

**BRITISH COLUMBIA
MINISTRY OF FORESTS, LANDS AND
NATURAL RESOURCE OPERATIONS**

**Morice
Timber Supply Area**

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

Effective March 16, 2015

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Table of Contents

Objective of this document.....1

Acknowledgement.....1

Statutory framework.....1

Description of the Morice TSA.....1

History of the AAC2

New AAC determination.....3

Information sources used in the AAC determination.....3

Role and limitations of the technical information used.....6

Guiding principles for AAC determinations7

The role of the base case10

Base case for the Morice TSA.....10

Consideration of factors as required by Section 8 (8) of the *Forest Act*12

 Land base contributing to timber harvesting13

 - general comments13

 - area-based tenures.....13

 - economic and physical operability.....14

 - riparian areas.....14

 - wildlife tree retention.....15

 -existing forest inventory16

 Expected rate of growth.....16

 existing natural stand yields16

 managed stand yields17

 - minimum harvestable volumes19

 - marginally economic stands.....20

 - utilization standards21

 - log grade adjustments22

 Integrated resource management23

 - general comments23

 - wildlife habitat23

 wildlife analyses.....24

 - landscape-level biodiversity26

 Other information26

 - First Nations consultation26

 Areas of special interest27

 Harvest performance29

 - climate change30

 - economic and employment implications.....30

 - alternative harvest forecasts.....31

 Economic and social objectives.....32

 Minister’s letters32

 Mid-term Timber Supply Action Plan32

 - summary of public input33

 Abnormal infestations, devastations and salvage programs34

 - non-recoverable losses.....34

 - mountain pine beetle infestation35

Reasons for Decision.....37
Determination.....39
Implementation.....40
Appendix 1: Section 8 of the *Forest Act*41
Appendix 2: Section 4 of the *Ministry of Forests and Range Act*44
Appendix 3: Minister’s letter of July 4, 2006.....45
Appendix 4: Minister’s letter of October 27, 201047

List of Tables

Table 1. Apportionment of the AAC.....3
Table 2. List of factors accepted as modelled12

Objective of this document

This document provides an accounting of the factors I have considered and the rationale I have employed in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Morice Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Acknowledgement

For preparation of the information I have considered in this determination, I am indebted to staff of the BC Ministry of Environment and BC Ministry of Forests, Lands and Natural Resource Operations (FLNR) in the Nadina Natural Resource District, the Skeena Natural Resource Region, and the Forest Analysis and Inventory Branch (FAIB). I am also grateful to the local residents, First Nations, local governments and licensees who contributed to this process.

Statutory framework

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

Description of the Morice TSA

The Morice TSA is situated on the western edge of British Columbia's (BC) central interior plateau and covers approximately 1.5 million hectares. The TSA extends from the most northerly tip of Babine Lake in the north to Ootsa and Whitesail Lakes in the south. The Morice TSA is administered by the Nadina Natural Resource District in Burns Lake.

Eight First Nations have traditional territories that overlap the Morice TSA: Yekooche First Nation, Cheslatta Carrier Nation, Lake Babine Nation, Moricetown Band, Office of the Wet'suwet'en, Nee Tahi Buhn Band, Skin Tyee Nation and Wet'suwet'en First Nation.

The TSA has a gentle, rolling landscape in the north and east that becomes more mountainous in the southwest. The overall climate, which includes cool summers and cold winters, reflects the transition between coastal and interior conditions. This climate supports forests that are dominated by lodgepole pine, hybrid spruce, and subalpine fir (balsam). Minor amounts of trembling aspen, amabilis fir, western hemlock and mountain hemlock also occur in the TSA.

About 935 000 hectares or 62 percent of the Morice TSA land base is considered productive Crown forest land. After all other resource requirements have been accounted for, about 649 000 hectares, or 43 percent of the total TSA area, are considered available for timber harvesting. The boundary of the TSA includes: several protected areas and parks; private land, Indian Reserves, and area-based tenures, such as community forests, and woodlots. These areas do not contribute to the TSA timber supply.

The Morice TSA provides habitat for a wide variety of wildlife including: deer, elk, moose, mountain goat, caribou, black bear, cougar, as well as many fish species. Species at risk in the TSA include: caribou, grizzly bear, wolverine, fisher, and bull trout.

In addition to supporting forestry, the forests of the Morice TSA supply summer forage to the beef-ranching industry. Recreation opportunities in the TSA include mountain biking, all-terrain vehicle use, hiking, hunting, camping, boating, cross-country skiing and snowmobiling.

Houston, with a population of 3129 (BC Stats, 2013) is the largest community in the TSA. The remainder of the population lives in smaller communities including Topley and Granisle, or on the many ranches and farms along the Highway 16 corridor and in the area from Owen Lake to Francois Lake.

The forest industry is the main economic driver of the TSA. According to the British Columbia Local Area Dependencies: 2006, the forest sector accounts for 31 percent of the after-tax income of Houston residents. Other sectors providing employment in the Houston area include: the public sector (23 percent), mining (9 percent), construction (5 percent), tourism (5 percent), and agriculture (2 percent).

Timber processing facilities associated with the Morice TSA, which are located in the Houston area, include a large lumber mill; a smaller sawmill, a pellet mill and two lumber remanufacturing plants. In total, the sawmill and pellet plant have the capacity to process about 2.2 million cubic metres of wood annually. Since the last TSR, one sawmill in Houston has announced a permanent closure due to the decreasing availability of salvageable pine and the projected decrease in mid-term timber supply. In addition to timber processing, there is one copper/molybdenum mine in the TSA.

History of the AAC

In 1981, the Morice TSA allowable annual cut (AAC) was set at 2 000 000 cubic metres. In 1996, the chief forester set the AAC at 1 985 815 cubic metres, a level which essentially maintained the previous AAC after accounting for volume issued under woodlot licences. In October 2002, a new AAC of 1 961 117 cubic metres was established which accounted for 24 698 cubic metres for additional woodlots.

On February 1, 2008, following an expedited timber supply review in response to the mountain pine beetle (MPB) epidemic, the AAC was set at 2 165 000 cubic metres, which included a 550 000 cubic metre partition attributable to non-pine species. The chief forester indicated that the intent of the partition was to enable the on-going salvage of dead pine, while ensuring that non-pine species were conserved to support mid-term timber supply.

The Morice TSA is subject to the Morice and Lakes Innovative Forest Practices Agreement (IFPA). In 2008, a 200 000 cubic metre per year increase in AAC was approved for the Morice TSA under the IFPA. The increase was based on several factors including harvest priorities, lower operational adjustment factors (OAF 1), lower stump heights, and recognition of genetic gain in applicable existing managed stands. The IFPA program ends in 2015 on a province-wide basis. Much of the additional volume has already been harvested, with the exception of two licensees who still have some remaining uplift volume to harvest.

Table 1 shows the apportionment of the AAC by the Minister of Forests, Lands and Natural Resource Operations, effective March 14, 2007.

Table 1. *Apportionment of the AAC*

Apportionment	Volume (m ³)	Percent of AAC
Forest Licences Replaceable	1 530 260	70.68
First Nations Woodlands Tenure	55 222	2.55
BCTS Timber Sale Licences	339 410	15.68
Community Forest Agreements and Woodlots	32 000	1.48
Forest Service Reserve	208 108	9.61
Total	2 165 000	100.0

New AAC determination

Effective March 16, 2015, the new AAC for the Morice TSA will be as follows:

- From March 16, 2015 to March 15, 2020, the AAC will be 1 900 000 cubic metres, of which no more than 1 600 000 cubic metres are attributable to live trees;
- From March 16, 2020 until the next determination, the AAC will be 1 600 000 cubic metres.

This AAC will remain in effect until a new AAC is determined, which must take place within 10 years of this determination.

Information sources used in the AAC determination

- Bahuguna, Devesh, Stephen J. Mitchell, and Yosune Miquelajauregui. "Windthrow and recruitment of large woody debris in riparian stands." *Forest ecology and management* 259, no. 10 (2010): 2048-2055.
- B.C. Executive Council Chambers, 1987. Order in Council #2245 Fulton River Reserve.
- B.C. Ministry of Forests. 2013. *Provincial-Level Projection of the Current Mountain Pine Beetle Outbreak: Update of the infestation projection based on the Provincial Aerial Overview Surveys of Forest Health conducted from 1999 through 2012 and the BCMPB model (year 10)*, A. Walton.
- B.C. Ministry of Forests. 1998. Procedures for factoring visual resources into timber supply analyses. Victoria, B.C. REC - 029.
- B.C. Ministry of Forests. 2003. Bulletin – modelling visuals in TSR III. Forest Practices Branch.
- B.C. Stats. Population Estimates, British Columbia and Sub-Provincial. Internet web page. <http://www.bcstats.gov.bc.ca/StatisticsBySubject/Demography/PopulationEstimates.aspx>.
- Beaudry, P. 2010. Identification of watershed hazards, sensitivities and risks for sixty-two watersheds in the Lakes TSA. Lakes IFPA Sustainable Forest management Plan.

- Canfor Corporation. 2013. News Release. Canfor Corporation Announces the Closure of Quesnel Sawmill and Tenure Exchange Agreement with West Fraser
<http://www.canfor.com/media-center/news-press-releases/2013/10/24/canfor-corporation-announces-the-closure-of-quesnel-sawmill-and-tenure-exchange-agreement-with-west-fraser>.
- Chief Forester tour of the Morice TSA and discussions with BC Ministry of Forests, Lands and Natural Resource Operations staff on July 7, 2014.
- Coombes, T. and Bernard, A. 2009. Nadina Road Widths Project. Burns Lake, B.C. unpublished report.
- Coombes, T., Bernard, A., and Nigh, G.D. 2010. Forest Access Road Widths in the Lakes Timber Supply Area. B.C. Journal of Ecosystems and Management.
- Daust, D. and K. Price. 2011. Projected climate change impacts in the Nadina Forest District.
- Daust 2010. Nadina climate change vulnerability assessment: summary of technical workshop 2—impacts on trees and timber.
- Daust, D. and D. Morgan. 2011. Management strategies for climate-change adaptation in the Nadina Forest District.
- Doyle, F. 2012. Status of Northern Goshawk Breeding Areas in the Nadina Forest District.
Environment and Land Use Act and regulations - current to February 25, 2015.
Forest Act – Regulations and amendments – current to February 25, 2015.
Forest and Range Practices Act – Regulations and amendments – current to February 25, 2015.
- Forest Practices Board. 2014. Timber Harvesting in Beetle Affected Areas-Is it meeting government's expectations? FPB/SR/44/.
- Forest and Range Evaluation Program Extension Note #17, 2011. State of Stream Channels, Fish Habitats, and Adjacent Riparian Area: RSM to Evaluate the Effectiveness of Riparian Management 2005-2008.
- Heritage Conservation Act* - current to February 25, 2015.
- Hubbard, Rob, Kelly Elder, Chuck Rhoades, Polly Hays, and Bruce Sims. 2014. Ch. 7: Small bugs with big impacts: Ecosystem and watershed-level responses to the MPB epidemic. In Future Forests Webinar Series, Webinar Proceedings and Summary: On-going Research and Management Responses to the Mountain Pine Beetle Outbreak. Proceedings RMRS-P-70. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 80 p. http://www.fs.fed.us/rm/pubs/rmrs_p070.html.
- Johnston, N. T., S. A. Bird, D. L. Hogan, and E. A. MacIsaac. "Mechanisms and source distances for the input of large woody debris to forested streams in British Columbia, Canada." *Canadian Journal of Forest Research* 41, no. 11 (2011): 2231-2246.
- Land Act and regulations* - current to February 25, 2015.
- Letter from the Deputy Minister to All Interior Licensees, Re-Advise notice of upcoming changes to Interior Market pricing System for MPB epidemic, April 1, 2010.
- Letter from the Minister to the Chief Forester, Re: Economic and Social Objectives of the Crown, July 4, 2006.
- Letter from the Minister to the Chief Forester, Re: Economic and Social Objectives of the Crown. October 27, 2010.
- Meeting with licensees, July 8, 2014 in Burns Lake, BC.
- Ministry of Agriculture and Lands-Integrated Land Management Bureau, 2007. Morice Land and Resource Management Plan (LRMP).

- Ministry of Environment, 2013. Order-Mountain Goat Ungulate Winter Range #U-6-003 Morice Timber Supply Area.
- Ministry of Environment. 2004. Notice-Indicators of the Amount, Distribution and Attributes of Wildlife Habitat Required for the Winter survival of Ungulate species in the Morice Timber Supply Area.
- Ministry of Environment. 2004. Notice-Indicators of the Amount, Distribution and Attributes of Wildlife Habitat Required for the Species at Risk in the Nadina Forest District.
- Ministry of Forests and Range Act* - current to February 25, 2015.
- Ministry of Forests, Lands and Natural Resource Operations, April 2014. Morice TSA Timber Supply Analysis Public Discussion Paper. Forest Analysis and Inventory Branch - Victoria, B.C.
- Ministry of Forests, Lands and Natural Resource Operations, July 2013. Morice Timber Supply Area Timber Supply Review Data Package. Forest Analysis and Inventory Branch - Victoria, B.C.
- Ministry of Forests, Lands and Natural Resource Operations, September 2013. RESULTS Monitoring Report-Reforestation Trends by some of the Major Licensees over 10 years (2002-2011). Resource Practices Branch, Victoria, B.C.
- Ministry of Forests, Lands and Natural Resource Operations. 2013. ADM Resource Stewardship Report.
- Ministry of Forests, Lands and Natural Resource Operations, Cut to Cruise database, Timber Pricing Branch.
- Ministry of Forests, Lands and Natural Resource Operations. 2014. Apportionment System-APTR011 Morice TSA. Forest Tenures Branch.
- Ministry of Forests, Lands and Natural Resource Operations. Harvest Billing System-Revenue database.
- Ministry of Forests, Lands and Natural Resource Operations. Forest Tenure Administration (FTA) database.
- Ministry of Forests, Lands and Natural Resource Operations. Forest and Range Evaluation Program Information Management System-database.
- Ministry of Forests, Lands and Natural Resource Operations. Reporting Silviculture Updates and Land Status Tracking System database.
- Ministry of Forests, Lands and Natural Resource Operations. Beyond the Beetle: A Mid-term Timber Supply Action Plan, October 2012.
- Ministry of Lands, Parks and Housing Act and regulations* - current to February 25, 2015.
- Ministry of Sustainable Resource Management, 2004. Order Establishing Provincial Non-Spatial Old Growth Objectives.
- Morice and Lakes IFPA Annual Forestry Plan Report - April 1, 2010 to March 31, 2011.
- Morice Timber Supply Area Rationale for Allowable Annual Cut (AAC) determination, Timber Supply Branch, February 1, 2008;
- Nordin, L., D. Maloney, J. Rex, and P. Krauskopf. P. Tschaplinski, and D. Hogan. 2008. *The Bowron River watershed: A landscape level assessment of post-beetle change in stream riparian function*. Mountain Pine Beetle Working Paper 2008-22 Ministry of Forests and Range, Northern Interior Region, Prince George, BC.
- Province of British Columbia. Growing Fibre, Growing Value, August 2012, Special Committee on Timber Supply.

- Roberge, L. 2007. Procedures for Carrying out Visually Effective Green-up (VEG) Tree Height Assessment in Scenic Areas. Northern Interior Forest Region, B.C. Ministry of Forests and Range. unpublished report.
- Rex, J., Krauskopf, P., Maloney, D., Tschaplinski. 2009. Mountain Pine Beetle and Salvage Harvesting: Small Stream and Riparian Zone Response in the Sub-Boreal Spruce Zone. Extension Note 90. 6p.
- Rex, J. F., D. A. Maloney, P. N. Krauskopf, P. G. Beaudry, and L. J. Beaudry. 2012. "Variable-retention riparian harvesting effects on riparian air and water temperature of sub-boreal headwater streams in British Columbia." *Forest Ecology and Management* 269: 259-270.
- Schnorbus, Markus, Arelia Werner, and Katrina Bennett. Quantifying the water resource impacts of mountain pine beetle and associated salvage harvest operations across a range of watershed scales: Hydrologic modelling of the Fraser River Basin. Vol. 423. Pacific Forestry Centre, 2010.
- Technical review and evaluation of current and expected operating conditions and consideration of information received from First Nations and the public at the AAC determination meeting held with BC Ministry of Forests, Lands and Natural Resource Operations staff in Burns Lake, B.C. on July 8 and 9, 2014.
- Teti, P. 2009. Effects of overstory mortality on snow accumulation and ablation. Canadian Forest Service, Mountain Pine Beetle working paper 2009-15. 24p.
<http://warehouse.pfc.forestry.ca/pfc/30497.pdf>.
- Wildlife Act and regulations* - current to February 25, 2015.
- Winkler, Rita, Sarah Boon, Barbara Zimonick, and Dave Spittlehouse. 2014. Snow accumulation and ablation response to changes in forest structure and snow surface albedo after attack by mountain pine beetle. *Hydrological Processes* 28, no. 2, 197-209.
- West Fraser, 2014. News Release. West Fraser Announces Mountain Pine Beetle Plan.
<http://www.westfraser.com/investors/news/news-releases/west-fraser-announces-mountain-pine-beetle-plan>.

Role and limitations of the technical information used

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

The analytical techniques used to assess timber supply are necessarily simplifications of the real world. Many of the factors used as inputs to timber supply analysis are uncertain, due in part to variation in physical, biological and social conditions. Ongoing scientific studies of ecological dynamics will help reduce some of this uncertainty.

Furthermore, computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Technical information and analysis; therefore, do not necessarily provide the complete answers or solutions to forest management decisions such as AAC determinations. Such information does provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

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

Guiding principles for AAC determinations

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

Given the large number of periodic AAC determinations required for British Columbia's many forest management units, administrative fairness requires a reasonable degree of consistency of approach in addressing relevant factors associated with AAC determinations. In order to make our approach in these matters explicit, we, the chief forester and deputy chief forester, jointly established the following body of guiding principles. However, in any specific circumstance in a determination where we consider it necessary to deviate from these principles, we will explain our reasoning in detail.

When considering the factors required under Section 8, we are also mindful of our obligation as stewards of the forests of British Columbia, of the mandate of the Ministry of Forests, Lands and Natural Resource Operations as set out in Section 4 of the *Ministry of Forests and Range Act*, and of our responsibilities under the *Forest Act* and *Forest and Range Practices Act* (FRPA).

Integrated decision making

One of the key objectives of the Ministry of Forests, Lands and Natural Resource Operations is to take an integrated approach to all resource management decisions that considers all resource values. In considering the factors outlined in Section 8 of the *Forest Act*, we will continue to consider all available information on timber and non-timber resources in the management unit, and all available information on the interactions of the management of those resources on timber supply.

Information uncertainty

Given the complex and dynamic nature of forest ecosystems coupled with changes in resource use patterns and social priorities there is always a degree of uncertainty in the information used in AAC determinations.

Two important ways of dealing with this uncertainty are:

- (i) managing risks by evaluating the significance of specific uncertainties associated with the current information and assessing the various potential current and future, social, economic and environmental risks associated with a range of possible AACs; and
- (ii) re-determining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs, it is important to reflect those factors, as closely as possible, that are a reasonable extrapolation of current practices. It is not appropriate to base decisions on proposed or potential practices that could affect the timber supply but are not substantiated by demonstrated performance or are beyond current legal requirements.

In many areas, the timber supply implications of some legislative provisions remain uncertain, particularly when considered in combination with other factors. In each AAC determination, this uncertainty is taken into account to the extent possible in the context of the best available information.

It is not appropriate to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government. However, where specific protected areas, conservancies, or similar areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base (THLB) and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting resource management objectives such as for biodiversity.

In some cases, even when government has made a formal land-use decision, it is not necessarily possible to fully analyse and account for the consequent timber supply impacts in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring, for instance, further detailed planning or legal designations such as those provided for under the *Land Act* and FRPA. In cases where there is a clear intent by government to implement these decisions that have not yet been finalized, we will consider information that is relevant to the decision in a manner that is appropriate to the circumstance. The requirement for regular AAC reviews will ensure that future determinations address on-going plan implementation decisions.

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

We acknowledge the perspective that alternate strategies for dealing with information uncertainty are to delay AAC determinations or to generally reduce AACs in the interest of caution. However, given that there will always be uncertainty in information and due to the significant impacts that AAC determinations can have on communities, we believe that no responsible AAC determination can be made solely on the basis of a response to uncertainty.

Nevertheless, in making a determination, allowances may need to be made to address risks that arise because of uncertainty by applying judgment to the available information. Where appropriate, the social and economic interests of the Crown, as articulated by the Minister of Forests, Lands and Natural Resource Operations, can assist in evaluating this uncertainty.

Climate change

One key area of uncertainty relates to climate change. While some controversy appears to remain on the causes of climate change, there is substantial scientific agreement that climate is changing, that the changes will affect forest ecosystems, and that forest management practices will need to be adapted. Nevertheless, the potential rate, amount, and specific characteristics of climate change in different parts of the province are uncertain. As research provides more definitive information on climate change, we will consider the findings in AAC determinations. Where forest practices are implemented to mitigate or adapt to the potential effects of climate change on forest resources, we will consider related information in our determinations.

In addition, vulnerability assessments can provide information on the potential risks associated with climate change, and could be useful in defining how to consider climate change in different AAC determinations. Such assessments could also highlight key topics in need of research that could improve climate change considerations for future determinations.

We note, however, that even with better information on climate change there will be a range of reasonable management responses. Considerations of how to respond in anticipation of uncertain, potential future impacts and risks differ from those related to responding to known or on-going processes such as the recent MPB infestation. For example, it is not clear if either increases or decreases to current harvest levels would be appropriate in addressing potential future increases in natural disturbance due to climate change. Conversely, the present forest conditions resulting from the MPB infestation provide a clearer circumstance to which to respond.

To some extent, decisions on the preferred management responses to potential future risks, including potential changes to allowable timber harvests, are appropriately informed by broad discussion among interested parties. We will monitor such discussions and consider them insofar as they are relevant to AAC determinations. In general, the requirement for regular AAC reviews will allow for the incorporation of new information on climate change and its effects on forests and timber supply as it emerges.

First Nations

Aboriginal Title Lands and other areas, such as Treaty Lands or Indian Reserves, are not provincial Crown land. Consequently, the timber on these lands does not contribute to the AAC of the timber supply area or tree farm licence with which they overlap. For other areas, where aboriginal title has not been legally proven, the Crown has a legal obligation to consult with First Nations regarding their asserted rights and title (Aboriginal Interests) in a manner proportional to the strength of their Aboriginal Interests and the degree to which the decision may impact these interests. In this regard, full consideration will be given to:

- (i) the information provided to First Nations to explain the timber supply review process;
- (ii) any information brought forward respecting First Nations' Aboriginal Interests, including how these interests may be impacted; and
- (iii) any operational plans and/or other information that describe how First Nations' Aboriginal Interests are addressed through specific actions and forest practices.

Aboriginal Interests that may be adversely impacted by an AAC decision will be considered, and where appropriate, addressed in a manner that is consistent with the scope of authority granted to the chief forester under Section 8 of the *Forest Act*. When information is brought forward that is outside of the chief forester's jurisdiction, this information will be forwarded to the appropriate decision makers for their consideration. Specific considerations identified by First Nations in relation to their Aboriginal Interests and the AAC determination are addressed in the various sections of this rationale.

AAC determinations should not be construed as limiting the Crown's legal obligations owed to First Nations in any way, and in this respect it should be noted that the determinations do not prescribe a particular plan of harvesting activity within the management units. They are also independent of any decisions by the Minister of Forests, Lands and Natural Resource Operations with respect to subsequent allocation of wood supply.

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 Provincial Timber Supply Review Program for TSAs and TFLs.

For most AAC determinations, a timber supply analysis is carried out using an information package including data and information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model, a series of timber supply forecasts can be produced to reflect different starting harvest levels, rates of decline or increase, and potential trade-offs between short- and long-term harvest levels.

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

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast 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 model used to generate it.

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

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

Thus, in reviewing the considerations that lead to the AAC determination, it is important to remember that the AAC determination itself is not simply a calculation. Even though the timber supply analysis I am provided is integral to those considerations, the AAC determination is 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 in part may be based 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 would be gained by attempting a computer analysis of the combined considerations.

Base case for the Morice TSA

The current AAC was determined in 2008 following an urgent timber supply review to address the rapid expansion of the MPB infestation. Pine mortality peaked in 2007 and recent forecasts and surveys have confirmed that the MPB infestation has collapsed. Although there is no significant new infestation, large volumes of dead pine have accumulated and have been the focus of accelerated salvage harvesting. This AAC determination addresses the ongoing salvage harvest and the transition to lower mid-term harvest levels. In timber supply reviews for management units severely impacted by MPB, “mid-term” refers to that portion of a harvest

forecast when dead pine is no longer economically viable and before regenerating pine stands reach harvestable condition.

A timber supply model was developed using Woodstock (Remsoft) to conduct the timber supply analysis. The data and assumptions used in the base case attempt to reflect current legislation, legally-established resource objectives, demonstrated current forest management practices and conditions as closely as possible.

The harvest objectives used in the base case include maximizing the salvage of dead timber volume and minimizing non-recoverable losses. For the base case, it was assumed that dead pine trees retain commercial value for 15 years after being killed by MPB. At the beginning of the forecast, the majority of infested pine trees were assumed to have been dead for 10 years and only suitable for harvesting for the first five years of the forecast period.

Severely damaged pine stands were prioritized for harvest during the first five years of the base case. In the analysis “severely damaged stands” were defined as those pine-leading stands where the remaining live volume was not projected to reach 150 cubic metres per hectare within 250 years. After the first five years, unharvested severely-damaged pine stands were assumed to revert to naturally regenerated stands and were re-assigned to unmanaged stand analysis units and stand age was set to 20 years. In addition to this harvest priority, the model was required to harvest 482 000 cubic metres per year of spruce and 289 000 cubic metres per year of balsam for the first five years.

Starting in 2013, the initial harvest level in the base case was set at 2 165 000 cubic metres per year, which is slightly higher than the level of the current effective AAC of 2 137 000 cubic metres. The effective AAC is lower than the 2008 AAC due to the transfer of AAC to area-based tenures issued after the last determination. The initial harvest level can be maintained for five years. After 2018, the harvest level decreases to 1 600 000 cubic metres per year and remains at this level for 55 years (2073), thereafter it increases to the long-term sustainable level of 1 960 000 cubic metres per year.

During the first five years of the base case, about 62 percent of the harvested volume comes from severely damaged pine stands (pine-leading stands where the projected remaining volume will not reach 150 cubic metres per hectare within 250 years), three percent is from less damaged pine-leading stands, 13 percent is from balsam-leading stands, and 22 percent is from spruce-leading stands. From year 6 to year 10, inclusive, about one-third of the total harvest is attributable to live pine stands. The remainder comes from non-pine leading species stands.

After the shelf life - the period of time after death that timber remains commercially usable - of the dead pine expires, at the end of year five, there is not enough live pine and non-pine volume available to maintain the initial harvest level. Consequently, the harvest level declines from 2 165 000 cubic metres per year to the mid-term harvest level of 1 600 000 cubic metres per year. By year 30, older existing plantations start to become merchantable, and by year 60, there is enough managed stand volume available to support an increase to the long-term level of 1 960 000 cubic metres per year.

I have reviewed the assumptions and methodology incorporated in the base case, the alternative harvest flows and the sensitivity analyses. Based on my review, I am satisfied, subject to the qualifications accounted for in various sections of this document, that the information presented to me provides a suitable basis from which I can assess the timber supply for the Morice TSA.

Consideration of factors as required by Section 8 (8) of the *Forest Act*

I have reviewed the information for all of the factors required to be considered under Section 8 of the *Forest Act*. Where I have concluded that the modelling of a factor in the base case appropriately represents current management or the best available information, and uncertainties about the factor have little influence on the timber supply projected in the base case, no discussion is included in this rationale. These factors are listed in Table 2.

Table 2. List of factors accepted as modelled

<i>Forest Act</i> section and description	Factors accepted as modelled
8(8)(a)(i) Composition of the forest	<ul style="list-style-type: none"> • non-forest • estimates for roads, trails, and landings • parks, and protected areas • Fulton River reserve • environmentally sensitive areas • low productivity sites • forest types
8(8)(a)(i) Expected rate of growth	<ul style="list-style-type: none"> • analysis units • site productivity estimates
8(8)(a)(ii) Expected time for the forest to be re-established following denudation	<ul style="list-style-type: none"> • regeneration assumptions • not satisfactorily restocked areas
8(8)(a)(iii) Silvicultural treatments to be applied	<ul style="list-style-type: none"> • silvicultural systems • incremental silviculture
8(8)(a)(iv) Standard of timber utilization and allowance for decay, waste, and breakage	<ul style="list-style-type: none"> • decay, waste and breakage
8(8)(a)(v) Constraints on the amount of timber produced by use of the area for other purposes	<ul style="list-style-type: none"> • adjacency/green-up • visual quality management • cultural heritage resources • hydrological considerations • bull trout • mountain goat
8(8)(a)(vi) Other information	<ul style="list-style-type: none"> • First Nations land/timber interests
8(8)(b) Short and long-term implications of alternative rates of timber harvesting from the area	<ul style="list-style-type: none"> • economic and employment implications
8(8)(d) Economic and social objectives of the government	
8(8)(e) Abnormal infestations and salvage programs	

For other factors, where more uncertainty exists, or where public or First Nations’ input indicates contention regarding the information used, modelling, or some other aspect under consideration, this rationale incorporates an explanation of how I considered the essential issues raised and the reasoning leading to my conclusions.

Section 8 (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**

Land base contributing to timber harvesting

- general comments

As reported in the public discussion paper (PDP), the Morice TSA covers about 1.5 million hectares, of which approximately 932 000 hectares is Crown forest land base (CFLB). After accounting for areas that are either unsuitable for harvesting or have been reserved from harvest to provide for other resource values (e.g., riparian areas, wildlife tree patches, wildlife habitat, etc.) a total of 648 956 hectares - or 43 percent of the total TSA area - are suitable and available for timber harvesting. This area is referred to as the 'timber harvesting land base' (THLB).

The timber harvesting land base (THLB) is an estimate of the land where timber harvesting is considered both acceptable and economically feasible, given the objectives for all relevant forest values, existing timber quality, market values and applicable technology. It is a strategic-level estimate used for timber supply analysis and as such could include some areas that may never be harvested or could exclude some areas that may be harvested. Consequently, the THLB estimate used in the base case has limited utility outside of the timber supply review process.

As part of the process used to define the THLB, a series of deductions was made from the Crown forest land base. These deductions account for economic or ecological factors that reduce the forest area available for harvesting. In reviewing these deductions, I am aware that some areas may have more than one classification. To ensure accuracy in defining the THLB, care has been taken to avoid any potential double-counting associated with overlapping objectives. Hence, a specific deduction for a given factor reported in the analysis or in this document does not necessarily reflect the total area with that classification; some portion of it may have been deducted earlier under another classification.

For the Morice TSA, I accept that the above approach was used appropriately to identify the THLB used in the base case and related analyses.

- area-based tenures

When an area-based tenure, such as a woodlot licence, community forest agreement or First Nations woodland licence is granted, the associated area and AAC is transferred from the "parent" TSA to the new tenure. Consequently, the effective AAC of a TSA may be lower than the AAC determined by the chief forester. In general, the initial harvest level used in the base case is set at or below the level of the effective AAC, unless a higher harvest level can be maintained for the entire forecast period.

In 2008, the chief forester set the AAC at 2.165 million cubic metres. Subsequently, issuance of two woodlot licences and the Dungate and Babine Lake Community Forest Agreements reduced the AAC to an effective level of 2.137 million cubic metres. Although the area associated with the new tenures was excluded from the area of the TSA, the base case initial harvest level was set at the level of the 2008 AAC (2.165 million cubic metres) instead of at the level of the effective AAC (2.137 million cubic metres).

As discussed in this document, there is still a significant volume of dead pine remaining in the Morice TSA available for salvage. When compared to the magnitude of the decrease in growing stock due to the MPB infestation, the slightly higher initial harvest level used in the base case is insignificant; therefore, I will not adjust the base case on this account and I will consider this factor no further in my determination.

- economic and physical operability

In the Morice TSA, stands located above an elevation of 1360 metres, on areas classified as unstable or potentially unstable terrain or on slopes greater than 40 percent are considered inoperable. Application of these criteria, which were originally developed from an operational plan review completed in 2000 and subsequently confirmed by district staff, resulted in the exclusion of 19 877 hectares from the THLB.

One licensee commented that while recent harvesting has occurred in developed areas at lower elevations and on moderate terrain, cable-logging was practiced on slopes greater than 40 percent annually in the past. It requested a sensitivity analysis be prepared to examine the timber supply effect of including stands on steeper slopes in the THLB. Based on a review of harvest information district staff concluded that there is little or no evidence of the use of cable harvest systems in the Morice TSA in the past 40 years.

On this basis, I accept that the operability criteria appropriately reflect demonstrated harvest practices in the Morice TSA and I will make no adjustment to the base case on this account. In the event that licensees can demonstrate significant harvest performance on steeper slopes in the future, this information can be reflected in subsequent timber supply reviews.

- riparian areas

The Forest Planning and Practices Regulation (FPPR) specifies the width and forest cover requirements for riparian management areas adjacent to streams, wetlands and lakes. Riparian management areas consist of riparian management zones (RMZ), which are subject to basal area retention requirements and riparian reserve zones (RRZ), in which harvesting is excluded. The riparian management areas for smaller, non-fish bearing streams and less sensitive riparian areas may not include RRZs.

In order to estimate the area to exclude from the THLB to account for riparian management requirements, a buffer width was developed for each riparian class. For RMZs, the percent basal area retention was applied to the zone width requirement to derive an equivalent width in which harvesting was fully excluded. This value was then added to the corresponding RRZ width to derive the riparian buffer. For example, for S3 streams in which the RRZ width is 20 metres and the basal area retention requirement is 50 percent within the 20-metre RMZ, a total buffer width of 30 metres was used. For modelling purposes, an area-weighted netdown was applied to account for the RRZ and RMZ reductions. Reductions were not applied for riparian classes where a riparian reserve is not required (e.g. S4 streams) as current management in these riparian areas consists primarily of retaining non-merchantable conifers, deciduous trees, shrubs, and herbaceous vegetation within 10 metres of the stream bank.

In the Morice TSA, Forest and Range Evaluation Program monitoring information shows that about one-third of the S4 streams and half of the S6 streams sampled have inadequate riparian buffers. Research results show that low levels of tree retention are one of the main sources of forestry-related impacts on streams and support recommendations to increase tree retention within the first 10 metres of all small streams as a means of maintaining ecological functionality. On this basis, the district manager has directed licensees in the Morice TSA to amend their forest

stewardship plans (FSP) to provide increased retention. Although approved FSP amendments now include the new requirements, they have not yet been implemented. Consequently, these were not reflected in the base case.

A licensee commented that the timber supply analysis should include a sensitivity analysis to test the impact of the directive to increase levels of retention around small streams. District staff note that while the directive has been issued, it has not yet been implemented. Given that small streams are only present in 17 percent of all cutblocks and after accounting for overlaps with areas excluded from harvesting for other factors, e.g. wildlife tree patches, staff estimate that the timber supply impact of the increased retention is likely minimal.

A licensee noted that in the analysis riparian reserve buffers were incorrectly applied along a number of S4, S5 and S6 streams that are being considered for, but have yet to be designated as, fisheries sensitive streams. FLNR staff agree with the licensee that in the absence of legal designation, riparian buffers should not have been applied to these streams and that this results in an 810-hectare underestimation in the THLB.

For this determination, I accept that the THLB used in the base case has been underestimated by 810 hectares. However, given the size of the THLB, an underestimation of this magnitude – about 0.1 percent of the THLB – has little if any impact on timber supply. On this basis, I conclude that the assumptions used in the base case reasonably reflect current management and will make no adjustment to the base case on this account. Any change in forest cover retention around small streams can be incorporated in subsequent timber supply reviews when implementation information becomes available.

- wildlife tree retention

The FPPR requires that a minimum of seven percent of the gross area harvested annually be retained for stand biodiversity purposes. After accounting for overlap with areas excluded to account for other factors (e.g. riparian areas), a net area of 21 456 hectares was excluded from the THLB to account for wildlife tree retention (WTR).

Although the WTR assumptions used in the base case reflect the minimum legal requirement, the results of Forest and Range Evaluation Program (FREP) monitoring and licensee input indicate that WTR on cutblocks in the Morice TSA is actually 15 percent. Therefore, after accounting for overlap with other factors, the WTR used in the base should have been about seven percent. In a sensitivity analysis in which WTR was increased from three percent to seven percent, mid- and long-term harvest levels were about one percent and four percent lower than projected in the base case, respectively.

One licensee commented that since wildlife tree patches are not static over time, that is they may be harvested and replaced elsewhere, applying an area reduction to the forested land base results in an unnecessary decrease in the THLB. In response, FLNR staff noted that modelling WTR as an area reduction is a better than the approach taken in previous timber supply reviews in which a yield curve reduction factor was used.

Having considered the FREP monitoring information and licensee input, I accept that the area excluded from the THLB to account for wildlife tree retention was underestimated by about four percent. Based on the results of the sensitivity analysis described, I conclude that this results in a one percent and four percent overestimation in the base case mid- to long-term harvest levels and I will account for this in my determination as discussed in “**Reasons for Decision**”.

-existing forest inventory

The forest inventory data used in the base case (e.g. volume, species, etc.) is from the provincial vegetation resources inventory (VRI). This information was updated for disturbance, year of disturbance, and live and dead standing volumes prior to projection for growth to 2013. The inventory data was also adjusted to reflect the effect of mountain pine beetle infestation on the pine inventory. A re-inventory is currently underway in the Morice TSA and the results are expected in 2017.

One licensee asked how the timber supply review will address the availability of new inventory information in 2017 given that the new information is expected to be significantly better than the existing inventory, particularly for species composition, tree height, site index and the volume estimates for dead trees.

I acknowledge that the results of the re-inventory will likely decrease the level of uncertainty associated with the currently available forest inventory. However, given that the dead pine available for salvage in the TSA is nearing the end of its shelf life and the projected decline in timber supply to the mid-term level within the term of this determination, I am not prepared to wait until after the new information becomes available in 2017 to determine a new AAC for the Morice TSA. I accept that the inventory information used in this timber supply review is the best available and I will make no adjustments to the base case on this account.

As described under “**Implementation**”, it is my expectation that FAIB staff will compare the inventory information used in this determination, including the existing stand volume estimates (see “*existing stand yields*” below) with the results of the re-inventory and report the results. In the event that there are differences that could significantly impact timber supply, I will consider re-visiting this determination earlier than the 10 years required in legislation.

Expected rate of growth

existing natural stand yields

All stands older than 44 years as of 2013 were assumed to be unmanaged stands. The volume estimates for these stands were generated using the Variable Density Yield Prediction model version 7 (VDYP7).

In VRI Phase I, forest inventory stand attributes such as height, diameter, species etc. are updated based on the interpretation of aerial photographs. In order to assess the correlation between VRI Phase I volume estimates and volume estimates generated using ground sample data, 50 sample plots were established in stands older than 50 years in the Morice TSA. Of these plots, which were established in 2012, 30 were located in the THLB. Comparisons of the ground sample volumes with the VRI Phase I volume estimates indicated that overall VRI Phase I stand volumes were underestimated by about 25 percent. On further examination, most of the volume underestimation was found to be attributable to balsam-leading stands outside of the THLB.

In preparation for the timber supply review, the 2012 volume audit data for the 30 sample plots within the THLB were re-analysed. The results show that the VRI Phase I volume estimates were overestimated for all stand types in the THLB. From this FAIB staff concluded that the results of the inventory ground audit were inconclusive and due to the uncertainty associated with the volume adjustments decided to use the unadjusted VRI Phase I volume estimates in the base case.

In order to assess the uncertainty associated with the using the unadjusted VRI Phase I volume estimates in the base case two sensitivity analyses were prepared. In the first, application of a regression model to each leading species type in the THLB resulted in a mid-term harvest level 722 000 cubic metres per year lower than in the base case. In the second, application of a ratio of the means methodology to each leading-species type in the THLB resulted in a mid-term harvest level 480 000 cubic metres per year lower than in the base case. The short- and long-term harvest levels in both sensitivity analyses were the same as in the base case.

Given the small number of ground sample plots established in the THLB and the large variability in the results, I accept that the unadjusted VRI Phase I existing stand volume estimates represent the best available information and are adequate for use in the base case. I expect that this uncertainty will be significantly reduced following completion of the inventory work in 2017. As discussed under “*forest inventory*”, it is my expectation that FAIB will compare the inventory information, including existing stand volume estimates, used in the base case with the new information and will report the results to me. In the event that there are significant differences in the information that could affect timber supply, I will consider re-visiting this AAC determination prior to the 10 years required in legislation.

managed stand yields

All stands 44 years old or younger as of 2013 were classified as existing managed stands. Stands established after 2013 were considered to be future managed stands. The growth and yield of both existing and future managed stands used in the base case were projected using the ministry’s Table Interpolation Program for Stand Yields (TIPSY) model version 4.2.

FLNR staff indicate that monitoring and scientific information suggest that managed stand yields may be lower than originally estimated due to changes in species composition and density, forest health, and climate change.

Reporting Silviculture Updates and Landstatus Tracking System (RESULTS) data show that 65 percent of the trees planted in cutblocks harvested between 1995 and 2008 were pine. Since 2008, the proportion of pine planted in cutblocks has declined to 40 percent. RESULTS data also indicate that planting densities, particularly with spruce, have declined.

Stand Development Monitoring (SDM) assessments conducted in the Morice TSA show that 96 percent of sampled stands were below optimum stocking density. The well-spaced density of sampled stands was on average six percent below full site occupancy at the time the stands were declared free growing.

Climate change forecasts (see “*climate change*”) currently project a warmer and wetter climate for the Bulkley-Nechako Region, which includes the Nadina Natural Resource District and Morice TSA. FLNR staff indicate that there is an increased risk of rust damage associated with warmer and wetter springs and summers.

In an effort to mitigate the above mentioned risks, the Nadina District Manager has requested changes for new or extended forest stewardship plans to address forest health, species selection and stand density issues. The requested changes have yet to be implemented in the TSA and were consequently not reflected in the base case.

Local government also commented that it is the ministry’s responsibility to manage free-growing stands to ensure that there is enough volume for the mid- and long-term. They suggested that the ministry should be investing in the Morice TSA to ensure that young stands are properly spaced in addition to actively investing to curb pine-rust mortality. FLNR staff agree that the management of free-growing stands is indeed the responsibility of the ministry. Staff note that

the best chance to influence future timber supply is at stand establishment, as economic and ecological opportunities are limited once trees are in place and expect that the new direction from the district manager should help to address these concerns.

volume estimates for existing managed stands

Information from the young stand monitoring (YSM) project completed in the Morice TSA in 2012 was used to adjust both the site index values and species composition of existing managed stands used in the base case. Overall the YSM-adjusted site index values are four percent higher for pine and 12 percent higher for spruce relative to the site index by biogeoclimatic zone site series (SIBEC) values. In a sensitivity analysis, replacing the YSM-adjusted existing managed stand yields with the unadjusted SIBEC site index values resulted in a mid-term harvest level 2.6 percent lower than in the base case.

In the data package prepared for this timber supply review, the species mix of existing managed stands was assumed to be 54 percent spruce, 34 percent pine and 12 percent balsam. Following YSM adjustment the species mix was 60 percent pine, 25 percent spruce, 13 percent balsam and one percent hemlock.

Genetic worth estimates were not applied to existing managed stands because these stands were established prior to the availability of seed from the tree-breeding program.

volume estimates for future managed stands

Unadjusted SIBEC values were used for all future managed stands in the base case. Stand density and species composition assumptions were based on a review of the information submitted in the RESULTS database. Genetic worth was applied to all planted pine and spruce stock based on recent reports of seedling genetic worth and the extent of select seedling use. For pine and spruce, genetic worth values of 7.2 percent and 17.2 percent were applied, respectively.

operational adjustment factors

Operational adjustment factors (OAF) are used to adjust the managed stand volumes projected in TIPSYS. OAF 1 accounts for less than ideal tree distribution, small non-productive areas, endemic pests and disease, and random risk factors such as wind throw. OAF 2 accounts for decay, waste and breakage. The standard OAF 1 value is 15 percent and the standard OAF 2 value is five percent.

Forest pathogens, such as pine rusts, are common in managed stands in the Morice TSA. Forest health surveys in the Nadina Natural Resource District found that almost all of the sampled plantations were affected by rusts, primarily western gall rust. In 43 percent of the sampled stands, more than 20 percent of the stand was infested with rust. A number of the plantations failed to meet the minimum stocking standards. These findings were consistent with the results of stand development monitoring (SDM) and YSM that indicate that 21 percent and 25 percent of sampled pine stems are infected with rust, respectively.

Due to the high prevalence of pine rusts in the Morice TSA, the OAF 1 for pine-leading stands used for the base case was increased from 15 percent to 20 percent. There is significant uncertainty about the eventual survival and growth of young stands affected by rust. In a sensitivity analysis increasing OAF 1 to 30 percent resulted in a mid-term harvest level 10 percent lower than in the base case. This sensitivity analysis represents the “worst case scenario” as an OAF 1 of 30 percent reflects 100 percent mortality of rust-infested trees.

Licensees commented that increasing OAF 1 from 15 percent to 20 percent in the base case is inconsistent with local knowledge and survey information and results in an underestimation of timber supply. One licensee noted that the most recent *Morice TSA and Lakes TSA Innovative Forest Practices Agreement Annual Forestry Plan Report* (April 1, 2012 to March 31, 2013) includes a suggestion that no OAF 1 be applied in TIPSY for planted stands. One licensee and local government also commented that the sensitivity analysis based on an OAF 1 of 30 percent to account for pine rusts is too high.

Based on my review of the volume estimates for managed stands used in the base case I have reached the following conclusions. Given that the 2012 YSM data available for the Morice TSA is relatively recent and localized, it represents the best available information and I accept its use to adjust both the species composition and site index values for existing managed stands used in the base case.

The forest health survey results for the Nadina Natural Resource District and the young stand and stand development monitoring information all indicate that there is a high incidence of pine rusts in managed stands in the Morice TSA. Until recently, most of the information available for managed stands has consisted of species composition, density, and seedling age, etc. from RESULTS and observations of stand conditions at the “free-to-grow” stage. Information from older managed stands is now becoming available from these monitoring programs. In many areas of the province this new information suggests that young stands may not be performing as originally projected. However, observations at this stage of stand development have only recently become available and it is unclear at this time to what extent the tree mortality now being observed exceeds “normal” stand development. I agree with the input received from local government and licensees that an OAF 1 of 30 percent is too conservative. However, given the observed incidence of pine rusts, I disagree with licensees who maintain that an OAF 1 of 15 percent or an OAF 1 of zero is appropriate. On this basis, I conclude that the use of an OAF 1 of 20 percent reasonably reflects current conditions in managed stands and I will make no adjustments to the base case on this account.

The recent changes in the species composition and planting density that have occurred since 2008, as well as the observed increase in the incidence of pine rusts could adversely affect future timber supply. As described under “**Implementation**”, I encourage licensees to implement the direction recently provided by the district manager and to work collaboratively with ministry staff to adapt forest management practices to mitigate the risks associated with pine rusts and climate change. I also request that FLNR staff identify the most efficient and effective approaches to both managed stand monitoring and incorporation of the resultant data in timber supply reviews.

- minimum harvestable volumes

The minimum harvestable volume required for stands to be considered eligible for harvest in the base case varied according to leading species. For pine- and spruce-leading stands the minimum threshold used in the base case was 150 cubic metres per hectare. For balsam-leading stands, which tend to be lower in value, the minimum harvestable volume was set 200 cubic metres per hectare.

Cruise data is used to appraise the value of a stand of timber to determine the amount of stumpage (tax) payable to government. This information, which is provided to government by licensees, is intended to represent a random, unbiased sample of the stand from which the volume and value of the stand can be established. A review of the Morice TSA cruise data for stands harvested between 2010 and 2014 shows that 96 percent of the stands had volumes greater than 250 cubic metres per hectare. Cruise data reported by BC Timber Sales indicates that recent cruise volumes in the TSA range between 200 cubic metres per hectare and 275 cubic metres per hectare. Most

of these were stands impacted by mountain pine beetle. Information from the Burns Lake Community Forest indicates that the average volume of recently harvested stands is 225 cubic metres per hectare.

Although recent cruise data indicate that the average volume of stands harvested in the Morice TSA is higher than assumed in the base case, there does appear to be a trend towards lower stand volumes and smaller volumes per tree. From 2008 to 2013, the average volume per hectare has decreased by 23 percent to an average of 326 cubic metres per hectare. For the same period, the volume per tree has decreased by 19 percent to an average of 0.42 cubic metres per tree.

In a sensitivity analysis, increasing the minimum harvestable volume criterion for all stands to 250 cubic metres per hectare resulted in mid- and long-term harvest levels 41 percent and 19 percent lower than in the base case, respectively.

In considering minimum harvestable volumes I am mindful of the long-standing downward trend in the volume per hectare of harvested stands throughout BC. Generally harvesting in most areas favours higher volume stands. However, as these stands become less available and technology and markets evolve over time, average stand volumes and tree sizes decreases. Based on my review of the recent cruise data for the Morice TSA and the results of the sensitivity analysis, I conclude that it is critical that licensees rapidly adapt their operations to accommodate lower volumes per hectare and smaller piece sizes. If this does not occur, the decline in mid-term timber supply could be significantly exacerbated and the long-term harvest level significantly lower than currently projected.

As indicated under “**Implementation**”, I request that district staff monitor the volume per hectare of harvested stands in the Morice TSA and make this information available for the next timber supply review. I also strongly encourage district staff and licensees to find opportunities to shift harvest operations into lower volume stands to at least the level of the minimum harvestable volumes used in the base case.

In addition to the stands currently assumed to be eligible for harvest in the base case, I am mindful of the significant volumes of timber available in stands with volumes less than 100 cubic metres per hectare (see “*marginally economic stands*”). As these stands were not included in the base case, they represent a significant opportunity to mitigate the projected decrease in mid-term timber supply. Therefore I encourage district staff and licensees to work collaboratively to investigate the feasibility of harvesting these stands.

- *marginally economic stands*

Stands historically excluded from the THLB are increasingly seen as a source of fibre for the bio-energy sector and as a means of partially mitigating mid-term timber supply reductions (see “*minimum harvestable volume*”). The Special Committee on Timber Supply appointed by the BC Legislature recommended in their August 2012 report, *Growing Fibre, Growing Value*, that FLNR review marginally economic forest in TSAs in order to quantify the types and areas of these forests that might be justifiably included in the THLB (see “*mid-term timber supply action plan*”). In this timber supply review, I asked staff to show the potential contribution of marginally economic stands so that I could consider the Special Committee’s recommendation in my determination.

In the base case, all stands available for harvesting with site indices of at least eight metres were considered economically operable and included in the THLB.

Marginally economic stands, which were excluded from the THLB in the base case, were defined as stands with site indices less than eight metres that currently have volumes greater than 100 cubic metres per hectare and were not needed to meet other non-timber values. The majority of these stands are balsam-leading. A sensitivity analysis showed that the addition of this marginally economic stands to the THLB would increase the mid-term and long-term harvest levels in the base case by 16 percent and 9 percent, respectively.

Local government commented that while the inclusion of marginally economic stands will help to increase the mid-term harvest level, changes in regulatory requirements and tenure will need to take place to help foster a more robust bio-energy sector. They suggested that this volume be included in the AAC determination, but that it be managed separately using a partition to ensure that the additional volume is used to harvest these stands.

District staff note that marginally economic stands, as defined above, are not being harvested at present and, therefore, should not be included in the AAC.

In absence of significant demonstrated performance within marginally-economic, lower volume stands, I conclude that these stands were correctly excluded from the THLB. As is the case for lower volume stands, sensitivity analysis results indicate that utilization of marginally economic stands represents a significant opportunity to increase mid-term timber supply. Under “**Implementation**”, I encourage district staff to monitor harvest performance in these stands and, together with the public, First Nations and licensees, to look for opportunities to harvest them in the future.

Section 8 (8) (a) (ii) the expected time that it will take the forest to become re-established on the area following denudation:

See Table 2.

Section 8 (8) (a) (iii) silvicultural treatments to be applied to the area:

See Table 2.

Section 8 (8) (a) (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area:

- utilization standards

Based on species composition, utilization levels define the maximum height of stumps that may be left on harvested areas, the minimum top diameter (inside bark), and the minimum diameter at breast height of stems that must be removed from harvested areas. The *Interior Timber Merchantability Specifications of the Provincial Logging Residue and Waste Measurement Procedures Manual* specifies the utilization levels for billing of harvested timber. These levels are also used in assessing cut control for AAC purposes. In the base case a stump height of 30 cm was used, which is the same as that in the Interior Timber Merchantability Specifications.

Proponents of the Morice/Lakes Innovative Forest Practices Agreement have surveyed stump heights in the TSA. Based on the results of these surveys, the average stump heights for stands harvested in 2010/2011 and in 2009/2010 were 12.6 centimetres and 9.3 centimetres, respectively. District staff agree with these results; however, they note that not all of the volume between the lower stump height and the 30-centimetre stump height is removed from the cutblock

after harvest. They also indicate that for stands subject to cruise-based billing, only the volume above a 30-centimetre stump height is counted towards the AAC. For stands subject to scale-based billing there is no way of knowing whether or not the log being scaled includes volume from below a 30-centimetre stump height.

On this basis, I accept the application of a 30-centimetre stump height in the base case. As described under “**Implementation**” in order to reduce the uncertainty associated with scale-based volumes and the extent to which the volume attributable to lower stump heights is being utilized, I recommend that district staff work with licensees to determine how much of the additional volume harvested is utilized and to what extent it contributes to scale-based volumes. I also encourage licensees to find ways of utilizing the additional volume attributable to lower stump heights, as this will help to mitigate the decrease in fibre supply due to the mountain pine beetle.

- log grade adjustments

In April 2006, new log grades were implemented for the BC interior. Previously, a log was assessed according to whether the tree it came from was alive or dead at the time of harvest. Prior to April 2006, grade 3 endemic (the ‘normal’ mortality observed in a mature stand) and grade 5 (dead tree with less than 50 percent firmwood and/or defects making the log unsuitable for lumber) were referred to as ‘dead potential’ and were not charged to the licensee’s AAC if harvested. Under the new system, grades are based on log size and quality at the time they are scaled and all logs that meet merchantability specifications are charged to cut control, regardless whether the tree they originate from was alive or dead at the time of harvest.

Dead potential volume was not assumed to be part of the AAC in previous timber supply reviews so, as a transitional measure, species adjustment factors were implemented to reduce the volume charged to cut control to reflect the expected dead potential volumes. District staff state that if this timber supply review includes consideration of dead potential, they will request repeal of the species adjustment factors within the Morice TSA.

The dead potential volume of existing stands is not included in the VRI estimates of timber volume used in the base case. Consequently, dead potential volume in these stands is not included in the base case harvest levels. A number of possible sources of data about dead potential volume exist, including: inventory audit plots, VRI ground samples, permanent sample plots and temporary sample plots. The estimate of dead potential volume from these sources varies considerably.

At this time, the inventory audit is considered the best of the above-mentioned sources of data regarding dead potential timber in the Morice TSA. These data indicate that dead potential volume equates to about 12 percent of the green volume for the forested land base over 60 years of age. Data from the harvest billing system for the period 1995-2004 (when taking dead logs to the mills was solely at the discretion of licensees) showed the sum of the grade 3 endemic and grade 5 volume equalled about 11 percent of the green volume scaled. Dead potential volume is only a consideration for existing stands that contribute to the short-term timber supply and about half of the volume available for harvest in the mid-term.

From this I conclude that the short- and mid-term harvest levels in the base case have been underestimated by about 11 percent and 5.5 percent, respectively and I will account for this in my determination as discussed “**Reasons for Decision**”.

Section 8 (8) (a) (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

- general comments

Under the *Ministry of Forests and Range Act* the ministry is required to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. The *Forest and Range Practices Act* and other legislation provide for, or enable, the legal protection and conservation of timber and non-timber values.

Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

In the Morice TSA, additional direction and guidance for IRM objectives is provided by the Morice Land and Resource Management Plan (LRMP), approved wildlife habitat areas and ungulate winter ranges with associated general wildlife measures established under the Government Actions Regulation (GAR) for mountain goat, and scenic areas with associated visual quality objectives. In determining the AAC for the Morice TSA, I have considered the legal requirements established under these orders.

- wildlife habitat

The *Forest and Range Practices Act* (FRPA) identifies three categories of wildlife that require special management attention to address the impacts of forest management activities: species at risk, regionally important wildlife, and ungulates. To date, management activities have focused on species at risk and ungulates. Species at risk in the Morice TSA include bull trout, caribou, wolverine, fisher, and grizzly bear. Ungulates in the Morice TSA include elk, caribou, moose, deer and mountain goat.

caribou

In 2004, the minister responsible for the *Wildlife Act* issued notices under Section 7 of the FPPR for northern and mountain caribou in the Morice TSA.

A Section 7 notice for the Tweedsmuir herd identifies natal areas in the Whitesail Reservoir as a habitat indicator for the survival of northern caribou but it does not specify management requirements for the areas. To date licensees have responded by adopting an avoidance strategy that is reflected in their forest stewardship plans (FSP). Another Section 7 notice identifies the Telkwa Caribou Herd Recovery Area as a habitat indicator for the winter survival of northern caribou. This notice specifies that the attributes and desired future conditions of the Telkwa herd are outlined in the *Interim Harvesting Guidelines for the Telkwa Caribou Herd Recovery Plan* (1999). The recovery plan provides green-up heights and tree retention requirements within the recovery area. After accounting for overlap with areas already excluded to account for other factors, a net area of 260 hectares was excluded from the THLB to account for the Tweedsmuir herd. The requirements for the Telkwa herd were modelled as forest cover constraints in the base case.

A Section 7 notice, also issued in 2004, identifies the area of Mount Sidney Williams and Mount Tsitlutl as a habitat indicator for the winter survival of the Takla mountain caribou herd. This notice identifies indicators of the distribution and attributes of critical winter habitat but does not specify management requirements for the herd. After accounting for areas already excluded account for other factors, a net area of 480 hectares was excluded from the THLB to account for this area. In addition, a forest cover constraint was used in the base case for areas outside of core habitat areas in the vicinity of the Mount Sidney Williams and Mount Tsitlutl. In these areas, 70 percent of stands in the CFLB were required to be at least 80 years old.

Draft WHAs have been developed for the Tweedsmuir and Telkwa caribou herds, and a draft UWR has been developed for the Takla herd. Since these are draft proposals, they were not accounted for in the base case.

I have considered the caribou habitat requirements established by government under Section 7 of the *Wildlife Act* and have reasoned as follows. The Section 7 notice for the Tweedsmuir herd identifies natal areas within the Whitesail Reservoir area as an important indicator for the survival of northern caribou. However, the notice does not provide forest management direction for the area. Likewise, the Section 7 notice for the Takla herd identifies indicators for critical habitat in the area of Mount Sidney Williams and Mount Tsitlutl important for the winter survival of mountain caribou but does not establish forest management requirements for the area. Although licensees have so far adopted an avoidance strategy in their FSPs for the northern caribou natal areas and mountain caribou winter range, government has not established legal land use requirements for the areas. On this basis, I conclude that these areas should not have been excluded from the THLB. Inclusion of these areas results in about a 0.1 percent increase in the size of the THLB. Given the magnitude of the area involved this has little, if any effect, on the base case. Likewise, as the forest cover constraint applied in non-core areas for the Takla herd apply to a relatively small area and do not exclude harvesting it is unlikely to have any appreciable effect on the base case. Consequently, I will consider these areas no further in this determination.

As described in “**Implementation**” in order to establish clear direction for northern and mountain caribou management, I encourage MOE staff and FLNR district staff to pursue legal orders that establish forest management requirements. In the interim, I take some measure of comfort knowing that licensees are avoiding harvesting these areas.

With regard to the Section 7 notice issued for the Telkwa mountain caribou herd, I note that the notice establishes legal forest management requirements and I accept that these were addressed appropriately in the base case.

Given that the proposed wildlife habitat areas for the Tweedsmuir caribou herd, and ungulate winter range for the Takla herd have not been finalized, I conclude that these areas should have been included in the THLB. However, owing to the relatively small size of these areas, inclusion of these areas is unlikely to have any significant effect on the base case. Any wildlife habitat areas and/or ungulate winter ranges established following this determination can be accounted for at the time of the next determination.

wildlife analyses

grizzly bear

Research indicates that increasing road density beyond a threshold of 0.6 metres per square kilometre contributes to decline in grizzly bear populations. In order to explore the timber supply implications of limiting road density, four scenarios were prepared using the same data as in the base case. In these scenarios, road density limits were applied by watershed within landscape

units. Grizzly bear management areas identified in the Morice LRMP were assigned more restrictive road density constraints. For each scenario, two road management alternatives were considered: no road deactivation and road deactivation after 20 years of inactivity and maintenance of non-active state for 20 years unless early reactivation was required due to a lack of timber elsewhere in the unit.

The results of the various analyses indicate that road density limits can have a direct impact on timber supply proportional to the percent of the area subject to the constraint. This impact is reduced when roads are deactivated. In the most restrictive scenario, the initial harvest level was 2.0 million cubic metres per year, which is 165 000 cubic metres per year lower than in the base case. The mid- to long-term harvest level decreased to about 1.0 million cubic metres per year with no road deactivation. This level was maintained for 150 years before gradually increasing to about 1.2 million cubic metres per year.

In the least constraining scenario, the initial and mid-term harvest levels were the same as in the base case for the first eight decades of the forecast. Thereafter, the base case harvest level increased earlier to levels slightly higher than in the road density limited forecasts.

moose

Human disturbance has also been identified as a risk factor for moose. Although timber harvesting results in an increase in early-seral stands that moose rely on for food, areas that are inaccessible to humans, at least for a period of time are also important.

In the moose analysis, a number of scenarios were prepared in which the maximum amount of THLB in a watershed, the length of time a watershed was accessible, and the length of time after access that watersheds remained closed prior to reactivation varied. In all scenarios, watershed access was not constrained for the first 10 years of the forecast period to allow for the completion of mountain pine beetle salvage.

The results show that decreasing the amount of THLB in active watersheds decreases mid-term timber supply. The same is generally true for longer post-access closures; however, not in all scenarios. Over time, the interactions between logging patterns and watershed access constraints result in THLB age class structures in the watersheds that align with access. This results in low to moderate long-term timber supply impacts for most scenarios. The magnitude mid-term timber supply impacts varied considerably by scenario, in the most restrictive case the mid-term harvest level was approximately 900 000 cubic metres per year lower than in the base case.

With respect to the research on road density and the spatial and temporal aspects of grizzly and moose habitat, the research indicates that depending on the level of the limitation there may be timber supply impacts. This suggests that in many cases protecting or managing grizzly bear and moose habitat may require a reduction in timber harvesting. However, without knowing how forest management will evolve based on these and other findings, it is difficult for me to predict what the eventual timber supply impacts may be. In many instances, the changes in forest management may not preclude harvesting but rather restrict the timing of harvest activities and road development. Consequently, for this determination, I will not directly account for the results of the wildlife studies discussed above.

With regard to First Nations expressed interest in grizzly bear and moose in the Morice TSA. I note that even if I reduced the AAC at this time to account for potential changes in habitat management, this decrease would not necessarily mean that wildlife habitat will be protected or well managed or that as a result, the population of grizzly bear and moose available to meet First Nations harvesting needs will either be positively or adversely affected. In order for that to occur, there needs to be specific, formal and enforceable wildlife habitat regimes in place, which are not within the scope of my authority to establish. However, to the extent that government has

established forest management requirements, either through legislation, such as FRPA; or through the issuance of legal orders establishing wildlife habitat areas, etc. I have considered them in this determination. These provisions that I have considered do, to some unknown extent, accommodate First Nations aboriginal interests.

- landscape-level biodiversity

Landscape-level biodiversity can be conserved by maintaining forests with a variety of patch sizes and seral stages across a variety of ecosystems and landscapes. Given other forest management provisions that provide for a diversity of forest stand conditions, old-forest retention is often considered a key landscape-level biodiversity consideration.

The provincial Non-spatial Old Growth Order (NSOGO) represents the current legal requirement in the Morice TSA for seral stage distribution. In the base case old-forest retention constraints in landscape units with a low BEO were set at 33 percent of the target for the base case.

Although a sensitivity analysis showed that application of the full target amounts for low BEO landscape units did not affect timber supply, district staff advised me that there are certain ecological units within the TSA where the full biodiversity targets cannot be met currently and other ecological units are at risk of falling below the full target if current harvesting practices continue. Harvesting will ultimately need to shift from these ecological units to other landscape units in the short term and for a portion of the mid-term. This may be more significant when considering other proposed harvest constraints such as old-growth management areas, wildlife habitat areas and ungulate winter ranges. Also, a draft land use order is currently under review. If implemented, it will change the way seral stage distribution is managed throughout the TSA from a landscape unit basis to a resource management zone basis.

A licensee commented that the results of the sensitivity analysis appear to be flawed and that the impacts of the draft order should have been included in the public discussion paper. FLNR staff noted that no information was presented to substantiate the comment that the sensitivity analysis was flawed and further responded that the TSR process is primarily oriented towards modelling existing land use requirements, not to speculate on the possible timber supply impacts of future land use decisions.

For this determination I accept that the seral stage assumptions in the base case adequately reflect current legal requirements and I will consider this factor no further in this determination.

Section 8 (8) (a) (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber;

Other information

- First Nations consultation

In June 2014, the Supreme Court of Canada (SCC) released its decision on the *Tsilhqot'in Nation v. British Columbia* case (*Tsilhqot'in* decision). This decision provided further clarification on the nature of and tests for aboriginal title, and established that the Tsilhqot'in Nation holds aboriginal title over an extensive area in the central interior of the province. I have considered the *Tsilhqot'in* decision and its relevance for this AAC determination. Consultation obligations with respect to asserted aboriginal rights and title (Aboriginal Interests), as outlined in

the SCC *Haida* and *Sparrow* decisions, still apply in the Morice TSA and I discuss the consultation process below.

The Crown has a duty to consult with, and accommodate if necessary, those First Nations for whom it has knowledge of the existence of Aboriginal Interests that may be impacted by a proposed decision, including strategic-level decisions such as AAC determinations. As chief forester, I must therefore consider information arising from the consultation process with First Nations respecting Aboriginal Interests or treaty rights that may be adversely affected by my AAC determination. As well, I will consider other relevant information available to the ministry regarding Aboriginal Interests, including information gathered during other consultation processes.

I note that there is a rich, diverse aboriginal history in the Morice TSA and that the TSA overlaps with the traditional territories for eight First Nations: Yekooche First Nation, Cheslatta Carrier Nation, Lake Babine Nation, Moricetown Band, Office of the Wet'suwet'en, Nee Tahi Buhn Band, Skin Tyee Nation and Wet'suwet'en First Nation.

Based on my review of the information sharing and consultation processes conducted by district staff summarized in the First Nations Consultation Summary, the available information regarding Aboriginal Interests and proven rights, and the potential impact my decision may have on these interests and rights, I am satisfied that the consultation process is consistent with the Province of British Columbia's 2010 *Updated Procedures for Meeting Legal Obligations When Consulting First Nations and the Tsilhqot'in decisions*. Furthermore, I note that district staff will continue to be available to meet and consult with First Nations at the operational planning level.

I am satisfied that opportunities were provided to all First Nations to share their concerns related to specific Aboriginal Interests and proven aboriginal rights that may be adversely impacted by this decision and to the extent possible within the scope of my authority under Section 8 of the *Forest Act*, I have considered those proven rights and Aboriginal Interests that were made known to me during consultation on this decision. If new information regarding First Nations' Aboriginal Interests becomes available that significantly varies from the information that was available for this determination and that may affect timber supply, I am prepared to revisit this determination sooner than required by legislation.

Areas of special interest

Lake Babine Nation

The Lake Babine Nation has identified several areas of interest to their communities, including areas for the re-establishment of traditional use cabins with adjacent no harvest or "buffer" zones. To date a buffer and/or management area of about 10 hectares has been established around an existing cabin. Future requests may emerge for similar accommodation measures.

Lake Babine Nation Hereditary Chiefs continue to express a desire for a level of old growth timber that will provide for traditional values (e.g. medicinal plants) that can be gathered from ecosystems that have not been affected by commercial forestry. The Hereditary Chiefs have also requested that protection zones, i.e. no harvest zones, be considered to protect areas of interest that are not addressed through the cultural heritage management commitments within licensee forest stewardship plans. The specific attributes and values for these areas are still being defined.

As of March 2014, the Lake Babine Nation entered into an Interim Treaty Agreement with government that identifies 510 hectares of interim treaty lands of which 327 hectares are within the Morice TSA. After accounting for overlap with areas excluded from the THLB for other factors, the THLB area associated with the Interim Treaty Agreement is minimal.

The area proximal to and extending east of Fort Babine is of particular interest to the Lake Babine Nation, especially the community of Fort Babine. This area has been under threat of blockade or blockade repeatedly. These blockades have affected timber harvesting.

Fort Babine members are interested in tourism opportunities around the small lakes east of the community, historic grease trails and BC Hydro infrastructure. FLNR is currently working with the Lake Babine Nation on a potential First Nations Woodland Licence in the Fort Babine area. A Fort Babine economic development society is in place to pursue resource extraction opportunities in coordination with the Lake Babine Nation Chief and Council.

No area was specifically excluded from the THLB to account for the 10 hectares associated with the traditional use cabin or for the THLB portion of the 327 hectares of Interim Treaty Lands that overlap the Morice TSA. However, owing to the small size of the areas involved, temporary or permanent deferral of harvesting is unlikely to have an effect on the overall timber supply of the Morice TSA.

Regarding the area east of Fort Babine: given that the Lake Babine Nation is currently exploring economic development opportunities in this area, including a First Nations Woodland Licence, I find it reasonable to include the area in the THLB used for this determination. Any changes in resource management that occur can be incorporated in subsequent timber supply reviews.

Wet'suwet'en First Nation

Forest development in the Gosnell, Crystal Creek and Thautil drainages west of the Morice River has been contentious for about four years. The recent natural gas pipeline proposals resulted in a blockade of the areas, referred to as the Unist'et'en Blockade, that has been ongoing since 2012. The total forested area under blockade is about 80 000 hectares, of which about 43 000 hectares are assumed to contribute to timber supply in the base case. FLNR staff indicate that it may be possible to work with the Wet'suwet'en to access the area, at least to salvage dead pine.

In addition to the blockade area, members of the Wet'suwet'en associated with the Unist'et'en Blockade have asserted that development in the area around Poplar Lake interferes with their aboriginal right to hunt, trap and fish. FLNR staff indicate that the Wet'suwet'en appear to have a strong strength of claim for the area and think that the area, which was assumed to contribute about 2000 hectares to the THLB, will continue to be deferred from harvest, perhaps indefinitely.

Wet'suwet'en House Code L03, a hereditary house territory, represents a total area of approximately 28 000 hectares and includes an area referred to as the "Red Top". The Red Top, which includes about 3700 hectares of THLB, is of high cultural value to the Wet'suwet'en. The Red Top has been treated as a "log around" since it was first blockaded by the Wet'suwet'en in 1999. Negotiations are currently underway and currently government has agreed not to authorize any forest developments in the area. FLNR staff working on landscape-level biodiversity note that the Red Top area is being considered for designation as an old-growth management area.

In the 1990's members of a Wet'suwet'en House drafted a petition to stop any forestry activity on the west side of Owen Lake, near a major Wet'suwet'en gathering area. The area, which is referred to as the Nadina Mountain Petition Area, is used for trapping and berry picking. It also provides habitat for grizzly bear and moose, both of which are of interest to First Nations. Until recently, timber harvesting in the 9400-hectare area has been deferred; however, there is now a strong assertion from House members that harvesting in the petition area may be in dispute. FLNR is currently working with the Hereditary Chief and Council representatives to help resolve the matter.

I have considered the areas identified as being of special interest to the Wet'suwet'en Nation and have reasoned as follows. In combination, the area subject to the Unist'et'en Blockade and the Nadina Mountain Petition area represent about 52 400 hectares of THLB. In the absence of legal designations prohibiting timber harvesting and in view of the uncertainty regarding the continued deferral of these areas, I find it reasonable to assume that they contribute to timber supply. Therefore I will make no adjustment to the base case on this account.

The Wet'suwet'en Nation has indicated that the area around Poplar Lake and the Red Top provide important cultural resources for their communities. District staff have indicated that owing to the strong strength of claim associated with the areas and the possibility that the Red Top will be designated as an old-growth management area it is likely timber harvesting will be excluded from these areas indefinitely. I accept this assertion, however, in the absence of legal designations prohibiting timber harvesting, and in keeping with my '*Guiding Principles*' I will not speculate in this regard. Furthermore, whether I accept or reject the inclusion of these areas in the THLB has no bearing on how they will be managed. Once such decisions have been made, in consultation with First Nations, they can be reflected in subsequent AAC determinations.

Harvest performance

The current AAC, determined in 2008, is 2.165 million cubic metres including a 550 000-cubic-metre partition attributable to non-pine species. Since 2008 the average annual harvest in the Morice TSA has been about 2.428 million cubic metres per year or about 12 percent higher than the AAC. The volume of non-pine harvested has gradually increased over time. Between 2008 and 2010, the average annual non-pine harvest was 574 950 cubic metres per year or about 4.5 percent higher than the partition. Since 2010, the average annual non-pine harvest has been 1.013 million cubic metres per year or about 85 percent higher than the partition.

On March 4, 2013, after extensive efforts with licensees to bring harvesting in line with the non-pine partition, the minister issued an order enforcing the partition in licence AACs. Following lengthy discussions with ministry staff, the two major licensees in the Morice TSA (Canfor and West Fraser Mills) and BC Timber Sales submitted a non-binding plan to align harvesting with the non-pine partition. At the time, the forest companies assured the minister that this plan would allow them to meet the partition, while providing them with cut control flexibility. In recognition of the commitments made by licensees in the harvest plan, the minister rescinded the partition order on May 28, 2013.

As discussed throughout this document, the volume of mature non-pine timber available for harvest between the time of this determination and when regenerating stands reach harvestable condition is limited. This AAC determination is based on a sustainable harvest level of live timber and the continued salvage of dead timber while it still has value. If harvest levels of live timber exceed the partition amount, it would represent an unsustainable level of harvest, which would have a negative impact on mid-term timber supply and ultimately cause a further reduction of the AAC. Consequently, it is imperative that licensees abide by the both the AAC and partition established in this determination. I strongly urge staff to ensure that the harvest level for the Morice TSA reflects this determination—especially the maximum harvest level partitioned for live timber. I am comfortable that establishing a live timber partition instead of the non-pine partition instituted in the previous AAC, will greatly facilitate licensees' ability to adhere to the partition and staff's ability to monitor compliance with the partition. In addition, I recommend that staff commence the work now that would allow the minister to issue a partition order enforcing this AAC partition for implementation as early as January 1, 2016.

- climate change

Climate in the Morice TSA is currently expected to become warmer and wetter, with temperature and precipitation increasing in the winter months more than in the summer. In addition, model projections suggest that a higher proportion of the fall/winter/spring precipitation will fall as rain instead of snow. This could result in a 30 percent to 40 percent decrease in spring snow packs in the western mountains. Climate variability is also expected to increase.

Although model projections indicate that climate is changing there is still significant variability between climate projections. Of the three climate projections assessed in the Nadina Natural Resource District, two show that most of the sub-boreal spruce biogeoclimatic zone will change and all three show that almost all of the Englemann spruce/sub-alpine fir biogeoclimatic zone will change. In the “wet” climate scenario, most of the TSA shifts to the interior cedar hemlock biogeoclimatic zone. In the “dry” climate scenario, the landscape becomes dominated by the interior Douglas-fir and interior cedar hemlock biogeoclimatic zones.

FLNR staff indicate that climate change could have a variety of effects on the forests of the Morice TSA. Some of these effects may be positive; for example warmer summers, longer growing seasons, and increases in carbon dioxide concentrations have the potential to increase tree growth. However, this growth may be limited if soils become too dry during the growing season. Conversely, warmer, wetter conditions have the potential to increase the virulence of foliar diseases and stem rusts. Fire disturbance and beetle-related mortality may also increase with climate change.

Future timber supply will likely reflect a balance between potential increases in tree growth due to warmer temperatures and longer growing seasons and reduced stand yields due to disease and insect infestation.

As outlined in my ‘*Guiding Principles*’, although I accept that climate is changing it is difficult to know how these changes will manifest and how forest ecosystems will respond. This highlights the need for continued monitoring of climate trends, tree growth and disturbance and to develop strategies to mitigate impacts on forest resources. For the Morice TSA, the results of the Skeena Natural Resource Region climate change work are expected to provide more definitive information. As forest practices are implemented to mitigate or adapt to the potential effects of climate change on forest resources, the information will be considered in AAC determinations. The requirement for regular AAC reviews will allow for the ongoing incorporation of new information from research and new forest practices as they are implemented.

Section 8(8) (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

- economic and employment implications

The Morice TSA lies within the Regional District of Bulkley-Nechako – Electoral Area ‘E’ (population 1507) and ‘G’ (population 975). Area ‘E’ also encompasses the southern portion of the neighbouring Lakes TSA and many of the residents of area ‘E’ may reside in that TSA. The largest community in the TSA is the District of Houston (population 3129). The Village of Granisle (population 304) is in the northern portion of the TSA on Babine Lake. There is also the smaller unincorporated community of Topley within the TSA (included in area RDBN Area G). The population of the Morice TSA is estimated to have decreased by 14 percent since 2001 (BC Stats).

The TSA has one large sawmill: Canadian Forest Products that has a 1.95 million cubic metres per year processing capacity and is combined with a pellet mill with a capacity of 225 000 dry tonnes per year, of which 60 percent is sawmill residuals and 40 percent is purchased fibre. Canfor is currently making changes to the mill that would allow it to process about 300 000 cubic metres per year of low quality timber.

There are three smaller mills: Pleasant Valley Remanufacturing and D H Manufacturing that remanufacture lumber from the Canfor mill and other mills in northern BC; and Tahtsa Timber. Tahtsa is currently making changes to its mill that uses about 300 000 cubic metres per year of low quality timber. The mills do not process logs or other directly harvested materials.

Just outside the TSA, in the Bulkley TSA, is West Fraser Mills' Pacific Inland Resources mill that currently processes about 950 000 cubic metres per year. Of this volume, approximately 300 000 cubic metres per year is supplied from the Morice TSA.

Canadian Forest Products holds licences for 66 percent of the TSA timber volume. West Fraser holds licences for 14 percent of the volume, and BC Timber Sales is responsible timber sales that represent 18 percent of the harvest. The remaining unallocated volume is being held for First Nations Woodland Tenures that are expected to be issued within the next two years.

As announced in October 2013, West Fraser agreed to exchange a portion of its existing timber harvesting tenure in the Morice TSA for Canfor-held tenures located in the Quesnel and Lakes TSAs. This tenure exchange is subject to the approval of the Minister. In March 2014, West Fraser Mills closed its mill in Houston – Houston Forest Products.

According to BC Stats, the forestry sector accounts for 31 percent of total basic employment in the Smithers-Houston Health Area. Other sectors providing employment include: public sector (23 percent); tourism (5 percent); construction (5 percent); agriculture and food (2 percent); mining and mineral production (9 percent); government transfer payments (13 percent).

I have reviewed the information regarding employment and community dependence related to the Morice TSA, I am aware of the important linkages between AAC and employment, both locally and provincially, of the importance of a balance between resources, and the importance of good stewardship. I have been mindful of these factors throughout this determination.

- alternative harvest forecasts

In addition to the base case, an alternative harvest forecast was prepared that examined the effect of reducing the initial harvest level in two steps to the mid-term level rather than one, all other assumptions were the same as in the base case. In the alternative forecast the initial harvest decreased to 1 800 000 cubic metres per year after five years. This level was maintained for five years before decreasing to a mid-term level of 1 565 000 cubic metres per year, which is 35 000 cubic metres per year lower than in the base case. The long-term harvest level was about the same as in the base case.

A local government commented, "Given that TSRs are not spatially derived, our talks with licensees and contractors have raised concerns that the availability of dead pine is not concentrated enough to maintain a binding pine partition. Therefore we do not believe the base case uplift should be maintained. We recommend that the alternative harvest flow outlined in Figure 7 (immediate drop in AAC to 1.55 million cubic metres per year) of the public discussion paper should be the target for the TSR."

I have considered the short- and long-term implications of alternative rates of harvest. On this basis, I conclude that reducing the harvest level to the mid-term level using additional steps comes entirely at the expense of mid-term timber supply. I will discuss my consideration of alternative harvest forecasts in “**Reasons for Decision**”.

Section 8(8) (c) repealed [2003-31-2 (B.C. Reg. 401/2003)]

This section of the *Forest Act* has been repealed [2003-31-2 (B.C. Reg. 401/2003)].

Section 8(8) (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 letters

The Minister of Forests and Range expressed the economic and social objectives of the Crown in two letters to the chief forester, dated July 4, 2006 (attached as Appendix 3) and October 27, 2010 (attached as Appendix 4). The minister asked for consideration, during AAC determinations, of the importance of a stable timber supply in maintaining a competitive and sustainable forest industry while being mindful of other forest values. The minister, in his 2010 letter, provided the Crown’s objectives with respect to mid-term timber supply in areas affected by the mountain pine beetle.

With respect to this, in the base case and in the alternative harvest flow projections described above, a primary objective has been to attain a stable, long-term harvest level where the growing stock is also stable. In addition, I have considered the impacts of mountain pine beetle on the timber supply of the Morice TSA throughout this determination.

Finally, the minister suggested that the chief forester should consider the local social and economic objectives expressed by the public, and relevant information received from First Nations.

During my consideration of the factors required under Section 8 of the *Forest Act*, I have been mindful of the local objectives, as provided in the Morice Land and Resource Management Plan and associated plans and orders. I have also reviewed the public consultation process undertaken by the district and considered the input received in making my determination. On this basis, I am satisfied that this determination accords with the objectives of government as expressed by the minister.

Mid-term Timber Supply Action Plan

In May 2012, a Special Committee on Timber Supply was appointed by the BC Legislature to make recommendations to address the reduction of mid-term timber supply due to MPB in the central interior of BC. The committee’s report is entitled *Growing Fibre, Growing Value* (August 2012). In October 2012, FLNR responded to the committee’s recommendations with the report *Beyond the Beetle: A Mid-term Timber Supply Action Plan*. Below, I have outlined key elements of the action plan that pertain to the TSR program and indicate where in this document I discuss my considerations that are relevant to these elements.

- identify marginally economic stand types as part of the TSR and quantify their potential contribution to the timber supply where applicable, while respecting resource objectives for other values, such as wildlife and water (discussed in “marginally economic stands”);

- continue to place a high priority on forest health activities designed to protect the mid-term timber supply from further losses (discussed in “volume estimates for managed stands”);
- review how unsalvaged losses are estimated during TSR to ensure they are not excluded from the AAC if they can be salvaged (discussed in “non-recoverable losses”);
- continue to ensure that the chief forester has appropriate analyses and information to support harvest flow decisions in each timber supply area when allowable annual cuts are determined (discussed in “alternative harvest forecasts”);
- continue to regularly monitor and review harvest performance and the timber supply to ensure that timber supply reviews are prioritized, relative to risk to forest stewardship. (discussed in “harvest performance”);
- where feasible and appropriate, provide information from the TSR to enhance public discussion of resource management objectives (discussed in “summary of public input”).

- summary of public input

The Minister’s letter of July 4, 2006 suggests that the chief forester consider important social and economic objectives that may be derived from public input during the timber supply review, where these are consistent with government’s broader objectives as well as any relevant information received from First Nations (see First Nations consultation section). To this end, a 60-day public review period from July 18, 2013 until September 18, 2013 was provided for the data package. A public review period from April 10, 2014 until June 20, 2014 was provided for the public discussion paper. A TSR information presentation was made to the District of Houston and the Regional District of Bulkley-Nechako. Presentations summarizing the public discussion paper were made to the District of Houston, the Village of Granisle, the Regional District of Bulkley-Nechako, and the Houston Chamber of Commerce.

A total of four submissions were received. At the determination meeting with staff, I was provided with all of the public input. Where the input relates to a factor I must consider in making my determination, I discuss that input in this rationale under the appropriate factor. First Nations comments are discussed primarily in the First Nations consultation section of this rationale.

A licensee provided a number of concerns it had regarding the TSR process including: a lack of transparency, an expedited schedule, and delays in receiving data and explanations about the data associated with their efforts to complete a “shadow” analysis. This licensee also had concerns with a number of specific elements of the analysis including: OAF 1, road width buffers, stump height, planting regimes, use of Class “A” pine seed, pine mortality projections, and pine distribution. This licensee also commented that the base case should incorporate draft GAR orders, a draft land-use order and a proposed First Nations Woodland Licence. This licensee did submit some additional information based on their “shadow” analysis.

FLNR staff note that this TSR followed the standard schedule and process. The concerns about specific elements of the TSR are discussed in the respective sections of this rationale.

Another licensee commented that there is a tendency for new area-based tenures to include a more than adequate amount of area along with very conservative estimates of productivity. This allows the new area-based tenure holder to re-assess their AAC soon after the award of the licence and obtain an increased AAC as a result. This creates a negative impact on volume-based tenures holders. This licensee also suggested that a new TSR may soon be required to address new VRI information, the biodiversity order, the caribou order, watershed designations and

improved OAF 1 estimates. This licensee also believes that the impact of the draft Morice biodiversity order has been underestimated in the base case.

There were also some issues raised as part of the public review that did not relate to a specific factor. Some input addressed concerns not directly related to my AAC determination such as land base for area-based tenures or concerns related to monitoring protocols. These issues are important and I would encourage the public to consult with district staff regarding how best to pursue these concerns.

I would like to thank all of the individuals and groups who participated in this timber supply review and note that their input helped to inform my considerations in determining an AAC for the Morice TSA.

Section 8(8)(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area;

Abnormal infestations, devastations and salvage programs

- non-recoverable losses

Non-recoverable loss factors are used in the analysis to account for the average volume lost each year due to natural causes, such as pests, fire and wind, that are not recovered or salvaged. Endemic pest losses are considered natural processes within stands and are accounted for within growth and yield models. Unsalvaged losses due to epidemic levels of MPB infestation are addressed separately.

The unsalvaged loss estimates used in the base case included 20 946 cubic metres for spruce bark beetle, 4595 cubic metres for spruce two-year budworm and 60 686 for fire for a total unsalvaged loss of 86 227 cubic metres per year.

To estimate annual unsalvaged losses due to insects (mountain pine beetle, spruce bark beetle, balsam bark beetle, and two-year cycle budworm), aerial overview survey data from 1999 to 2012 were merged together and combined with inventory information to identify the THLB, harvest openings, and mature conifers. The total volume of affected tree species in the resulting data file was adjusted for the severity of the attack using the mid-point for each severity class.

According to the current provincial projection results for the mountain pine beetle outbreak, the projected annual kill for the 2013-2024 period gradually declines from 602 048 cubic metres to 20 272 cubic metres. After 2024, it is assumed that the outbreak will be over and annual kill will be comparable to endemic levels. Consequently, in the base case, annual kill associated with the mountain pine beetle were assumed to remain at 20 272 cubic metres per year after 2024. Unsalvaged losses were assumed to be comparable to the pre-outbreak level of 9000 cubic metres per year after 2024. This volume loss was accounted for by the reduction of yield tables for the pine beetle impact.

Spruce bark beetle is found throughout the BC Interior, including in the Morice TSA. Since spruce is a valuable species for harvest, beetle suppression activities are typically aggressive and affected stems are usually quickly harvested. For example, an outbreak that peaked in 2000-2001 was successfully repressed and only 75 hectares of new infestation have been noted since 2011. In total 20 946 cubic metres per year of unrecoverable losses are associated with this beetle.

The western balsam bark beetle has caused widespread damage throughout the Morice TSA. Generally, the same stands are attacked year after year resulting in chronic low levels of mortality. A study conducted in the Morice TSA in 2002 by the regional entomologist concluded that the mortality associated with the balsam bark beetle was accounted for in VDYP in its entirety. This study compared cruise information measured in the field to VDYP projections. Although there appear to be an increased trend in mortality associated with the balsam bark beetle, more research is required to understand whether that trend is significant and whether it is accounted for in current growth and yield projections. Therefore, there are no unsalvaged losses associated with the balsam bark beetle in the base case.

In the Morice TSA, the principle hosts for the two-year-cycle budworm are higher elevation stands of spruce and subalpine fir (balsam). Most of the affected area is situated north of Fulton Lake and the peak in defoliation usually occurs during odd years. It is estimated that about 48 827 hectares of mature forests are currently impacted by the two-year cycle budworm. This area contains a total of about 10 million cubic metres of spruce and balsam. Since the damage caused by this insect occurs every second year, the trees have a chance to recover. Based on observations made by the regional forest health specialist, it is estimated that mortality would only occur in areas with severe defoliation. It is further estimated that only about 10 percent of the trees in the severe class would die. A total of 64 326 cubic metres of spruce and balsam is estimated to have been killed by the two-year cycle budworm. This corresponds to an annual loss of 4595 cubic metres.

Since 1992, about 13 560 hectares of forests have damaged by wildfires in the Morice TSA. Most of these fires were caused by lightning and occurred since 2004. To estimate the annual unsalvaged loss due to fire, fire polygon information was obtained from the BCGW. All fires outside of the timber harvesting land base (from TSR3) were deleted along with all fire polygons overlapped by harvest openings. Since there is no salvage activity occurring in the burned areas, the remaining polygons are assumed to correspond to unsalvaged losses.

The polygons corresponding to unsalvaged losses were overlaid with a district inventory layer of mature conifers. The total volume of conifer in the resulting data file was adjusted to account for overlap with areas impacted by the spruce and balsam bark beetles. The total affected volume is estimated at 1 213 270 cubic metres and corresponds to an unsalvaged loss of 60 686 cubic metres per year. According to fuel projection work done by Wildfire Management Branch, the probability of fire in the Morice TSA is high. Therefore, it is anticipated that this level of unsalvaged losses will continue.

I conclude that unsalvaged losses were appropriately accounted for in the base case. Under “**Implementation**”, I ask FAIB staff to examine the trend in mortality associated with western balsam bark beetle and to ensure that these losses are fully accounted for in the VDYP model prior to the next AAC determination.

- mountain pine beetle infestation

The MPB infestation in the Morice TSA peaked in 2007 and recent surveys and forecasts have confirmed the MPB infestation has collapsed and that there will be no significant new pine mortality associated with the current epidemic in the Morice TSA.

In the base case, dead pine was assumed to remain commercially viable until the tree has deteriorated to the point of collapse 15 years after tree death. The length of time that a beetle-killed pine tree remains commercially usable (‘shelf life’) varies depending on many factors including the type of product being manufactured. It is generally accepted that the quality of wood gradually diminishes after death from dimensional lumber quality through to

pulp/oriented strand board (OSB) fibre to secondary product (e.g., biofuel) quality. For the first five years of the base case, dead pine is prioritized for harvest. After five years, it is assumed that the dead pine will not be an economically viable source of wood fibre for the purposes of timber, pulp, or bioenergy production.

One licensee commented that while the PDP included a summary of the history of the infestation there was no information about continued or future infestation. FLNR staff noted that the PDP did state that “the infestation is largely over and total mortality has stabilized at about 56 percent”. Another licensee commented that in the PDP there was no specific information about how MPB impacts were modelled. FLNR staff noted that the PDP did specify that updated mortality estimates from the British Columbia Mountain Pine Beetle Model version 10 (BCMPB v 10) were used in the base case.

Two pine-leading stands groups were used in the base case – “less damaged” and “severely damaged”. The “less damaged” pine stands will meet or exceed the minimum harvest volume criterion after the dead pine volume is discounted. The “severely damaged” pine stands will not meet the minimum harvest volume criterion after the dead volume is discounted. If these stands were not harvested after five years they were set to age 20 years and grown as unmanaged stands.

A licensee provided information from ground sample plots that indicated the amount of damage from MPB was less than the level projected by BCMPB v10 used in the base case. Based on this information, a sensitivity analysis was prepared using lower mortality estimates. In the sensitivity analysis, the average mortality used for “less damaged” stands (33 percent) was applied to all pine stands. This decrease in mortality for “severely damaged” stands means that none of the stands lose sufficient volume to fall below the minimum harvest criterion. The results indicate that an initial harvest level of 1 900 000 cubic metres can be maintained for five years before decreasing to a mid-term level of 1 730 000 cubic metres per year, or 130 000 cubic metres per year higher than in the base case.

For the base case, it was assumed that dead pine remained merchantable for 15 years and at the beginning of the forecast, most of the dead pine was assumed to have been dead for 10 years. A review of harvest performance information indicates that the total volume of pine harvested annually in the Morice TSA has been declining from a high of 74 percent in 2010 to an average of 58 percent in the last three years. The proportion of dead pine contributing to the total harvest has also been declining from about 52 percent in 2010 to 36 percent in the last three years. Currently, it is estimated that dead pine accounts for about 18 percent of the total harvest. This information suggests that dead pine in the TSA has shorter shelf life and the amount of commercially-viable dead pine in the TSA is decreasing.

In order to assess the timber supply implications associated with shelf life uncertainty, a sensitivity analysis was prepared in which the shelf life was varied by five years. The results show that decreasing the shelf life from 15 years to 10 years and maintaining the base case initial harvest level of 2 165 000 cubic metres per year for five years reduces the mid-term harvest level from 1 600 000 cubic metres to 1 480 000 cubic metres per year. Increasing the shelf life from 15 years to 20 years increases the mid- and long-term harvest levels by 44 800 cubic metres per year and 16 700 cubic metres per year, respectively.

I have considered the MPB assumptions used in the base case in the context of the BCMPB model projections, the information provided by the licensee, harvest performance information and the results of the sensitivity analysis and reason as follows. MPB mortality projections in BCMPB are based on repeated annual forest health aerial surveys conducted across the TSA. These projections have been validated and form the provincial standard for MPB mortality estimation in BC. On this basis, I accept the mortality estimate used in the base case. I will discuss the results of the pine shelf life sensitivity analyses in the following section.

Reasons for Decision

In reaching my AAC determination for the Morice TSA I have considered all of the factors required under Section 8 of the *Forest Act* and I have reasoned as follows.

For most AAC determinations, a timber supply forecast is prepared that attempts to avoid excessive changes from decade to decade and significant timber shortages in the future. For the Morice TSA, where a large proportion of the dominant tree species was killed by mountain pine beetle and the time available to salvage the dead timber was limited it was not possible to produce a forecast that avoided large changes throughout the forecast period. The base case modelled the current harvest priorities that attempt to maximize the salvage of dead timber.

The initial harvest level in the base case was set at the current AAC of 2.165 million cubic metres. This rate could only be maintained for five years from the start of the forecast period in 2013. After five years, in 2018, the harvest level decreases to 1.6 million cubic metres per year and remains at this mid-term level for 55 years until 2073, after which it increases to the long-term sustainable level of 1.96 million cubic metres per year.

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

- Log grade adjustments – not accounting for the contribution of dead potential volume in the base case results in a 5.5-percent underestimation in the base case short- to mid-term harvest levels.
- Wildlife tree retention – not accounting for the level of wildlife tree retention observed in FREP monitoring results in a one percent overestimation in the short- to mid-term harvest level and a four percent overestimation in the long term.

In addition to the above factors that are reasons why the timber supply may have been over or underestimated there are also others that are difficult to quantify or in some cases to definitively determine whether they are upward or downward pressures on timber supply, but nonetheless introduce some degree of uncertainty. These include the accuracy of the forest cover inventory, volume estimates for existing stands, classification of pine stands by degree of damage, and climate change. I anticipate that the issues with the forest cover inventory and existing stand volumes will be addressed prior to the next timber supply review by the completion of the new VRI. Climate change will be addressed in future timber supply reviews as improved information becomes available.

In considering the above-mentioned influences, I find that - other than log grade adjustments - increased wildlife tree retention results in about a one percent overestimation in the short- to mid-term and about a four percent underestimation in the long-term harvest levels projected in the base case. In the context of all of the uncertainties associated with the information and modelling of timber supply, an over- or underestimation of this magnitude is of little consequence and I will consider these factors no further in this determination. The underestimation of short- and mid-term timber supply due to log grade adjustments, while significant when considered independently, is not a reason to contemplate an increase in harvest levels when considered in the context of an already accelerated harvest rate. While I will not be specifically increasing short-term harvest levels due to this factor, I would clarify that my determination has fully considered and accounted for the log grade change. In any event, any dead volume harvested in the short term in place of live timber that is currently accounted for in the inventory will provide for a more robust timber supply in the future. I will not consider this factor further in this determination.

In considering the information available to me for this determination, I am mindful of the timber supply dynamics demonstrated by the base case and alternative harvest forecast:

- The base case initial harvest can be supported for five years (2013-2017) by the continued salvage of available dead pine and incidental live trees within the salvaged stands.
- Beyond five years, salvage opportunities diminish as the remaining severely damaged pine no longer contributes to the timber supply since it will have been dead for longer than 15 years.
- The mid-term harvest level is restricted to about 82 percent of the long-term sustainable harvest level due to a reliance on the limited volume available from mature stands that were not killed by the beetle infestations.
- Managed stands that are currently established will be the source of much of the timber supply for the later mid-term harvest.
- By the end of the mid-term, harvest levels will be able to increase to long-term sustainable levels based on the existence of managed stands that will be created by the regeneration of current and projected harvesting. Reducing the harvest level to the mid-term level using additional steps comes entirely at the expense of mid-term timber supply.

The key issue in this determination is resolving the expectation of salvaging dead pine stands with the reality of primarily harvesting non-pine stands. It is apparent from the information presented regarding harvest performance that licensees are not harvesting dead pine stands and consequently the harvest focus is shifting to non-pine stands. This is illustrated by the significant difference between the October 2013 to March 2014 harvest data that show 18 percent of the total harvest volume was dead pine and the base case harvest forecast which assumes 67 percent of the first five years harvest will be from dead pine-leading stands. It is clear that while there is still dead pine being harvested it is not nearly as large a proportion of the harvest as is assumed in the base case harvest forecast. The higher short-term harvest level shown in the base case is supported by harvesting significant amounts of dead pine. Given the shift in harvest away from dead pine in recent years, I find it difficult to justify an AAC at or near the initial harvest level of the base case.

However, as there is still evidence of pine salvage in the TSA, albeit lower than in the base case, I want to continue to provide licensees with an opportunity to harvest as much of the remaining dead pine as possible. It is for this reason, that I am disinclined to lower the AAC immediately to the mid-term level of 1 600 000 cubic metres. I am also mindful of the social and economic implications associated with the transition to the mid-term harvest level that will occur during the period this determination is in effect. In this respect, my intention is to provide a balance between maintaining a higher harvest volume for as long as possible with conserving and improving the future growing stock.

I am aware that the base case and sensitivity analyses demonstrate that projected harvest levels are highly dependent upon the length of time that beetle-killed pine trees continue to contribute to the timber supply. I recognize that shelf life can vary depending on the type of product being manufactured, milling technology, market conditions and the environmental conditions affecting how long dead pine trees remain standing. I also recognize that the assumptions supporting the stratification of the pine-leading stands into “less damaged” and “severely damaged” in the base case have some uncertainty associated with them and that the consequence of the “severely damaged” stands having insufficient remaining volume to reach the minimum harvest volume has a significant impact on the mid-term harvest level.

I am cognizant of my obligation to consider and accommodate First Nations Aboriginal Interests and proven aboriginal rights and concerns when determining the AAC for the Morice TSA. I note that although the base case did not specifically exclude areas to account directly for Aboriginal Interests, these interests often coincide with areas excluded to account for other forest values, such as riparian areas, wildlife habitat and old growth. I also am aware that in determining this AAC I am in no way approving a specific forest management activity and that these decisions will be made in consultation with First Nations at an operational level. In any event, even if I reduced the AAC in an attempt to accommodate Aboriginal Interests there is no guarantee that such a reduction would result in the desired changes in forest management or land use.

Based on all of these considerations, I conclude that an AAC of 1.9 million cubic metres would allow the salvage of as much of the beetle-infested stands as possible; thereby, capturing the value of dead timber, and improving future growing stock. However, I am also mindful that a harvest of 1.9 million cubic metres per year cannot be maintained for a full 10-year period without adversely impacting mid-term growing stock. In order to strike a balance between maximizing the salvage of dead timber and minimizing the risks to future timber supply and forest values, I have decided to establish a two-tiered AAC. For the first five years following this determination, the AAC will be 1.9 million cubic metres, of which a maximum of 1.6 million cubic metres per year is attributable to live trees. Thereafter, the AAC will decrease to 1.6 million cubic metres until a new AAC is determined.

This AAC and the partition are intended to provide licensees with flexibility to continue harvesting MPB impacted pine to the extent that the dead pine continues to be commercially useable and to conserve healthy, non-pine stands and secondary-stand structure to support mid-term harvest levels.

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 the following AAC is necessary and appropriate to accommodate objectives for all forest resources, to reflect current management practices, address concerns identified by First Nations and to achieve the socio-economic objectives of the Crown:

- From March 16, 2015 to March 15, 2020, the AAC will be 1 900 000 cubic metres, of which no more than 1 600 000 cubic metres are attributable to live trees;
- From March 16, 2020 until the next determination, the AAC will be 1 600 000 cubic metres.

This determination is effective March 16, 2015 and will remain in effect until a new AAC is determined. Legislation requires a new AAC determination within 10 years of the effective date of this determination; however, I expect that this determination may need to be revisited in approximately five years after new information is available from harvest performance monitoring and other actions described below in “**Implementation**”. Annual reporting and recommendations from the district will inform the decision about when to initiate the next timber supply review.

If additional significant new information is made available to me, if major changes occur in the management assumptions upon which I have predicated this decision, or if the harvest performance does not match the partition, then I am prepared to revisit this determination sooner than indicated above.

Implementation

In the period following this decision and leading to the subsequent AAC determination, I encourage FLNR staff and licensees to undertake or support the tasks noted below, the particular benefits of which are described in appropriate sections of this document. I recognize that the ability of staff and licensees to undertake or support these projects is dependent on available resources, including funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Morice TSA.

- (i) I expect licensees to continue to focus harvesting as much as possible on mountain pine beetle-impacted pine-leading stands in the Morice TSA; to keep FLNR staff informed of the evolving economic viability of dead pine stands; and to harvest their share of the AAC attributable to dead tree volume.
- (ii) I request that district staff monitor the following and report annually to the chief forester: the harvest performance within dead stands and within the AAC partition attributable to live tree volume and the current and foreseeable economic viability of harvesting dead pine stands (i.e. the remaining dead pine shelf life).
- (iii) I encourage licensees and district staff to work collaboratively to adapt management to address the health of young stands and the impact on stocking levels.
- (iv) I encourage district staff to monitor performance in harvesting lower volume stands to provide information to the next timber supply review. I also encourage district staff and licensees to seek harvesting opportunities in lower volume stands, specifically those below 100 cubic metres per hectare.
- (v) I encourage district staff to monitor stump height and utilization of this potential extra volume with the intention of considering this at the next determination.
- (vi) I encourage expedited government orders for biodiversity and wildlife.
- (vii) I ask that FAIB staff confirm that endemic losses for pests such as the western balsam bark beetle are fully accounted for in VDYP prior to the next determination.



Dave Peterson, RPF
Chief Forester

March 16, 2015

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, c. 157, (current to February 25, 2015), reads as follows:

Allowable annual cut

8 (1) The chief forester must determine an allowable annual cut at least once every 10 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding the Crown land in the following areas:

- (i) tree farm licence areas;
- (ii) community forest agreement areas;
- (iii) first nations woodland licence areas;
- (iv) 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 (2) or (3),

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

(c) within 10 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 10 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 10 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

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

(a) by written order may postpone the next determination under subsection (1) to a date that is up to 15 years after the date of the relevant last determination, and

(b) must give written reasons for the postponement.

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

- (a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and
 - (b) must give written reasons for setting the earlier date.
- (4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).
- (5) In determining an allowable annual cut under subsection (1) the chief forester may specify that portions of the allowable annual cut are attributable to one or more of the following:
- (a) different types of timber or terrain in different parts of Crown land within a timber supply area or tree farm licence area;
 - (a.1) different areas of Crown land within a timber supply area or tree farm licence area;
 - (b) different types of timber or terrain in different parts of private land within a tree farm licence area.
 - (c) [Repealed 1999-10-1.]
- (6) The minister must determine an allowable annual cut for each woodlot licence area, in accordance with the woodlot licence for that area.
- (7) The minister must determine an allowable annual cut for
- (a) each community forest agreement area in accordance with the community forest agreement for that area, and
 - (b) each first nations woodland licence area in accordance with the first nations woodland licence for that area.
- (8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider
- (a) the rate of timber production that may be sustained on the area, taking into account
 - (i) the composition of the forest and its expected rate of growth on the area,
 - (ii) the expected time that it will take the forest to become re-established on the area following denudation,
 - (iii) silviculture treatments to be applied to the area,
 - (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,
 - (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and
 - (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,
 - (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
 - (c) [Repealed 2003-31-2.]

(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.

(9) Subsections (1) to (4) of this section do not apply in respect of the management area, as defined in section 1 (1) of the *Haida Gwaii Reconciliation Act*.

(10) Within one year after the chief forester receives notice under section 5 (4) (a) of the **Haida Gwaii Reconciliation Act**, the chief forester must determine, in accordance with this section, the allowable annual cut for

(a) the Crown land in each timber supply area, except the areas excluded under subsection (1) (a) of this section, and

(b) each tree farm licence area

in the management area, as defined in section 1 (1) of the *Haida Gwaii Reconciliation Act*.

(11) The aggregate of the allowable annual cuts determined under subsections (6), (7) and (10) that apply in the management area, as defined in section 1 (1) of the *Haida Gwaii Reconciliation Act*, must not exceed the amount set out in a notice to the chief forester under section 5 (4) (a) of that Act.

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

Section 4 of the *Ministry of Forests and Range Act* (current to February 25, 2015) reads as follows:

Purposes and functions of ministry

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

Appendix 3: Minister's letter of July 4, 2006



JUL 04 2006

Jim Snetsinger
Chief Forester
Ministry of Forests and Range
3rd Floor, 1520 Blanshard Street
Victoria, British Columbia
V8W 3C8

Dear Jim:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the responsibility for determining Allowable Annual Cuts—decisions with significant implications for the province's economy, communities and environment. This letter outlines the economic and social objectives of the Crown you should consider in determining Allowable Annual Cuts, as required by Section 8 of the *Forest Act*. This letter replaces the July 28, 1994 letter expressing the economic and social objectives of the Crown, and the February 26, 1996 letter expressing the Crown's economic and social objectives for visual resources. The government's objective for visual quality is now stated in the *Forest Practices and Planning Regulation of the Forest and Range Practices Act*.

Two of this government's goals are to create more jobs per capita than anywhere in Canada and to lead the world in sustainable environmental management. The Ministry of Forests and Range supports these objectives through its own goals of sustainable forest and range resources and benefits. In making Allowable Annual Cut determinations, I ask that you consider the importance of a stable timber supply in maintaining a competitive and sustainable forest industry, while being mindful of other forest values.

The interior of British Columbia is in the midst of an unprecedented mountain pine beetle outbreak. Government's objectives for management of the infestation are contained in British Columbia's Mountain Pine Beetle Action Plan. Of particular relevance to Allowable Annual Cut determinations are the objectives of encouraging long-term economic sustainability for communities affected by the epidemic; recovering the greatest value from dead timber before it burns or decays, while respecting other forest values; and conserving the long-term forest values identified in land use plans.

Page 1 of 2

Minister of
Forests and Range
and Minister Responsible
for Housing

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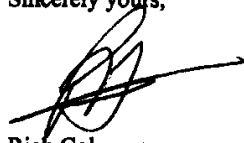
Jim Snetsinger

To assist the province and affected communities in planning their responses to the beetle infestation, it would be best to have realistic assessments of timber volumes that can be utilized economically. Therefore, in determining the best rate of harvest to capture the economic value from beetle-killed timber, I ask that you examine factors that affect the demand for such timber and products manufactured from it, the time period over which it can be utilized, and consider ways to maintain or enhance the mid-term timber supply.

The coast of British Columbia is experiencing a period of significant change and transition. In making Allowable Annual Cut determinations I urge you to consider the nature of timber supply that can contribute to a sustainable coast forest industry, while reflecting decisions made in land and resource management plans.

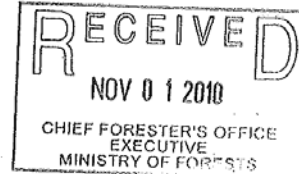
You should also consider important local social and economic objectives expressed by the public during the Timber Supply Review process, where these are consistent with the government's broader objectives as well as any relevant information received from First Nations.

Sincerely yours,

A handwritten signature in black ink, appearing to be 'Rich Coleman', with a long horizontal stroke extending to the right.

Rich Coleman
Minister

Appendix 4: Minister's letter of October 27, 2010



File: 280-30/MPB
Ref: 126097

OCT 27 2010

Jim Snetsinger, Chief Forester
ADM Forest Resource Stewardship Division
Ministry of Forests and Range
3rd Floor, 1520 Blanshard Street
Victoria, British Columbia
V8W 3C8

Dear Mr. Snetsinger:

Re: Economic and Social Objectives of the Crown Regarding Mid-Term Timber Supply in Areas Affected by the Mountain Pine Beetle

On July 4, 2006, Rich Coleman, former Minister of Forests and Range, wrote to you outlining the social and economic objectives of the Crown for AAC determination (in accordance with Section 8 of the *Forest Act*) with respect to issues associated with the Mountain Pine Beetle (MPB) epidemic. The aforementioned letter articulated the Crown's objectives of ensuring long-term economic sustainability for communities affected by the epidemic; recovering the greatest value from dead timber before it burns or decays, while respecting other forest values; and conserving the long-term forest values identified in land use plans. I am writing to you regarding the Crown's objectives with respect to mid-term timber supply in areas affected by the mountain pine beetle.

The MPB infestation has had a profound impact on the timber supply outlook for the interior of the province. In particular, forecasts of timber supply in the mid-term—the period between the ending of the economic shelf life of killed pine and the time when the forest has re-grown and again become merchantable—are now significantly lower than prior to the infestation. These shortages threaten the wellbeing of forest-dependent cities and towns. The

Page 1 of 2

Ministry of Forests and Range and
Minister Responsible for Integrated
Land Management Bureau

Minister's Office

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Jim Snetsinger, Chief Forester

Government of British Columbia is working closely with beetle action committees, municipalities, and the private sector to diversify economies. However, for many forestry-dependent towns mid-term timber supply shortages could still have significant socio-economic impacts.

During this challenging time it will be necessary to reassess management objectives and administrative approaches that were developed when forest conditions in the province's interior were very different than now exist. In this reassessment it will be important to enhance the understanding of how best to balance objectives for non-timber forest values with objectives for timber supply to achieve a range of socio-economic benefits. It will also be important to assess how innovative practices and incremental silviculture could mitigate mid-term timber supply shortfalls in MPB affected areas, and if flexibilities can be found in timber supply administration.

During the Timber Supply Review process, in addition to the considerations included in the July 2006 letter, I would like you to undertake analysis that can provide information on how changes to current management practices and administration could increase mid-term timber availability in MPB-affected areas. This information should be shared with Ministry of Forest and Range Executive and used to inform discussions among interested parties, and considered by appropriate land use and management decision makers. If formal changes are made to management objectives and administration, you will be in a position to incorporate those changes in Timber Supply Reviews and AAC determinations.

Sincerely,



Pat Bell
Minister

pc: Dana Hayden, Deputy Minister