that operability is a function of economics and can therefore change over time. Skeena Cellulose also asks for clarification about how much operable area results from the inclusion of non-conventional methods.

Bell Pole states its disagreement with excluding from the timber harvesting land base all stands over age 100 with volumes less than 250 cubic metres per hectare. The company says the age cut-off should be 200 years since trees may achieve that minimum volume of 250 cubic metres per hectare as they grow past the age of 100. Skeena Cellulose notes that the site index limits used to define low productivity sites appear to be low and suggests these numbers be re-examined to reflect existing harvestable constraints.

Three submissions say the estimate of 8.8 per cent to account for productivity losses from future roads, trails and landings is excessive. Skeena Cellulose provides a summary of non-productive areas from recent silviculture prescriptions and says the summary indicates a 6.1 per cent reduction to the timber harvesting land base would be more reasonable. Bell Pole says the figure of 8.8 per cent was carried forward from the previous Timber Supply Review and needs to be reviewed based on current practices.

Skeena Cellulose questions why the correlation between terrain classification and environmentally sensitive areas (for soils) was only done for terrain class V and not class IV. The company asks how deductions from the land base for environmentally sensitive areas would have been impacted by the inclusion of class IV.

Expected Rate of Growth and Productivity

Skeena Cellulose questions how the new site index figures will be incorporated into the timber supply analysis and asks for the rationale for the operational adjustment factors used. The company agrees that to define a minimum harvestable age, a minimum volume of 250 cubic metres per hectare is reasonable, but requests sensitivity analyses using minimum diameters of 20, 30 and 35 cm.

Kalum Timber Supply Area

Silviculture Systems

Kitamaat Village Council says that since educated assumptions are used throughout the section on current forest management assumptions, they should also be used to project the inclusion of partial cutting systems for the purposes of the analysis.

An individual submission says a 100-year rotation should be considered for the 880 hectares of spruce in the Kitimat Valley because there is a glut of pulp on the market now. This individual says if these stands have survived spruce weevil infestation and are healthy, they could be the basis of a strategy to re-introduce the historical stand composition.

Biodiversity

According to Skeena Cellulose, the requirements for landscape level biodiversity need clarification. The assignment of biodiversity emphasis options to landscape units is known, says this submission, but the management objectives aren't yet known.

Wildlife

Skeena Cellulose's submission says the company is unclear how wildlife netdowns will be dealt with in the analysis. The company also states its disagreement with the assumption that 70 per cent of the timber supply area has been harvested without the recommended wildlife tree retention occurring. An estimate of 50 per cent is more accurate, according to Skeena Cellulose.

BC Environment says mountain goats should be mentioned in the *Information Report*, since current practices include consideration of goat habitat.

Visually Sensitive Areas

Skeena Cellulose requests a sensitivity analysis that uses a green-up height of three metres, compared to the standard five metres.

First Nations Issues

An individual submission states opposition to further clearcut logging, especially in the Jesse Lake and Wathlsto Creek watersheds, and in general is concerned that the Haisla people receive very little economic benefit from harvesting in their territory. This individual asks for a commitment that this issue will be considered in future land use decisions.

Kitamaat Village Council ask for a wording change so that the results of impact assessments and traditional-use surveys will be "implemented" not just "considered" in the Timber Supply Review. The Council also requests that silviculture jobs be separated from logging-related jobs in the analysis.

Community Dependence

The City of Terrace's economic development officer says the economic profile in the *Information Report* understates the importance of forestry to the region and especially to Terrace where 18 per cent of the labour force is directly employed in the forest industry. According to this submission, the inclusion of Kitimat in the regional labour force skews the figures. This submission also expresses the opinion that the figures for indirect and induced jobs are extremely underestimated, noting that the usual multiplier is 2.

Timber Supply Area Analysis Report

Existing Forest Inventory

In its submission, Skeena Cellulose says timber supply over the next several decades is very sensitive to uncertainty in estimates of existing stand volumes. The company says overestimation is possible due to uncertainties in inventory classifications and issues around decay, waste and breakage factors. As well, this submission notes that historical harvested volumes are lower than inventory volume estimates.

Kalum Timber Supply Area

Site Productivity Estimates

The Nisga'a Tribal Council submission notes that the base case scenario incorporates the findings of a study on the productivity of managed hemlock stands. Referring to the study, the Council says the productivity adjustments suggested by the study only apply where management practices ensure that stands are free from factors that hinder tree growth, such as competition from pests and other vegetation. Since current forest management practices do not ensure these conditions, the Council says it is premature to adjust estimates of site productivity for regenerated stands of hemlock.

Land Base Factors

Skeena Sawmills expresses concern there are no area reductions for environmentally sensitive areas for recreation (Er), wildlife (Ew) and watershed (Eh) values. The company acknowledges that forest cover requirements may be acceptable to account for Er values, but is of the opinion that some reduction for Eh appears necessary, given the number of areas of water use in the Kalum Timber Supply Area. This submission also says a 50 per cent reduction for environmentally sensitive areas appears low based on a small sample.

Skeena Sawmills also comments on the reduction from the land base for future roads, trails and landings. The company says the 8.8 per cent reduction appears overestimated and that soil disturbance does not necessarily correlate with loss of productivity.

The City of Terrace expresses concern that while the size of the timber harvesting land base may be larger than estimated, it may also be smaller. The City says the increasing cost of harvesting some areas could have significant impacts on the long-term allowable annual cut, and therefore harvesting costs should be a priority for the Forest Service. The City also notes that the removal of First Nations land claim areas from the Kalum Timber Supply Area does not necessarily imply its removal from the region's timber supply.

Biodiversity and Wildlife

Skeena Cellulose states its agreement with 10 per cent retention of trees in riparian management zones. The company notes that the analysis didn't provide for any retention along smaller streams (classes S4, S5 and S6) and questions what the impact on timber supply would be if retention were applied to these stream classes. As well, Skeena Cellulose says it would agree that 75 per cent of the requirements for wildlife tree patches can be met outside the timber harvesting land base if a 10 per cent retention were applied to S4, S5 and S6 streams.

Skeena Cellulose also notes that critical wildlife habitat outside riparian management areas and its impact on timber supply is not adequately addressed in the analysis. The company questions how early seral requirements were applied in the sensitivity analysis and requests a copy of that analysis by landscape unit.

Other Comments

Several submissions commented on factors or issues other than those specifically covered by Timber Supply Review documents. These comments are summarized in this section.

Timber Supply Review Process

The City of Terrace says the Timber Supply Review should recognize that its primary purpose is to provide an environment of long-term stability and therefore it must incorporate an estimate of impacts from impending decisions (e.g., the Nisga'a Treaty, LRMPs). This will help the public understand the impacts of various decisions, in the City's opinion. Bell Pole's submission requests a sensitivity analysis of the impacts of the Nisga'a Treaty. The City of Terrace also says the Timber Supply Review must be improved as a public policy tool that identifies challenges to and rewards for timber supply increases.

Kalum Timber Supply Area

The Nisga’a Tribal Council says one of the goals of the Timber Supply Review process is to identify where more information is needed to better manage forest resources. The Council notes that the process has failed to address the pine mushroom industry, both its economic contribution and its effect on the timber harvesting land base. The Council says regulation of the pine mushroom resource is inevitable and urges the Ministry of Forests to start addressing this issue.

The District of Kitimat expresses its appreciation for the open and inclusive process, and confidence that decisions will take into account broader public interests.

Skeena Cellulose says a 20-year plan would be beneficial to confirm the proposed base case, as it would show if the projected harvest volume can be located on the landscape.

BC Environment recommends a number of changes to the sensitivity analyses proposed in the *Data Package* and Skeena Sawmills notes several minor errors in the *Analysis Report*.

Harvest Levels

The City of Terrace expresses its support for maximizing the allowable annual cut within the confines of a “sustainable” harvest level so forest sector activity levels and employment can be maintained or increased. Both the City and the Regional District of Kitimat-Stikine support maintenance of the allowable annual cut at current levels and urge that more resources be allocated for research on topics such as site productivity so harvest levels can be maintained or increased in the future.

The Nisga’a Tribal Council are of the opinion that a significant downward adjustment to the allowable annual cut is urgently required due to the long history of overcutting and mismanagement of Nisga’a forests.

Appendix 1

Submissions received by the Kalum Forest District

Submissions received on the Data Package

First Nations

Kitamaat Village Council

Local government

City of Terrace

Government agencies

BC Environment

Industry

Skeena Cellulose Inc., Terrace

Bell Pole Company, Terrace

General public

two individual submissions

Submissions received on the Timber Supply Area Analysis Report

First Nations

Nisga'a Tribal Council

Local government

Regional District of Kitimat-Stikine

District of Kitimat

City of Terrace

Industry

Skeena Cellulose Inc., Terrace

Skeena Sawmills (West Fraser Mills Ltd.), Terrace