



Province of
British Columbia

OFFICE OF THE
MINISTER

Ministry of
Forests



MEMORANDUM

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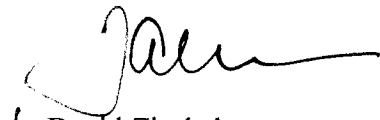
To: All Regional Managers

From: The Honourable David Zirnhelt
Minister of Forests

Re: *Interior Appraisal Manual*

I hereby approve the new *Interior Appraisal Manual* and attach a copy of it for your use. This manual is effective December 1, 1997, and applies to all interior stumpage appraisals.

Amendments or revisions to this manual require my further approval.



D. David Zirnhelt
Minister

Attachment

cc: Bill Howard, Director, Revenue Branch

All Subscribers, *Interior Appraisal Manual*

New Interior Appraisal Manual Highlights.

The new *Interior Appraisal Manual* includes clarification to policy and updating of the cost base to July 1, 1995. By section the changes are as follows.

Chapter 1	New words to clarify policy.
Section 2.2	New words to clarify policy.
Section 2.3	New words to clarify policy.
Section 2.3 (1)	Insert new words to qualify that sudden and severe damage must involve at least 10 ha. or be at least 10% of the original appraised volume before considering application of this section.
Section 2.3 (3)	New words to clarify policy.
Section 2.3 (4)	New words to clarify policy.
Section 2.4 (2)	New words to clarify policy.
Section 2.5	Expanded definition of sawmill. Change the definition of Point of Appraisal to exclude manufacturing cost from the least cost determination.
Section 3.1	Expanded definition of Lumber AMVs.
Section 3.3	Zone LRF tables updated.
Section 3.3 (5)	Update shipping differentials.
Section 3.3 (6)	Update manufacturing differentials.
Section 4.1	New words to clarify policy.

Section 4.1.1	<ul style="list-style-type: none">- Salvage logging redefined for clarity of policy.- Skyline Logging removed as a specified operation as it is now a full phase estimate, Section 4.4.3 (4b)- Pushover logging and stump removal are consolidated under Root Disease Control.- Ocean tow removed as it is now part of the regular towing phase, Section 4.5.3- Kinbasket Lake barge/ferry not used for truck haul (private), added due to the unique conditions on the lake and small volumes involved.
Section 4.2	New words to clarify policy.
Section 4.3	New words and reorganization of the section to clarify policy. Is now consistent with the <i>Coast Appraisal Manual</i> format.
Section 4.3.1	Renumbered and redesigned section as part of reorganization of Section 4.3. Clarifies policy.
Section 4.3.1.1	This is the old Section 4.3.1, all sub-sections are renumbered for clarity and consistency with the <i>Coast Appraisal Manual</i> . New words to clarify policy.
Section 4.3.2.1	Section rewritten for clarity.
Section 4.3.2.2 (1)	New words to clarify policy.
Section 4.3.2.2 (2)	<ul style="list-style-type: none">- New words to clarify policy.- Special designation for Fort Nelson roads removed. They are now part of group 7 (Table 4-1)
Section 4.3.2.2 (3)	New words to clarify policy.
Section 4.3.2.2 (5)	New words to clarify policy.
Section 4.3.2.2 (6)	Removed Region as a variable. Replaced with biogeoclimatic variable as defined.

- Section 4.3.2.3
- New grouping approach to subgrade equations. This is a change to help simplify appraisals.
 - New snow road cost in \$/km cost for any snow roads.
 - Insert Table 4-1: Road Groups. Defines geographical areas of the province that have similar road construction conditions.
- Section 4.3.2.4
- New estimates in tables for Culvert and Bridge costs.
 - New words to clarify policy.
- Section 4.3.2.5
- New words to clarify policy.
 - New equations for additional stabilizing material linked to the new road group approach. This is a change to help simplify appraisals.
- Section 4.3.2.6
- New costs for cattle guards, wing and remedial fences.
 - Pipeline Crossings added with average costs.
- Section 4.3.3
- Rewording to clarify policy.
 - Transferred (16) Pipeline Crossing to Section 4.3.2.6.
 - Added Slough removal over 250 m³ material volume.
 - New words to clarify policy on data required and costs that may be included in Section 4.3.3.
- Section 4.4.1 & 2
- New words to clarify policy and define new variables.
- Section 4.4.3
- New costs for Helicopter and Horse logging, new equations for ground skidding, overhead cable yarding and small tree volume additive.
 - New sub-section with equation for skyline logging.
- Section 4.4.5
- New words to clarify policy.
- Section 4.5.1
- New words to clarify policy, default times for delays have been included in policy to improve the consistency of application.
- Section 4.5.2
- New equations for highway, off-highway and secondary hauling.

Section 4.5.3	New equations and cost estimates for water transportation. Consolidation of minor estimates into logical groups.
Section 4.5.4	New equations and cost estimates for special transportation systems., Consolidation of unique location estimates into generic phase estimate. Eliminates the need for one off approvals.
Section 4.6	New words to clarify policy. New estimates in tables.
Section 4.8.1	<ul style="list-style-type: none">- New words to clarify policy.- Overhead changed to new district based cost estimates.
Section 4.8.2	New cost estimates for isolated cutting authorities. Consolidation of access types to create generic estimates rather than site specific ones.
Section 4.8.3	New Low Volume Estimate policy and costs. This section is moved from section 6.2 (3). The new policy provides two estimates. One is related to small AAC licenses (less than 3 000 m ³). The second is related to cutting authorities that have an appraised volume of less than 3 000 m ³ .
Section 4.10	<ul style="list-style-type: none">- New cost estimates for silviculture. The forest districts have been regrouped to better represent similar conditions.- New words to clarify policy.
Section 4.11	New Manufacturing cost estimates.
Section 4.12	New trend factors.
Chapter 6, Section 6.2	Low Volume Cost Additive moved to Chapter 4.
Section 6.3	New words to clarify policy.
Section 6.4	New words to clarify policy.
Section 6.5	<ul style="list-style-type: none">- Renumbered sections from the new <i>Forest Act</i>.- Deleted reference to TSL with more than 10 000 m³ AAC. This is now consistent with the <i>Coast Appraisal Manual</i>.
Section 6.6 (2)	Added qualifier to development levy to clarify policy.

Section 6.7.1, Table 6-1	New words to simplify description lakes where logs are salvaged below the high water mark.
Appendices	New equipment and labor rates. Glossary revised.

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**Interior Appraisal Manual
Effective December 1, 1997**

**Cost Base
Woods: July 1, 1995
Manufacturing: July 1, 1995**

Table of Contents

1 Introduction

1.1 Terms of Reference.....	1-2
1.2 Area of Application.....	1-3
1.3 Cutting Authority.....	1-4
1.3.1 Cutting Authority Area.....	1-4
1.4 Responsibility for Stumpage.....	1-5
1.5 Comparative Value Timber Pricing	1-6
1.6 Stumpage Adjustments	1-8

2 Appraisal Principles and Procedures

2.1 Types of Determination.....	2-2
2.2 Time Schedule - Appraisals and Reappraisals	2-3
2.3 Reappraisal	2-5
2.4 Fixed Stumpage Rate and Extension of Term	2-9
2.5 Point of Appraisal	2-11
2.5.1 Method of Transportation to be Used in Determining Point of Appraisal	2-12
2.6 Calculation Conventions	2-13

3 Interior Selling Prices

3.1 Lumber Average Market Values	3-2
3.1.1 Application of Lumber Average Market Values	3-3
3.1.2 Lumber Average Market Value (AMV) Zones	3-3
3.2 Chip Average Market Values	3-4
3.3 Calculation of Species End Product Selling Price	3-4

4 Operating Cost Estimation

4.1 Cost Estimates.....	4-2
4.1.1 Specified Operations	4-2
4.2 Appraisal Data Requirements	4-4
4.3 Development	4-5

4.3.1 Development Cost Categories	4-6
4.3.1.1 Development Cost Allocation	4-8
4.3.2 Tabular Cost Estimates	4-11
4.3.2.1 Subgrade Construction	4-11
4.3.2.2 Subgrade Construction Variables	4-11
4.3.2.3 Subgrade Cost Estimate	4-14
4.3.2.4 Drainage Structures	4-16
4.3.2.5 Additional Stabilizing Material	4-19
4.3.2.6 Cattle Guards, Remedial Fences and Pipeline Crossings	4-21
4.3.2.7 Snow Road Reconstruction	4-21
4.3.3 Detailed Engineering Cost Estimates	4-22
4.4 Tree-to-Truck	4-26
4.4.1 Harvesting Methods	4-27
4.4.2 Tree-to-Truck Variables	4-28
4.4.3 Tree-to-Truck Cost Estimate	4-31
4.4.4 Tree-to-Truck Additive for Damaged Timber	4-35
4.4.5 Prorating Tree-to-Truck Cost Estimates	4-36
4.5 Log Transportation	4-37
4.5.1 Truck Haul Variables	4-37
4.5.2 Truck Haul Cost Estimates	4-39
4.5.2.1 Primary Haul	4-39
4.5.2.2 Secondary Haul	4-40
4.5.3 Water Transportation Cost Estimate	4-40
4.5.4 Special Transportation Systems	4-40
4.6 Road Maintenance	4-42
4.7 Road and Land Use Charges	4-46
4.8 Administration and Other Costs	4-47
4.8.1 Overhead	4-47
4.8.2 Isolated Cutting Authority Areas	4-48
4.8.3 Low Volume Additive	4-48
4.9 Post-Logging Treatment Costs	4-49
4.10 Basic Silviculture Cost Estimate	4-50
4.11 Manufacturing Cost Estimates	4-53
4.12 Cost Trend	4-56

5 Stumpage Rate Determination

5.1 Indicated Stumpage Rate	5-2
5.2 Value Index	5-3
5.3 Mean Value Index	5-4
5.4 Market Value Indexing	5-5
5.5 Base Rate	5-6
5.6 Calculation of Stumpage Rate	5-7
5.6.1 Calculation of Indicated Stumpage Rate	5-7

5.6.2 Prescribed Minimum Stumpage Rate	5-7
5.6.3 Reserve Stumpage Rate.....	5-7
5.6.4 Upset Stumpage Rate.....	5-8
5.6.5 Total Stumpage Rate.....	5-8

6 Miscellaneous Timber Pricing Policies

6.1 Average Value Indexes by District and Species	6-2
6.2 Cutting Authorities With 5 000 m ³ or Less Volume.....	6-3
6.3 Right-of-Way Cutting Authorities	6-4
6.4 Partially Harvested Timber	6-5
6.5 Small Business Forest Enterprise Program (SBFEP) Sales.....	6-6
6.6 Levies	6-7
6.7 Miscellaneous Stumpage Rates	6-8
6.7.1 Special Forest Products and Other Miscellaneous Rates	6-8
6.7.2 Miscellaneous Stumpage Rates for Timber Licences.....	6-11

Appendices

Appendix I Equipment and Labour Rates	A-2
Appendix II Lumber Recovery Factors (board feet/cubic metre).....	A-4
Appendix III Development Cost Allocation.....	A-5
Appendix IV: Glossary	A-6

Index

Tables

Table 4-1: Road Groups	4-15
Table 5-1 Timber Licence Stumpage Rate Adjustment Schedule	5-8
Table 6-1 Miscellaneous Stumpage Rates.....	6-9
Table 6-2 Miscellaneous Stumpage Rates for Timber Licences.....	6-11

Introduction

1

1.1 Terms of Reference

The *Forest Act*, Sections 103 to 108, and regulations provide the statutory authority for the determination of stumpage for Crown timber.

The *Forest Act*, Section 105, requires adherence to the policies and procedures approved for the forest regions by the Minister of Forests. This *Interior Appraisal Manual*, approved by the Minister, contains the policies and procedures for determining stumpage rates charged for Crown timber harvested in the area described in Section 1.2.

The data used in the manual is based on a broad sampling of timber harvesting, silviculture, manufacturing costs and lumber and chip selling prices experienced by licensees in the interior.

1.2 Area of Application

This manual applies to the "Interior", which is defined as the entire province of British Columbia, excluding the Vancouver Forest Region (as established by the *Forest Act* and Regulations), and that part of the Prince Rupert Forest Region west of the Cascade Mountains Administrative Line from Tweedsmuir Park to the state of Alaska.

There is one exception to the above definition. Timber in that portion of the Kalum Forest District, lying west of the Cascade Mountains Administrative Line is appraised using the *Interior Appraisal Manual*.

1.3 Cutting Authority

The term "cutting authority" is defined as:

1. A cutting permit issued under:
 - a. a forest licence,
 - b. a timber sale licence that provides for the issuance of cutting permits,
 - c. a tree farm licence (a tree farm licence cutting authority may include more than one cutting authority area),
 - d. a woodlot licence, or
 - e. a timber licence.
2. A timber sale licence under which cutting permits have not or will not be issued.
3. A licence to cut.
4. A road permit.

1.3.1 Cutting Authority Area

The term "cutting authority area" means the area of timber that:

1. may be harvested under a cutting authority, and
2. has a unique timber mark.

1.4 Responsibility for Stumpage

For the purposes of Section 105 of the *Forest Act*, the following employees of the ministry are authorized to determine, redetermine and vary stumpage rates.

- Regional Managers, Regional Appraisal Coordinators and other employees authorized by the Regional Manager, and
- Director, Revenue Branch and employees of Revenue Branch.

1.5 Comparative Value Timber Pricing

Comparative Value Pricing (CVP), subject to a minimum stumpage rate, is the basis for determining stumpage rates. Sections 2.1 (2), (3) and (4) provide the methods that are used for specific products and extraordinary situations.

One component of CVP is the determination of the average stumpage rate for the Interior. The stumpage rate for a given stand of timber is more or less than the pre-set average rate (Interior Target Rate) (see Chapter 5) depending upon whether the stand is more or less valuable than the average stand. To assess the value of the stand and hence to determine a stumpage rate, the forest officer will typically:

1. Estimate the selling price of the products that can be recovered from the timber stand (see Chapter 3).
2. Estimate the least total cost necessary to harvest and deliver timber to a point of appraisal then add the manufacturing cost for that point of appraisal (see Chapter 2 and 4).
3. Determine the Value Index (see Chapter 5) of the timber stand by subtracting the estimated operating cost from the estimated selling price.
4. Determine the indicated stumpage rate by comparing the Value Index for the timber stand with the Interior Mean Value Index and adding the Interior Base Rate (see Chapter 5).
5. Determine the reserve stumpage rate (see Chapter 5) by selecting:
 - a. the greater of the indicated stumpage rate or the prescribed minimum stumpage rate, or
 - b. for an appraised cutting authority area containing timber licence volume, the greater of the adjusted indicated stumpage rate or the prescribed minimum stumpage rate.
6. Determine the upset stumpage rate by adding any development and silviculture levies (see Section 6.6) to the reserve stumpage rate.
7. Determine the total stumpage rate by adding any bonus bid to the upset stumpage rate.

One stumpage rate is determined for all appraised timber in each cutting authority area with the exception of miscellaneous stumpage rates as specified under Section 6.7.

The average stumpage rate for the interior is indexed to lumber market values as explained in Chapter 5.

1.6 Stumpage Adjustments

Unless a cutting authority or the application and tender for a timber sale licence specifies that stumpage rates are fixed for a specified period or for the full term of the cutting authority, stumpage rates are adjusted quarterly on January 1, April 1, July 1, and October 1 of each year subject to Section 6.5.

Each quarter the adjusted stumpage rates reflect changes in estimated selling prices (as authorized in this manual since the previous adjustment), and the recalculated operating cost based on the appropriate trend factors shown in Section 4.12. In addition, the adjustment reflects changes to the Statistics Canada Softwood Lumber Index for the Interior, the Interior Base Rate and the Interior Mean Value Index.

Appraisal Principles and Procedures

2

2.1 Types of Determination

Stumpage rates are determined by one of the following methods:

1. An appraisal or reappraisal under Chapters 3 and 4 of this manual.
2. An Order-in-Council directive setting rates under the *Forest Act*, Section 105.
3. Pricing under Chapter 6 of this manual.
4. The use of stumpage rates developed by regional revenue staff, and approved by the Regional Manager or Regional Manager's designate.

2.2 Time Schedule - Appraisals and Reappraisals

Timeliness is an important factor in the stumpage appraisal process. The following schedule applies:

1. For each new cutting authority, the licensee must include with the application to the District Manager a completed Interior Appraisal Data Sheet (data sheet) and appropriate support information. When the data is received the District Manager will proceed as in Subsection 3 of this section.
2. For a reappraisal the licensee will provide all data, subject to Section 2.3 (3), which must be received by the District Manager at least 45 calendar days prior to the anniversary of the cutting authority term (effective date). If the licensee fails to provide all data, then the District Manager:
 - a. may contact the licensee by the due date (45 calendar days prior to effective date) for reappraisal data and request that data known to have changed since the previous appraisal be submitted within 15 calendar days, and
 - b. if the data is not received within 15 calendar days, use the best data available at the district office 30 days prior to the effective date.
3. The District Manager or designate reviews the available data and if in agreement with the submission, signs the data sheet and advises the licensee. If no data was submitted for reappraisal, then advising the licensee is not required and Subsections 4 and 5 of this section do not apply.
4. The District Manager or the licensee may request a meeting to discuss the appraisal data submission.
5. At the meeting, the licensee may only clarify data previously submitted. The District Manager may revise the data sheet as a result of the meeting.
6. The District Manager shall advise the licensee of any changes, made to the appraisal data sheet.
7. The District Manager shall provide an appraisal data sheet to the Regional Office as part of the appraisal package.
8. The regional revenue staff will advise the District Manager who will advise the licensee of any further changes made to the data sheet.
9. Regional revenue staff will notify the licensee by letter or facsimile transmission, of the stumpage rate and the summary of appraisal information used in determining the stumpage rate.

10. The licensee may advise regional revenue staff, verbally or in writing, of any objection to the information contained in the stumpage advisory notice that could be resolved without an administrative review or appeal.. The receipt of an objection will be acknowledged verbally or in writing by the forest officer. At this point the objection is not considered an administrative review or appeal under the *Forest Act* (Section 143 - 150.).

2.3 Reappraisal

A reappraisal is a re-estimation of Operating Cost and Selling Price according to the Appraisal Manual in effect on the effective date of the reappraisal. Except in the case of "sudden and severe damage" as explained below, a reappraisal is based upon a complete reassessment of a cutting authority and assumes the cutting authority being reappraised has been returned to its original condition prior to development or harvesting. If there are changes to the cutting authority the operating cost data must be revised to reflect those changes, unless a reappraisal is exempted under Section 2.3.3.

At reappraisal the election of quarterly adjusting, or annual adjusting stumpage rate remains unchanged.

A cutting authority that has elected fixed stumpage rates is not reappraised unless Section 2.3 (1) or (5) require a reappraisal.

A cutting authority that has fixed stumpage rates because it was appraised under Section 6.2 (1) shall remain as fixed status.

At the time of a reappraisal, initial detailed engineering cost estimates may be re-estimated once after construction to reflect more accurate on-site field information. However, development costs originally estimated using ministry approved competitive bids, or costs that have been apportioned to more than one cutting authority are not re-estimated in a reappraisal.

A reappraisal is only made if one of five situations arises:

1. Sudden and Severe Damage

If the Regional Manager is satisfied that sudden and severe damage in excess of 10 ha or 10% of the original volume has occurred to the appraised timber, the cutting authority is reappraised upon the licensee's request. The effective date of the redetermined rate is the first of the month following the occurrence of the damage, unless otherwise specified by the Regional Manager. A reappraisal is not made in the case of fire damage caused by the licensee if they have failed to comply with the *Forest Practices Code of British Columbia Act*, Sections 75 through 95 and relevant regulations.

In the case of "sudden and severe damage" the redetermined stumpage rate is based upon the remaining timber only. The Regional Manager may approve the use of appraisal data obtained from comparable cutting authorities. The reappraisal cost estimate for development and silviculture takes into account volume already removed.

This policy on "sudden and severe damage" applies to fixed rate cutting authorities as well as to adjustable rate cutting authorities. Any existing bonus bid and/or levy is payable in addition to the redetermined upset stumpage rate.

2. Amendments

If a cutting authority area or cutting authority (see Section 1.3) is amended, a reappraisal may be triggered if:

- a. the accumulated amendments (either addition or deletion of merchantable timbered stumpage-bearing area) equal or exceed either 10 ha or 10 percent of the merchantable area, whichever is less; the entire cruise must be recompiled and the stumpage rate redetermined, or
- b. the amendment requires a Specified Operation or different logging method (see Sections 4.1.1 and 4.4.1), that equals or exceeds 10 percent of the cutting authority volumes; the entire cruise must be recompiled and the stumpage rate redetermined, or
- c. the amendment requires major subgrade reconstruction or replacement or reconstruction of a major drainage structure. In these instances, the cost estimate is based solely upon remaining timber volume (i.e., applicable volume).

The redetermined stumpage rate becomes effective on the first day of the month following written notice to the licensee which approves the amendment.

3. Reappraisal at Anniversary Date

"Anniversary date" means the annual recurrence of the month and day when the term of the cutting authority began.

Reappraisal at the anniversary date is mandatory for all woodlot cutting authorities regardless of the volume remaining (Section 2.4 (2)).

Reappraisals must be carried out on all quarterly adjustable stumpage rate cutting authorities with subsequent anniversary dates when the following conditions are satisfied:

- a. timber from the cutting authority area is expected to be scaled under the cutting authority during the next year, and
- b. there is at least 2000 m³ of merchantable timber remaining on the cutting authority area.

Where the above conditions have not been met, reappraisals may be made at the option of either the District Manager, Regional Manager or licensee (see Section 2.2).

Anniversary date reappraisals are made in accordance with the Interior appraisal manual in effect on the anniversary date of the cutting authority. The effective date of the redetermined stumpage rate is the anniversary date.

If a reappraisal is not made, the untrended logging and silviculture cost estimates from the current appraisal will continue to be trended quarterly to determine stumpage rates.

4. Mathematical Error

- a. If a government employee or contractor in the Ministry of Forests or a licensee (or employee or contractor of a licensee) becomes aware of what is or probably is a mathematical error in a stumpage determination, that person shall give written notice of the error ("the Notice") as follows:
 - i. in the case of appraisals and reappraisals, to the appropriate Regional Manager, and
 - ii. in the case of quarterly adjustments, to the Director, Revenue Branch,
- b. the Notice shall describe the stumpage determination or determinations involved and shall describe the nature and cause of the error to the extent reasonably possible,
- c. upon receipt of the Notice, the Regional Manager or the Director, Revenue Branch, shall make the appropriate investigation to decide whether or not an error has, in fact, been made,
- d. if the Regional Manager or the Director, Revenue Branch, decides that an error has not been made, then they shall notify the person who sent the Notice of the decision and the reasons for it,
- e. if the Regional Manager or Director, Revenue Branch, decides that an error has been made, then the following shall occur:
 - i. the Regional Manager or the Director, Revenue Branch, shall notify the person who sent the Notice of the decision and the reasons for it,
 - ii. the Regional Manager or the Director, Revenue Branch, shall take reasonable steps to ensure that all licensees who have been affected by the error are informed of the Notice and of the nature and cause of the error,
 - iii. the cutting authority or authorities under which the error was made shall be reappraised or the quarterly stumpage adjustment recalculated to correct the error unless the cutting authority, the appraisal manual or the application in tender for a timber sale licence, specified that the stumpage rate is fixed, and
 - iv. the effective date of the redetermined rate shall be the first day of the month following the date on which the Notice was received by the Regional Manager or the Director, Revenue Branch,

- f. if an error has occurred and no Notice has been given with respect to it, the Notice shall be deemed to have been given on the date on which the Regional Manager or the Director, Revenue Branch, became aware of the error or probable error,
- g. no person who discovers or otherwise becomes aware of a mathematical error in a stumpage determination shall be obliged to send the Notice as required herein if that person, on reasonable grounds, believes that someone else has sent the Notice with respect to the same error,
- h. the redetermined rate does not apply to timber scaled before the first of the month following the date upon which the Notice was given. No remedy will be available with respect to timber scaled before the first of the month,
- i. in this section, a mathematical error is any of the following:
 - i. an error in transcribing or compiling approved cruise field data, or in the application of approved loss factors and taper equations,
 - ii. an error in a calculation made as part of the data sheet,
 - iii. an error in transcribing the data from an approved data sheet or in performing the calculation specified in the manual,
 - iv. an error in the application of published appraisal parameters,

A difference between cruise estimates and actual timber quality or quantity does not constitute an error in the appraisal.

A difference between appraisal estimates of selling price or operating cost and the licensee's experience does not constitute an error in the appraisal.

Omission of data by the licensee on an approved data sheet does not constitute an error in the appraisal.

5. Minister's Direction

The Minister of Forests may direct that a reappraisal be made at any time and that the redetermined stumpage rate be effective on any future date. The reappraisal is made according to the appraisal manual in effect on the effective date of the reappraisal.

2.4 Fixed Stumpage Rate and Extension of Term

1. Small Business Forest Enterprise Program

A licensee may elect to have a fixed stumpage rate for a timber sale licence under the Small Business Forest Enterprise Program. Where the fixed election is made, the stumpage rate remains fixed for the term and all extensions (Section 6.5).

Under the Small Business Forest Enterprise Program a fixed stumpage rate means that the reserve stumpage rate, levies and bonus bids are fixed and will not change during the term of the cutting authority and all extensions. The only exceptions are if a reappraisal is done under Section 2.3 (1) or 2.3 (5).

2. Woodlots

A woodlot licensee may elect an annual stumpage rate. The annual stumpage rate shall remain in effect until the anniversary date of the cutting authority, at which time the cutting authority will be reappraised. If the election is not made within the specified time, the quarterly stumpage rate adjustment will apply.

The election of an annual stumpage rate applies as follows:

- a. All *new* woodlot cutting authorities will be offered an irrevocable election at the time of the initial appraisal,
- b. All existing woodlot cutting authorities that have not been offered the opportunity to make an election will now have an opportunity to make an irrevocable election at the cutting permit's anniversary date,
- c. The stumpage rates on woodlot cutting authorities that have elected non-adjusting stumpage rates will remain unchanged during the original term of the cutting authority. At the time of extension, the cutting authority will be reappraised regardless of volume and the new stumpage rate will apply until the expiry date. A reappraisal is required at the time of each future extension. There will be no opportunity to change the original election.
- d. There will be no change to any woodlot cutting authorities that have elected a quarterly stumpage rate adjustment. They will continue to adjust the stumpage rate quarterly and be subject to annual reappraisal regardless of the volume remaining.

Amendments to cutting authorities with the annual stumpage adjustment option would be subject to reappraisal at the time of the amendment (as defined in Section 2.3 (2)). The new stumpage rate would not be adjusted until the cutting permit's anniversary date or expiry, whichever occurs first.

3. Regional Manager's Rates

If a stumpage rate was determined under Section 2.1 (4) and the term of the cutting authority is extended, the Regional Manager may either leave the stumpage rate unchanged or reappraise the cutting authority. When the term of a cutting authority is extended and that cutting authority is reappraised, the notification requirements of Section 2.2 do not apply.

4. District Average Value Index

If the stumpage rate was determined under Section 2.1 (3) and the term of the cutting authority is extended, the Regional Manager or District Manager may either leave the stumpage rate unchanged or reappraise the cutting authority. When the term of a cutting authority is extended and that cutting authority is reappraised, the notification requirements of Section 2.2 do not apply.

Cutting authorities that have been appraised using the District Average Value Index method, other than the Small Business Forest Enterprise Program, must be reappraised upon extension after three years.

5. Miscellaneous Stumpage Rates

Miscellaneous stumpage rates (Section 6.7) will be based on the *Interior Appraisal Manual* in effect on the date of scale, except for those cutting authorities that specify miscellaneous stumpage rates in their cutting authority document.

6. Timber Licence

When a cutting authority that includes the authorization to harvest timber licence volume has the term extended, the stumpage rate will be determined under Subsection 5. of this section if:

- the cutting authority has a term that began before May 1, 1995, and
- the cutting authority area was not appraised.

2.5 Point of Appraisal

The appraiser must select the point of appraisal, from the list below, which will produce the least total harvesting and delivery cost estimate for the cutting authority area. All species, qualities and sizes of timber must be appraised to a single point of appraisal. The appraiser must estimate the cost of transporting timber to the sawmill, which is nearest the point of appraisal and produces the least total harvesting and delivery cost estimate. The appraiser must then assume manufacturing costs and average market values for the zone relative to that point of appraisal.

A sawmill is defined as a conversion facility capable of producing lumber and chips, and includes the log sorting/storage areas and satellite mill yards if applicable. A sawmill does not have to be physically capable of producing lumber and chips from all the wood appraised to that site. A sawmill is considered capable of producing lumber and chips unless it has been damaged by fire or a destructive force of nature. A damaged sawmill will not be considered a location at a point of appraisal if it has not been repaired within three months of the damage. It will be reconsidered as a location at a point of appraisal on the first day of the next stumpage quarter once it is capable of producing lumber and chips again.

The logs are deemed to have reached the point of appraisal once they have entered the site, commonly the weight scale, upon which the sawmill is located. All further log handling costs except scaling (see Section 4.8) are deemed to be part of the manufacturing cost estimate.

Points of Appraisal

Northern Interior (Zone 5, 15 & 25)			
Bear Lake	Fort St. James	Mackenzie	Smithers
Burns Lake	Fraser Lake	Prince George	Strathnaver
Clear Lake	Houston	Quesnel	Upper Fraser
Engen	Isle Pierre		Vanderhoof
Skeena (Zone 6, 16 & 25)			
Terrace	Carnaby	Hazelton	Kitwanga
Southern Interior (Zone 7, 17 & 25)			
Adams Lake	Elko	Lytton	Revelstoke
Armstrong	Galloway	McBride	Slocan
Boston Bar	Grand Forks	Merritt	Squamish
Canal Flats	Kamloops	Midway	Thrums
Canoe	Kelowna	Okanagan Falls	Valemount
Castlegar	Lavington	Park Siding	Vavenby
Craigellachie	Louis Creek	Princeton	Westbank
Cranbrook	Lumby	Radium	Ymir
Creston			

Southern Cariboo (Zone 8, 18 & 25)			
100 Mile House	Chasm	Lillooet	Williams Lake
Fort Nelson - Peace (Zone 9, 19 & 25)			
Chetwynd	Fort Nelson	Fort St. John	Taylor

2.5.1 Method of Transportation to be Used in Determining Point of Appraisal

The appraiser must base his estimate of transportation costs on the method of transportation which will produce the least total harvesting and delivery cost estimate for the cutting authority area, unless that particular method of transportation is not possible under the cutting authority. In considering whether or not a particular method of transportation is possible under the cutting authority, the appraiser must not have regard for:

1. Any destination referred to in the cutting authority.
2. Any document other than the cutting authority.

2.6 Calculation Conventions

All operating cost calculations are performed to the full capacity of the calculating machine with the results truncated at four places of decimals and rounded to two places.

Results from 5 to 9 are rounded upward and from 1 to 4 are rounded downward.

After each phase cost estimate (\$/m³) (see Chapter 4) has been rounded to the nearest cent it is summed with other estimates to obtain the total cost estimate.

Where values are specified as limits (constraints or requirements for equations), they are treated as absolute values and actual measurements or records are not rounded before use unless otherwise specified.

Stumpage rate calculations are performed according to the methods specified in the document entitled, *Specification: Calculating Stumpage Rates for Interior Appraisals*, approved by the Director, Revenue Branch.

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Interior Selling Prices

3

Selling price estimates are based on schedules of lumber and chip values collected and published by Revenue Branch. When the values are compiled and distributed they become an integral part of this manual.

3.1 Lumber Average Market Values

Monthly market value information for the Interior is obtained by Revenue Branch from lumber producers located in each of the recognized Average Market Value Zones. Average Market Values (AMV) for each species are compiled by dividing total sales value by total sales volume for each zone. When there is inadequate data to provide a reasonable average for a species in one zone, the data is adjusted and combined with other species in other zones. Separate AMVs are derived for small log, licences which require utilization of small logs, stud, and random lumber.

The volume that is manufactured to Canadian Lumber Standard/American Lumber Standard (CLS/ALS) sizes is reported in foot-board measure (fbm). Lumber manufactured in non-CLS/ALS sizes is adjusted to equivalent CLS/ALS sizes. The total volume for each species includes all sizes and grades of rough and dressed lumber in the green and dried state. Also included are railroad ties, trim blocks, finger jointed CLS/ALS lumber and machine stress rated (MSR) lumber.

The total net sales value for each species is reported in Canadian dollars, after freight, actual sales expenses incurred to a maximum of 5%, cash discounts, duty and entry charges and leased rail car costs have been deducted from the selling price.

1. Small Log AMVs

Small log AMVs are based on dimension lumber products capable of being produced from small trees.

Small log AMVs are used for cutting authorities with an average volume per tree (conifers only) of less than 0.20 m³ where the governing licence document does not require this restriction. Cutting authorities meeting this criteria will use lumber AMVs listed under "AMVs for Small Logs" which is included in the quarterly stumpage parameters published by Revenue Branch.

The selection of a Small Log AMV zone (Zones 15, 16, 17, 18 and 19) will only affect AMVs and will be made at the time of appraisal or reappraisal. Lumber Recovery Factors and Manufacturing costs will continue to be determined by zonation based on point of appraisal.

2. AMVs for Licences which Require Utilization of Small Logs

AMVs for licences which require utilization of small logs are based on dimension lumber products capable of being produced from trees smaller than normal utilization requirements. These AMVs are created by removing the effect of the LRF add-on (Section 3.1 (1)) from "Small Log AMVs."

These AMVs are used for all cutting authorities where the governing licence document restricts harvesting to stands of timber having a net average cruise volume per tree of

less than 0.20 m³/tree. Other similarly restricted licences may also use these AMVs at the Regional Manager's discretion. Cutting authorities meeting this criteria will use lumber AMVs listed under "AMVs for Licences which Require Utilization of Small Logs" (Zone 25) which is included in the quarterly stumpage parameters published by Revenue Branch.

The selection of AMV Zone 25 will only affect AMVs and will be made at the time of appraisal or reappraisal. Lumber recovery factors and manufacturing costs will continue to be determined by zonation based on point of appraisal.

3. Stud Lumber AMVs

Studs are defined as all lumber which is less than 10 feet (approx. 3.25 m) in length, and which has a nominal thickness and width of 2 inches x 6 inches (approximately 5 cm x 15 cm) or smaller, as produced by any lumber manufacturer. Stud AMVs are compiled for two species groups; Lodgepole Pine/Douglas-fir/Larch and Spruce/Balsam. No other species are recognized as "stud species".

4. Random Lumber AMVs

Random AMVs are compiled for all species.

3.1.1 Application of Lumber Average Market Values

Application of the Small Log, Licences Which Require Utilization of Small Logs, Stud and Random Lumber AMVs in appraisals for all cutting authorities are made according to the formula in Section 3.3.

3.1.2 Lumber Average Market Value (AMV) Zones

Refer to Section 2.5 for a list of Points of Appraisal by Lumber AMV zones.

3.2 Chip Average Market Values

Monthly market value information is obtained and compiled by Revenue Branch.

3.3 Calculation of Species End Product Selling Price

The total end product selling price in \$/m³ is determined for each species using lumber recovery factors (LRF) from the cruise compilation summary, LRF update add-ons, current applicable average market values for the species and zone and species chip yield factors. Lumber and chip prices are each calculated to the nearest cent before being totalled.

Burned Timber

In the case of burned timber, the burn percent is used to reduce the selling price of the stand by assigning a zero value to the estimated chip recovery of the burned wood. This is to compensate for an increased manufacturing cost, lower lumber and chip recovery and lower lumber and chip average market values associated with processing burned timber.

$$\text{Burn Percent} = \frac{\text{BT m}^3}{\text{Total m}^3} * 100$$

where

BT m³ = volume of light, moderate and heavily fire-damaged timber
Total m³ = total volume *inclusive* of burned wood

The only other adjustment to the appraisal is for heavily fire damaged timber and is covered under Section 4.4.4 (Tree to Truck Additive for Damaged Timber).

The LRFs are determined from the following formulas and tables:

1. Zonal LRF Update Add-Ons and Combined Product Recovery Factors

Zone	Species	LRF Update Add-Ons	Combined Product Recovery Factors
Northern Interior (Zone 5)	Lodgepole Pine	74	430
	Spruce	76	430
	Balsam	70	430
	Douglas Fir	32	430
	Larch	31	430
	Cedar	26	430
	Hemlock	26	430
	White pine	30	430

Skeena (Zone 6)	Lodgepole Pine	44	389
	Spruce	48	389
	Balsam	45	389
	Cedar	4	389
	Hemlock	4	389

Southern Interior (Zone 7)	Lodgepole Pine	67	409
	Spruce	72	409
	Balsam	64	409
	Douglas Fir	27	409
	Larch	26	409
	Cedar	23	409
	Hemlock	24	409
	White Pine	26	409
	Yellow Pine	27	409

Zone	Species	LRF Update Add-Ons	Combined Product Recovery Factors
Southern Cariboo (Zone 8)	Lodgepole Pine	56	420
	Spruce	60	420
	Balsam	54	420
	Douglas Fir	18	420
	Larch	17	420
	Cedar	13	420
	Hemlock	15	420
	White pine	17	420
	Yellow pine	18	420

Fort Nelson-Peace (Zone 9)	Lodgepole Pine	60	423
	Spruce	61	423
	Balsam	55	423

Example: (Zone 5) Lodgepole Pine	Cruise LRF		LRF Update Add-on		Appraisal LRF
All Logs	182	+	74	=	256

2. Chip Yield Derivation

$$\text{Chip Yield (BDU/m}^3\text{)} = (\text{Combined Product Recovery Factor} - \text{Appraisal LRF}) \times \text{Species Chip Yield Factor}$$

3. Chip Yield Factors

Species	Factor (BDU/fbm)
Balsam	.00072
Cedar	.00067
Fir	.00098
Hemlock	.00089
Larch	.00119
Lodgepole Pine	.00087
Spruce	.00076
White Pine	.00078
Yellow Pine	.00095

4. Determination of Stud Log Percent

The stud log percent (%) is determined as follows:

The stud log percent for each stud species (spruce, balsam, lodgepole pine, Douglas fir and larch) is determined from the cruise compilation summary. The stud log percent is defined as the net volume of 5 m logs with top diameters under 20 cm expressed as a percentage of the total net cruise volume. The stud log percent is calculated and rounded to the nearest whole percentage point.

The percent (%) stud AMV is determined as follows:

If the stud log percent is 45 or greater and less than or equal to 65:

$$\text{the percent stud AMV} = (5 * \text{stud log \%}) - 225$$

If the stud log percent is less than 45, the percent stud AMV = 0;

If the stud log percent is more than 65, the percent stud AMV = 100.

5. Shipping Differential

The Shipping Differential for the following points of appraisal are:

\$0.40/m ³	\$0.70/m ³	\$4.03/m ³
Bear Lake Fort St. James Mackenzie Quesnel Strathnaver	Adams Lake Clear Lake Louis Creek Merritt Midway Okanagan Falls Princeton Thrums Westbank Ymir	Fort Nelson

6. Manufacturing Cost Differential

\$2.95/m ³
Fort Nelson

7. Calculation of Total Species End Product Selling Price

- a. Lumber AMV = $(\% \text{ Stud AMV}/100) * (\text{Stud AMV}/1000)$
 $+ (1.0 - (\% \text{ Stud AMV}/100)) * (\text{Random AMV}/1000),$
- b. Lumber SP = Lumber AMV * Appraisal LRF,
- c. Chip SP = Chip Value * Chip Yield, and
- d. Total Species SP = Lumber SP + Chip SP - D

Where	SP	=	Selling Price in \$/m ³
	AMV	=	The Lumber Average Market Value (of the appropriate species in the appropriate zone)
	Appraisal LRF	=	The LRF for all logs from Section 3.3 (1).
	Chip Value	=	The Chip Average Market Value (of the appropriate species for the appropriate point of appraisal)
	Chip Yield	=	The Chip Yield for all logs from Section 3.3 (2).
	D	=	The Differentials for the appropriate points of appraisal from Section 3.3 (5) and 3.3 (6).

Operating Cost Estimation

4

The Operating Cost is the sum of the trended Total Logging Cost Estimate, the trended Basic Silviculture Cost Estimate and the trended Manufacturing Cost Estimate as detailed in this chapter. The cost estimates in this chapter are applicable to all cutting authorities unless superseded by the procedures outlined in Section 2.1.

4.1 Cost Estimates

The appraiser must estimate harvesting and delivery costs for a cutting authority area in a manner which will produce the **least total harvesting and delivery cost estimate**. The estimate of transportation costs must be based on the method of transportation to the point of appraisal which will produce the least total cost estimate, unless that particular method of transportation is not permitted under the cutting authority. Once the least cost point of appraisal has been established, the cost estimate of manufacturing for that point is applied.

In considering whether or not a particular method of transportation is permitted under the cutting authority, the appraiser must not have regard for:

1. Any destination referred to in the cutting authority.
2. Any document other than the cutting authority.

The phase cost estimating formulas and tables in this manual were derived from a survey of logging and lumber manufacturing operations in the Interior. The survey includes both employee and contractor operations. The survey collects actual costs to the licensee, including wages, benefits, overtime, depreciation, fuel, supplies, repair and maintenance, moving assistance, applicable licences, insurance, etc., from a representative sample of Interior operations. Contract costs, including contractor profit and risk margins, overhead, crew transportation, etc., are included.

The phase cost estimates are complete and reflect average conditions, operating practices, and phase accounting allocations experienced in the survey data. Additions and subtractions to phase cost estimating formulas and tables to reflect specific operating conditions are not permitted. The cost estimates have an effective cost base date of July 1, 1995.

4.1.1 Specified Operations

In addition to the logging methods and phase costs that are covered by this manual, there are specified operations which require special cost estimating. The following is a complete list of specified operations for which certain phase cost estimates are based on the information on hand rather than on the tables and formulas in this manual. Other phase cost estimates in this manual are combined with the specified operation cost estimate to determine the total operating cost. Where appropriate, specified operations are weighted according to the applicable net cruise volume.

Specified Operations shall be recognised only when the treatment is required within the Silviculture Prescription, Cutting Authority Document or the Forest Development Plan as dictated by site conditions. Where a specific treatment is not required based on these conditions the conventional cost estimate shall apply.

Further information on Specified Operations may be obtained from the Regional Appraisal Coordinators.

Specified Operations	Affected Phase
Salvage of small patches of timber dispersed over a large area*	Tree-to-Truck (Section 4.4)
Kinbasket Lake Barge/ferry not used for truck haul (private)	Special Transportation Systems (Section 4.5.4)
Root Disease Control (Pushover Logging and Stump Removal)	Silviculture (Section 4.10)
Skidder Swinging (includes all ground skidding methods)	Log Transportation (Section 4.4)

- * For use with ground skidding and cable logging only when salvaging diseased or damaged timber.

4.2 Appraisal Data Requirements

The cruise and all other pertinent information required for the appraisal must be submitted by the licensee with the appropriate **Interior Appraisal Data Sheet** to the District Manager.

Unless otherwise specified by the Director, Revenue Branch, cruise data must be gathered and compiled according to the approved interior close utilization specifications and in accordance with the following Ministry of Forests Publications:

- Forest Service Cruising Procedures & Cruise Compilation (Cruising Manual)
- Cruise Compilation Program - Documentation Manual
- Cruise Compilation System - Change Specification Detailed Requirements & Design
- *Regional Publications* - (e.g., Operational Cruising Requirements in a Forest Region)
- *Forest Service Policies* - (e.g., Timber Utilization Standards, Policies & Procedures for the Interior of the Province).

In order to verify the accuracy of the cruise compilation program, the licensee must provide, on request, photocopies of the tally sheets and a magnetic copy of the data list in a format prescribed by the Regional Manager.

The net cruise volume (m^3) is the gross volume (m^3) less decay, waste and breakage by species. The cutting authority total net cruise volume is calculated by multiplying the net cruise volume per hectare (m^3/ha) by the total merchantable timbered area(ha) to be harvested, net cruise volume is rounded to the nearest cubic meter as required in the *Cruising Specifications*.

Each reappraisal uses a cruise volume by species which is the original net cruise volume adjusted on the basis of approved amendments to the cutting authority since the last appraisal (see Section 2.3).

4.3 Development

Development costs are estimated for each of three categories:

1. new construction,
2. reconstruction and replacement, and
3. access management.

Throughout this section the term "roads" includes roads, drainage and other pertinent structures.

- a. A total cost (\$) is calculated for each category of Section 4.3.1, and 4.3.1.1, these category costs are summed to provide a total development cost estimate.

In order to calculate a unit ($\$/\text{m}^3$) cost by category, the applicable volume will be the total net cruise volume (as defined in Section 4.2) or the remaining volume (Section 4.3.1.2). Where the cutting authority document requires obligatory utilization of deciduous timber, the deciduous volume must be included in the applicable total net cruise volume.

The costs for development works may only be allocated to the first tributary cutting authority, subject to Section 4.3.1.1.5. A cutting authority is considered to be tributary:

1. If timber from the cutting authority is appraised over the development works in question, or
2. If the development works occur on a Main Service Road. A Main Service Road is defined as a main access road to the operation, necessary to maintain and supply the day-to-day harvesting activities of the cutting authority being appraised. To qualify a Main Service Road must be used on a regular basis for transportation of bulk fuels, supplies, equipment and the harvesting crew.

Two methods of estimating development costs are used in the appraisal system:

1. Tabular cost estimates are made for construction of roads and drainage structures using the applicable formulas in Section 4.3.2 of this manual. Tabular estimates must be used for an appraisal when physical dimensions and conditions fall within the tabular limitations.
2. Detailed engineering cost estimates are made when the physical dimensions and conditions of a road section or a drainage structure exceed the tabular limitations of the manual. A detailed engineering estimate is made according to Section 4.3.3. Projects eligible for this costing method are listed in Section 4.3.3.

Where applicable, these cruised volumes and development cost estimates must be segregated on the basis of legal boundaries.

4.3.1 Development Cost Categories

Development cost allocation (Section 4.3.1.1) applies to all cost estimates made under this section.

1. New Construction

New construction is defined as the following construction phases: subgrade construction, placement of additional stabilizing material and the construction and installation of drainage and other pertinent structures.

New construction costs are allocated to the first tributary cutting authority (subject to Section 4.3.1.1.5).

a. Road Cost Estimates

i. Tabular cost estimates

Each road section cost estimate is determined from the appropriate tables (Section 4.3.2). These section costs are totalled to give a road cost estimate for each road. The road costs for all roads are then totalled to give a total cost for tabular roads.

ii. Detailed engineering cost estimates

Each project cost is estimated according to Section 4.3.3. These projects may include: (see Section 4.3.3 for a complete listing)

The total of the estimated costs for each project is summed to give a total cost (\$) for engineered roads.

b. Drainage Structure Cost Estimates

Each drainage structure cost estimate is determined either from the appropriate table (Section 4.3.2.4) or as a detailed engineering cost estimate (Section 4.3.3).

Where materials are reused by the original purchaser at a second or subsequent location, the cost estimate will include dismantling, transportation and installation at the new site. The initial materials cost and delivery costs are excluded.

Where used bridge materials are purchased from a legally non-associated party, the cost of purchase and shipping those materials will be included in the cost estimate. The requirements of Section 4.1 still apply.

The total of the estimated costs for all bridges are summed to give a total cost for bridges.

The total costs for tabular roads, engineered roads, and bridges are totalled and then divided by the total net cruise volume to give a unit cost (\$/m³) for new construction.

2. Reconstruction and Replacement

Reconstruction and Replacement are defined as:

- a. replacement or structural repair of a major drainage structure (e.g., replacing stringers, cross ties, or cribbing), or
- b. major resurfacing, which means resurfacing sections of more than 0.3 km in length that were initially surfaced, but have deteriorated due to long term wear and tear, or
- c. major reconstruction, which means restoring at least 0.1 km of road (per occurrence) that requires complete rebuilding of the subgrade.

The costs approved under this section must not qualify under routine maintenance as described in Section 4.6.

Bridges replaced on forest service roads that are included in the Forest Renewal B.C. five year "Bridge Replacement Program on Forest Service Roads" will not be included in any appraisal.

Reconstruction and replacement cost estimates are determined as detailed engineering cost estimates (Section 4.3.3) and must be approved in advance by the district manager. The cost estimates may be applied to remaining tributary timber (i.e., applicable volume) provided the project was not known of or planned for at the time of appraisal. If the cost estimate is not applied to the remaining tributary volume, it must be applied to the first tributary cutting authority appraised over the reconstruction or replacement. Section 4.3.1.1.5 may be applicable for main roads. Cost estimates for reconstruction are not to exceed the tabular costs for new construction under similar conditions.

Costs will not be recognized if the licensee has been negligent or has not followed approved plans or standards as defined under the Forest Practices code and regulations.

3. Access Management

Access management is defined as the temporary removal of a major drainage structure or construction of a barrier, including a gate, excavation, or placement of boulders with the purpose of temporarily eliminating all vehicle access.

An access management cost estimate will be determined by a detailed engineered estimate.

The access management required in the cutting authority must be based on a formal Access Management Strategy approved in the forest development plan.

Costs may be determined for more than one removal/replacement of the structure/barrier if the cutting authority term warrants it.

Costs approved under this section must not qualify under routine maintenance as described in Section 4.6 or overhead as described in Section 4.8.1.

4.3.1.1 Development Cost Allocation

Where proration is required for Section 4.3.1.1.1, 4.3.1.1.2 and 4.3.1.1.3:

$$\text{Crown Share} = \text{Total Estimated Cost} * \frac{\text{Appraised Timber Volume}}{\text{Total Timber Volume}}$$

Where:

Crown Share (\$) = dollar amount to be allocated to stumpage-bearing timber in the cutting authority being appraised.

Total Estimated Cost (\$) = dollar amount of the total development cost estimate.

Appraised Timber Volume (m³) = volume of appraised timber tributary to the project and under the control of the licensee or a company legally associated with the licensee, including volume in all areas contributing to the allowable annual cut determination.

Total Timber Volume (m³) = total volume tributary to the project and under the control of the licensee or a company legally associated with the licensee.

In all cases volumes are estimated from the latest approved operational or inventory cruise data and maps of the area within the drainage to the height of land.

The Crown share is a dollar amount which is included in the appraisal of a tributary cutting authority, subject to Section 4.3.1.1.5.

Development cost estimate is allocated according to the outline below (see also Appendix III).

4.3.1.1.1 Development Cost Estimates on Crown Lands

1. Development providing access to appraised timber only:

Total estimated costs are included in the appraisal.

2. Development providing access to non-appraised timber only:

Cost estimates are not included in the appraisal.

3. Development in appraised timber areas providing access to both appraised and non-appraised timber held by the licensee or a company legally associated with the licensee:

All costs are prorated between appraised and non-appraised timber. The appraised timber portion is then included in the appraisal.

4.3.1.1.2 Development Cost Estimates for Full Appraisal on Timber Licence (TL) Cutting Authorities

1. New development will be allocated as in Section 4.3.1.1.1.
2. Unamortized development on the TL that is required for access to the cutting authority area will be included in the appraisal of that cutting authority. Unamortized development is defined as:
 - a. the development started after January 1, 1988,
 - b. development cost estimates that were not included in any prior appraisal calculation for Crown timber (or were considered as zero), and
 - c. having had no non-appraised timber transported over the development (excluding right-of-way timber).

Costs for this type of existing development are exempt from Section 4.3.1.1.4.

Cost estimates for these existing roads will be derived from the nearest appraised cutting authority area by:

1. Establishing the average road cost per kilometre from that appraised estimate, excluding bridges and pertinent structures, and
2. Multiply that \$/km by the kilometres of tributary road in the TL cutting authority area.

Cost estimates for bridges or pertinent structures will be determined according to Section 4.3.2.4, or from the detailed engineering estimates as defined in Section 4.3. At reappraisal, these initial cost estimates for existing development will be trended as provided for in Section 4.12, but will not otherwise be revisited.

4.3.1.1.3 Development Cost Estimates on Private Land

When a new or reconstructed road or structure on private land is required for Crown timber extraction, the estimated cost of the road or structure will be included in the appraisal of a tributary cutting authority according to the procedures of Section 4.3.1.1 and the following guidelines:

1. Development provides access to appraised timber only:

The total estimated costs are included in the appraisal.

2. Development provides access to non-appraised timber only:

Cost estimates are not included in any appraisal.

3. Development provides access to both non-appraised and appraised timber.

All cost estimates are prorated between non-appraised and appraised timber (Section 4.3.1.1) and then the Crown portion is included in the appraisal.

4.3.1.1.4 Existing Roads and Structures

The following are defined as existing roads for the cutting authority being appraised and are not eligible for inclusion in development cost estimates:

1. Costs of constructed roads that have been previously considered in appraisals of Crown timber within another cutting authority, or;
2. roads, drainage and other pertinent structures previously constructed and used to haul non-appraised timber (excluding right-of-way), or;
3. roads previously constructed all or in part for purposes unrelated to logging the cutting authority area being appraised, or;
4. all roads, drainage and other pertinent structures previously constructed, repaired or reconstructed on private land before August 1, 1996.

If the existing road requires reconstruction or replacement after August 1, 1996, the cost estimate is made as described in Section 4.3.1. If the existing road is on private land, road and land use charges may be recognised as described in Section 4.7.

A road on private land that has previously been included in an appraisal because it was required for only short term timber extraction (as per previous policy) shall continue to be included upon reappraisal.

4.3.1.1.5 Extended Road Amortization

Where the development cost estimate exceeds \$4.00/m³ a written agreement may be made which apportions the main access road cost estimate to two or more tributary cutting authorities. The main access road ends at the far boundary of the first cutting authority being appraised.

The agreement is subject to the following conditions:

1. Only main access roads serving the tributary cutting authorities (as defined in Section 4.3) may be considered.

2. Each cutting authority must be in the licensee's approved forest development plan.
3. The agreement must be signed by the licensee and the licensor prior to the appraisal or reappraisal.
4. The amount apportioned will be a fixed lump sum which will be trended as provided for in Section 4.12 but not otherwise revisited.
5. The term of the agreement must not exceed the terms of the cutting authorities.
6. The agreement will only be valid under CVP and confers no obligation for the Crown to compensate licensees for any unamortized costs.

4.3.2 Tabular Cost Estimates

These roads are generally a single lane width with turnouts. These roads may or may not be stabilized (ballasted or surfaced) with additional materials.

4.3.2.1 Subgrade Construction

The subgrade construction cost estimate includes:

- clearing,
- grubbing,
- stripping,
- debris disposal,
- stump removal,
- ditch construction,
- turnout construction (not landings),
- material costs, and
- installation of culverts with diameters up to 950 mm or the equivalent cross-section area or single log abutment culverts up to 3.4 m span.

Right-of-way felling and logging is excluded.

4.3.2.2 Subgrade Construction Variables

For appraisal purposes the following subgrade construction variables are recognized:

1. Section length: (L)

Road sections are recorded in multiples of 0.1 km. Each section should be representative of a single moisture class. Each section should be 1 km or longer, although some individual section lengths less than 1 km but greater than 0.1 km are acceptable for extreme variations of slope or percent rock. The section length includes that portion traversing through landings. For ground skidding, short roads (up to and

including 100 m long) that access single landings are included in the Tree-to-Truck cost estimates (Section 4.4) and are not eligible for development cost estimates.

2. Road Type:

- **Operational Roads (OP):** - are generally built under the authority of a Road Permit but portions may be constructed under the cutting authority. An operational road exists within a cut block when the road accesses timber beyond the cutblock or is intended to access timber beyond the block as shown on a development plan.
- **Block Roads (BLOCK):** - are generally built under the cutting authority and include roads which are located completely within the cutblock.
- **Snow Roads (WINTER):** - snow roads are a form of overland construction that uses clean snow and ice as fill. Suitability of materials is not an issue as all are frozen. Stripping is limited to large stumps that cannot be easily covered with snow or ice. Cuts into mineral or organic soil must not exceed 0.3 m in depth for sustained distances or 0.5 m in depth for distances up to 5 m. This road type includes operational and block road categories. Stabilizing costs are not applicable. Snow (winter) roads constructed on side slopes of greater than 15% are appraised as block roads.

3. Uphill Side Slope: (SLOPE %)

Uphill side slope percent represents the average of all slopes in the section to a maximum of 50%. To derive an average for uphill side slope percent, several representative cross-section measurements are taken along the section length and the sum of one-half of the distance on each side of the measurement is applied as a weight against the measurement at that cross-section. The uphill side slope percent is measured at right angles to the road centreline and is recorded to the nearest integer. Where the road is located on a bench, the uphill side slope of the bench is used.

4. Percent Rock: (ROCK %)

Rock includes bed rock and large boulders, it may be rippable or may require drilling and blasting. The percent rock is determined as follows to a maximum of 50%:

$$\text{ROCK \%} = \frac{h^2}{H^2} * 100$$

Where:

h = the vertical cut height of all rock measured from the bottom of the ditch

H = the total vertical cut height of all materials above the bottom of the ditch

To determine the percent rock for roads not yet constructed, constructed roads on similar land/rock forms are used as a guide.

5. Soil Moisture Regime (SMR):

Soil moisture regimes 'sub-hygic, hygric, sub-hydric or hydric' within CWH, MH, ICH, SBS, or ESSF Biogeoclimatic Zones are eligible for an increased cost estimate. Any other biogeoclimatic zones and any other soil moisture regimes are not.

6. Biogeoclimatic Zones:

CWH or MH	-	Coastal Western Hemlock or Mountain Hemlock
ESSF	-	Engelmann Spruce - Subalpine Fir
IDF	-	Interior Douglas Fir
ICH	-	Interior Cedar Hemlock
SBPS	-	Sub-Boreal Pine - Spruce
SBS	-	Sub Boreal Spruce

4.3.2.3 Subgrade Cost Estimate

For each operational and block road the subgrade cost estimate in \$/km is determined from the equation for the appropriate road group.

Road Group

1	$6426 + 649 * \text{SLOPE\%} + 174 * \text{ROCK\%} + 7971 * \text{OP} + 13688 * \text{CWH} + 13688 * \text{MH}$
2	$8188 + 339 * \text{SLOPE\%} + 4672 * \text{OP}$
3	$3934 + 116 * \text{SLOPE\%} + 7160 * \text{OP}$
4	$2007 + 314 * \text{SLOPE\%} + 3616 * \text{SMR} + 7222 * \text{OP}$
5	$4837 + 216 * \text{SLOPE\%} + 5446 * \text{SMR} + 4363 * \text{OP}$
6	$6406 + 101 * \text{SLOPE\%} + 6782 * \text{OP} - 1956 * \text{ESSF}$
7	$497 + 260 * \text{SLOPE\%} + 10155 * \text{SMR} + 18682 * \text{OP} + 6498 * \text{ESSF}$
8	$4149 + 5145 * \text{OP} - 3014 * \text{IDF} - 2368 * \text{SBPS}$
9	$3543 + 357 * \text{SLOPE\%} + 3660 * \text{OP}$
10	$8295 + 151 * \text{SLOPE\%} + 4472 * \text{ESSF}$
11	$5571 + 742 * \text{SLOPE\%}$
12	$596 * \text{SLOPE\%} + 10091 * \text{OP}$ (\$1935/km set as minimum. If less than \$1935/km then use \$1935/km)

Where:

Road groups are defined in Table 4.1

OP	=	1 if an Operational Road, otherwise = 0
SMR	=	1 if Soil Moisture Regime is 'sub-hygic, hygric, sub-hydric or hydric' and is in CWH, MH, ICH, SBS or ESSF biogeoclimatic zones. Otherwise SMR = 0.
CWH	=	1 if road construction is within this biogeoclimatic zone. Otherwise CWH = 0.
MH	=	1 if road construction is within this biogeoclimatic zone. Otherwise MH = 0
ESSF	=	1 if road construction is within this biogeoclimatic zone. Otherwise ESSF = 0
IDF	=	1 if road construction is within this biogeoclimatic zone. Otherwise IDF = 0

Snow roads

The subgrade cost estimate for all snow roads (winter) is **\$5700/km**.

Table 4-1: Road Groups

Road Group #	Districts Included	Within the Geographic Boundary of a TSA, SB and TFL
1	Kalum	
2	Bulkley, (Cassiar), Kispiox	
3	Lakes, Morice	
4		Williams Lake TSA, SBs K & L Prince George TSA, SBs G & H, TFLs 30, 53 Quesnel TSA, SBs E,F,G,H & I, TFL52 100 Mile House TSA, SBs D,G & H Williams Lake TSA, SB J
5	Vanderhoof	Prince George TSA, SBs E,F & I
6	Fort St. James	Mackenzie TSA, SBs G through P
7	Dawson Creek Fort St. John Fort Nelson	Mackenzie TSA, SBs A through F
8	Chilcotin	Williams Lake TSA, SBs F,G,H & P Quesnel TSA, SBs A,B,C & D, TFL5 100 Mile House TSA, SBs A,B,C,E,F
9	Kamloops Merritt Penticton Vernon Lilloett	
10	Boundary Cranbrook Invermere	
11	Arrow Columbia (Golden, Revelstoke) Kootenay Lake	
12	Clearwater Robson Valley Salmon Arm	Williams Lake TSA, SBs M & N

Woodlot and Timber Licence cutting authorities are to be assigned to the road group area in which they are geographically located.

4.3.2.4 Drainage Structures

An appraisal may include a cost estimate for large drainage structures only where their requirement is substantiated by field data. Such structures shall be placed so as to maintain the natural drainage pattern of the area crossed by the proposed road. All pipe culverts under 950 mm in diameter and all single log abutment culverts under 3.5 m span length are included in the subgrade cost estimates (see Section 4.3.2.1).

See page 39 of the forest Road Engineering Guidebook for a detailed description.

See pages 85 (Pipe Culverts) and 93 (Log Culverts) of the Forest Road Engineering Guidebook for detailed description.

1. Culverts

The cost estimates for the supply and installation of culverts from 0.95 m to 1.8 m in diameter are determined from the following table. Detailed engineering cost estimates are required for larger metal culverts (culverts smaller than 0.95m are included in the subgrade costs). No interpolation of values is permitted. Total installation cost for culverts includes all costs of transporting the culvert to the jobsite and all costs of installation of the culvert to the final subgrade stage.

INSTALLED COST ESTIMATE (\$)

Circular or oval pipes						
Equivalent Round Diameter (m)		1.0	1.2	1.4	1.6	1.8
X-Section Area (m²)		0.78	1.13	1.54	2.00	2.54
Length (m)						
9	742	1868	2993	4118	5244	
10	1018	2143	3268	4394	5519	
11	1293	2418	3543	4669	5794	
12	1568	2693	3819	4944	6069	
13	1843	2969	4094	5219	6345	
14	2118	3244	4369	5494	6620	
15	2394	3519	4644	5770	6895	
16	2669	3794	4920	6045	7170	
17	2944	4069	5195	6320	7445	
18	3219	4345	5470	6595	7721	
19	3495	4620	5745	6871	7996	
20	3770	4895	6020	7146	8271	
21	4045	5170	6296	7421	8546	
22	4320	5446	6571	7696	8822	
23	4595	5721	6846	7971	9097	
24	4871	5996	7121	8247	9372	
25	5146	6271	7397	8522	9647	
26	5421	6546	7672	8797	9922	
27	5696	6822	7947	9072	10198	
28	5972	7097	8222	9348	10473	
29	6247	7372	8497	9623	10748	
30	6522	7647	8773	9898	11023	

2. Log Bridges

Cost estimates are made for log bridges where their necessity is substantiated by field data. Cost estimates for non-log bridges, where required, are made as detailed engineering cost estimates (Section 4.3.3).

Cost estimates for log bridges are based on span lengths (distance between the centres of the top sill logs) and average crib height (measured from the bottom of the bottom sill log to the point where the stringer rests on the top sill log at the centre line of the bridge) from the table that follows. Cost estimates for bridge sizes greater than the table limits require detailed engineering data as described in Section 4.3.3.

Table values are for both timber-decked and gravel-surfaced bridges. Gravel-surfaced bridges have guard logs lashed to the cribs and stringers.

Bridge costs include:

- crib back-fills to a maximum distance of 15 m on either end,
- site preparation,
- protection features such as rip rap,
- material and equipment supply and delivery,
- installation.

Input data within table boundaries is rounded to fit; no interpolation or adjustment of values is permitted.

LOG BRIDGE COST ESTIMATE

(Thousands of Dollars)

Span Length (m)	Single Log Sill	Multi-Log Crib Average Crib-Height (m)			
		2	3	4	5
4	8.0	11.2	13.7	16.2	18.7
5	8.7	11.9	14.4	16.9	19.4
6	9.4	12.6	15.1	17.6	20.0
7	10.1	13.3	15.8	18.3	20.7
8	10.8	14.0	16.5	19.0	21.4
9	11.5	14.7	17.2	19.6	22.1
10	12.1	15.4	17.9	20.3	22.8
11	12.8	16.1	18.6	21.0	23.5
12	13.5	16.8	19.2	21.7	24.2
13	14.2	17.5	19.9	22.4	24.9
14	14.9	18.2	20.6	23.1	25.6
15	15.6	18.8	21.3	23.8	26.3

4.3.2.5 Additional Stabilizing Material

Road stabilization is the placement of gravel or broken rock on the road subgrade to provide stable support and a running surface for logging equipment using the road (see Section 4.3.3 (13) for cost estimates pertaining to the use of special materials). Where stabilizing material developed during the subgrade or ditch construction is insufficient, a cost estimate for additional stabilizing material to be trucked in from selected borrow pits may be included in the appraisal.

Unit Cost Estimate

The unit cost estimate (\$/km) for the additional stabilizing material includes:

- borrow pit preparation,
- rock drilling, explosives, loading of explosives and blasting,

- loosening and/or pushing materials in borrow pits when required (e.g., compacted or cemented gravel, oversize material, etc.),
- loading gravel trucks,
- truck hauling, and
- spreading and compacting the material.

The cost estimates assume borrow pits are located adjacent to the road side and are not part of the subgrade excavation. If a new road needs to be constructed to access the borrow pit, then an access road cost estimate is required in addition to the in-place unit cost estimates.

For each road, the additional stabilizing material cost estimate (\$/km) is determined from the equation for the appropriate road group.

Road Groups *	Equation
1	$16050 + 11089 * QROCK + 8717 * CWH + 8717 * MH$
2	17455
3	9881
4	9418
5	9775
6	7326
7	10966
8	9365
9	9448
10	5491
11	8714
12	15399

* See Table 4-1 for description of included area

Where:

For the above equations:

- QROCK = 1 if road is stabilized with quarried rock that requires drilling and blasting. Otherwise QROCK = 0.
- CWH = 1 if road construction is within this biogeoclimatic zone. Otherwise CWH = 0
- MH = 1 if road construction is within this biogeoclimatic zone. Otherwise MH = 0

Also see Detailed Engineered Costs Section 4.3.3 (3).

No cost estimate for additional stabilizing material is allowed for any Snow Roads.

4.3.2.6 Cattle Guards, Remedial Fences and Pipeline Crossings

Where the cutting authority specifies the installation of cattle guards, wing fences or remedial fences, the installed cost using new or recycled material is estimated as follows:

- | | |
|------------------------------------|-----------------|
| 1. Cattle Guards | \$2732 each |
| 2. Remedial Fences and Wing Fences | \$513 per 100 m |
| 3. Pipeline Crossings | \$3400 each |

All costs include materials, transportation and installation.

4.3.2.7 Snow Road Reconstruction

Snow road reconstruction is defined as the reconstruction of previously used snow roads and seismic lines; as defined under Snow Roads (Section 4.3.2.2). These costs are included in the road maintenance cost estimate (Section 4.6).

4.3.3 Detailed Engineering Cost Estimates

Where the tabular cost estimating procedures of this manual cannot be used due to their physical limitations, the cost of a project shall be estimated by preparing a detailed engineering cost estimate. The Regional Manager may approve standardized procedures to generate cost estimates for use in projects as listed below.

Where specific development projects involve detailed engineering cost estimates, based on approved road layout and design plans, the District Manager shall be advised of project details no later than 60 days before the start of work on the project.

For appraisal purposes, the estimated development project costs are made on the basis of the site-specific data and the equipment and labour rates specified in Appendix 1. Due consideration is given to arm's length competitive bids for any specific project. The appraisal estimate is not constrained in any way by a licensee's actual costs

All detailed engineering costs must be adjusted to match the cost base used for the other phases of this manual. Where road sections estimated as a detailed engineered cost estimate are contiguous with tabular cost estimates, costs for mobilization and demobilization will only be allowed for special equipment not required for the construction of the tabular roads. The following specific situations, are considered for detailed engineering cost estimates:

1. New construction and upgrading of forest service roads that meet the criteria and conditions provided in the Main Access Roads policy.
2. Road construction on uphill side slopes greater than 50 percent.
3. When rock percent exceeds 50 percent, or terrain class 4 and 5.
4. Road construction on terrain with two or more gullies over 10 m deep at centreline in a 0.3 km section.
5. End haul construction (of roads and landings) requiring removal by truck of excavated material to a spoil area.
6. Overland construction to provide a roadbed by trucking in material for extensive filling, see page 54 of Forest Road Engineering Guidebook for a more detailed discription.

7. Non-log bridges, log bridges with greater than 5.4 m average crib height, and/or greater than 15.4 m span length, or ice bridges including ice bridge reconstruction for additional logging seasons following the procedures outlined in Section 4.3.2.7. Crib back-fills and all site preparation and protection features such as rip rap are to be included, as well as material and equipment supply, delivery and installation. Includes installation, compaction and all other installation costs up to the final subgrade.
8. Structural maintenance of bridges, substructure and cribwork .
9. Reconstruction of roads and pertinent structures. Cost estimates for reconstruction are not to exceed the tabular cost for new construction under similar conditions.
10. Upgrade of roads and pertinent structures. Road upgrade resulting in a change in the standard of the road and structure or where the licensee was not obligated to carry out road maintenance prior to the appraisal. Where road maintenance obligations exist, road upgrade is limited to widening the running surface, vertical and horizontal realignment, and additional culverts.
11. Replacement of road running surfaces for uninterrupted lengths over 0.3 km. Lengths less than 0.3 km are included in road maintenance (Section 4.6).
12. Metal culverts greater than 1.8 m in diameter when specified in the cutting authority, or road permit. Metal culverts greater than 30 m in length regardless of diameter also qualify. The cost estimate includes all costs of transporting the culvert to the jobsite and all costs of installation of the culvert to the final subgrade stage.
13. Placement of additional stabilizing material where geo-tech fabric, corduroy, crushed and/or screened rock/gravel are used.
14. Retaining walls, railway crossings and other special structures (may include multiple culverts, baffled culverts, arched culverts and other structures determined by the appraisal coordinator).
15. Access management (as defined in Section 4.3.1 (3)).
16. Deactivation of roads defined as follows:
 - a) Bridge removal
 - b) Major culvert removal, (i.e., over 950 mm).
 - c) Pull back unstable sidecast or road fills.
 - d) Cut/fill slope stabilization.
 - e) Recontouring,

- f) Deep fill removal (greater than 3 m).
- 17. Slough removal of more than 250 m³ of material, where the slough was not caused by the negligence of the licensee.

The data which may be required for excavation and fill estimates are:

- 1. Plans, profiles, cross-sections showing the ground and design grade lines.
- 2. Volume summary sheets showing excavation quantities by various soil types, for subgrade and stabilization.
- 3. Type of construction equipment and quantity of material to be used, or ministry approved competitive bid costing.
- 4. Location of borrow and waste areas to calculate material haul distances.

The data required for bridges, culverts and for other unusual structures are:

- 1. Where the bridge span is 15.4 m or less and the crib height is 5.4 m or less and a permanent structure is proposed; an economic life cycle comparison between a log structure and the permanent proposal is required.
- 2. Where the bridge span is greater than 15.4 m, and/or the crib height is 5.4 m or more and for pipe culverts greater than 1.8 m in diameter or 30 m in length; plans, specifications and design for the proposed structure, detailed estimate of costs of materials, equipment and labour or ministry approved competitive bid pricing, amount of timber accessed by the structure and the number of years of use for harvesting all the timber.
- 3. Where bridge materials are reused the cost estimate will include dismantling, transportation and reinstallation at the new site, but will exclude initial materials purchased and initial delivery costs.

Costs that may be included in the detailed engineered cost estimate are:

- 1. freight (for materials),
- 2. Provincial sales tax (for materials).
- 3. Supervision of construction of complex structures by a Professional Engineer.
- 4. Bridge certification by a Professional Engineer (maximum of three field trips) unless otherwise approved by the Regional Appraisal Coordinator (the costs for Professional Engineers are permitted whether they are on the licensees staff or hired under contract),

5. Site plans, designs and layouts.
6. Where equipment is not, or will not be already on site for adjoining tabular road, bridge or culvert construction, then the costs of mob and demob may be included in the engineered cost estimate.

GST and supervision costs other than as stated above, are not to be included in the engineered estimate.

Where different timber volumes are used for separate cost estimates, the unit costs are rounded to the nearest cent before totalling.

In some cases, the detailed engineering cost estimates may be apportioned to two or more licensee's tributary cutting authorities, as described under Section 4.3.1.1.5.

Small Business Forest Enterprise Program projects which are constructed or reconstructed at Crown expense are estimated separately to enable the determination of an appropriate development cost levy.

4.4 Tree-to-Truck

Cost estimates recognized in the tree-to-truck phase of the logging operation include, but are not limited to, expenses incurred for:

- felling
- skidding
- yarding
- bucking
- sorting (bush, dryland, and water)
- loading
- landing construction, rehabilitation and reconstruction (excluding end haul)
- fuel and equipment moves
- pest control
- grass seeding
- crew accommodation for accessible operations
- contractor overhead and profit, fringe benefits
- tree marking
- three metre knockdown
- lop & scatter
- landing burning (includes fireguards)
- roadside debris piling and disposal
- skid and back spar trail construction and rehabilitation/slashing
- slashing
- pheromone treatment
- crew transport
- spur roads for ground skidding of less than or equal to 100m length (See Section 4.3.2.2 (1))

4.4.1 Harvesting Methods

Certain harvesting methods are recognized only when required by the cutting authority document (inclusive of logging plan).

- Helicopter,
- Horse,
- Ground Skidding, and
- Overhead Cable Logging.

4.4.2 Tree-to-Truck Variables

For appraisal purposes the following variables are recognized, based on all compiled cruise plots segregated by logging method where applicable (see Section 4.4.5). Where the utilization of deciduous is mandatory then all applicable variables are to include the deciduous component.

1. Biogeoclimatic Zone

A separate biogeoclimatic zone may be recognized for each ground skidding (clear-cut), ground skidding (partial cut), overhead cable (clear cut), and skyline (clear cut) logging method as part of the regional constant.

3. Slope (SLOPE%)

The average side slope percent is derived from an area weighted average of the maximum side slope percentage on all cruise plots, rounded to the nearest whole percentage point.

3. Volume per Hectare (VOLHA)

The average net cruise volume per hectare (m^3/ha), rounded to the nearest cubic metre. For partial cutting, it is based on the actual volume per hectare being harvested.

4. Percent Blowdown (BD%)

The percentage of the net cruise volume classified as blowdown. Where, if BD% is less than or equal to 15% then $\text{BD}\% = 0$.

5. Percent Partial Cut (PCUT)

Partial cutting includes silviculture systems such as faller selection, shelterwood, individual tree and group selection (where the opening size does not exceed one hectare).

The percent partial cut is determined as:

$$PCUT = \frac{\text{Net cruise volume required to be removed using the Partial Cut System}}{\text{Total net cruise volume on the area where Partial Cut System is required}} * 100\%$$

and the maximum percent partial cut is less than 90%. All partial cut percent from 90-100% are to be appraised as clear cut.

7. Distance to Support Centre (DS)

Accessible cutting authorities: (see Section 4.8.2), the one way distance to support centre is the distance over continuous road access from the geographic centre of the cutting authority to the main post office (or other location designated by the Regional Appraisal Coordinator) in a community from the following list. The distance to support center includes the distance covered by a daily barge or ferry service. Where there is more than one block in the cutting authority, the weighted average distance to support centre must be calculated using the individual distances and the individual block volumes. Where more than one alternative is possible, the least cost alternative is used. The distance is measured to the nearest kilometre. The following is a list of communities by Forest Region.

Prince Rupert

Burns Lake
Houston
Kitimat

Kitwanga
New Hazelton

Smithers
Stewart

Terrace

Kamloops

Boston Bar
Clearwater
Hope

Kamloops
Kelowna
Lillooet

Merritt
Pemberton
Penticton

Princeton
Salmon Arm
Vernon

Prince George

Chetwynd
Dawson Creek
Fort Nelson

Fort St. James
Fort St. John
Fraser Lake

Mackenzie
McBride
Prince George

Valemount
Vanderhoof

Nelson

Canal Flats
Castlegar
Cranbrook

Creston
Fernie
Golden

Grand Forks
Greenwood
Invermere

Nakusp
Nelson
Revelstoke

Cariboo

100 Mile House

Quesnel

Williams Lake

For isolated cutting authorities: (see Section 4.8.2), the distance to support centre is the one-way road distance from the geographic centre of the cutting authority to the isolated camp or where there is no isolated camp, to a community from the list above. Where more than one alternative is possible the least cost alternative is used. The distance is measured to the nearest kilometre.

8. Volume per Tree (VOLTREE)

The average net cruise volume per tree (m^3), rounded to two decimals. For partial cutting, it is based on the trees to be harvested.

9. Gross Volume (GVOL)

Gross volume per tree (m^3) is computed as: $\text{tree volume} / (1 - \text{defect \%}/100)$.

Where:

Defect is the estimate of decay, waste and breakage (DWB) percent of the coniferous gross volume from the cruise summary for the trees to be harvested. DEFECT% is recorded to the nearest whole percentage point for appraisal calculation purposes.

4.4.3 Tree-to-Truck Cost Estimate

Tree-to-Truck costs estimates are determined for each harvesting method as follows:

1. Helicopter Logging

Only partial cut and clear-cut logging variables are recognized. The cost estimates are applied to the volume of timber which is required to be logged by helicopter.

Two variations are recognized:

- a. Clear Cut $\$/\text{m}^3 = 65.29$

Clear Cut is defined as volume removal of 90 percent or greater of the total net cruise volume.

- b. Partial Cut $\$/\text{m}^3 = 79.22$

Partial cut is defined as volume removal of less than 90 percent (see Section 4.4.2 (5)) of the total net cruise volume.

2. Horse Logging

No variables are recognized for this method. The cost estimates are applied to the volume of timber to be clear cut or partial cut, which the logging plan requires to be skidded by horse(s).

$$\$/\text{m}^3 = 28.95$$

3. Ground Skidding

Two variations are recognized:

- a. Clear Cut

Clear Cut is defined as the removal of 90 percent to 100 percent of the total net cruise volume.

- b. Partial Cut (PCUT)

Partial cut is defined as the removal of less than 90 percent (see Section 4.4.2 (5)) of the total net cruise volume.

When the volume per tree is less than 0.20 m^3 , a cost additive will apply to the Ground Skidding Tree-to-Truck cost estimates in all Forest Regions. The cost additive is determined as follows:

$$\$/\text{m}^3 = 3.75 - 17.60 * \text{VOLTREE}$$

The tree-to-truck cost estimate is determined from the equation as follows:

$$\$/\text{m}^3 = \text{CONSTANT} + 7.02 * \text{SLOPE\%/100} - 6.57 * \text{VOLHA/1000} + 4.85 * \text{BD\%/100} + 6.67 * \text{DPCUT} - 6.63 * \text{PCUT/100} + 1.16 * (\text{DS}-50)/100$$

Where CONSTANT =

Region	Biogeoclimatic Zone			
	CWH/MH	ICH	ESSF	All Other
Nelson	21.14	20.22	21.11	18.82
Prince George	18.41	17.49	18.38	16.09
All Other	19.05	18.13	19.02	16.73

For the above equation the following definitions apply:

- if DS is less than or equal to 50 km, then $(\text{DS}-50) = 0$,
- if DS is greater than 150 km, then $(\text{DS}-50) = 100$,
- if BD % is less than or equal to 15, then BD % = 0,
- GVOL = gross volume per tree (m^3) computed as $\text{VOLTREE} / (1 - \text{DEFECT \%} / 100)$,
- DPCUT = 1 if partial cut percent is greater than 0 and less than 90 otherwise DPCUT = 0,
- PCUT = percent volume removed in a partial cut (EXCEPT: if partial cut percent $\geq 90\%$ then, PCUT=0).

4. Overhead Cable Logging

Overhead cable logging cost estimates will be recognized when required in the cutting authority document. The method includes both highlead (spar) mobile (grapple) yarders and skyline yarders, but variations in machine size, spar/boom height, winch line capacity and yarding technique are not recognized. All overhead cable is appraised as clear cut.

Variations recognized within the method are:

a. Highlead and Grapple

The tree-to-truck cost estimate is determined from the formula as follows:

$$\$/\text{m}^3 = \text{Constant} + 7.08 * \text{SLOPE}\%/100 - 5.43 * \text{VOLHA}/1000 - 1.80 * \text{GVOL} + 0.17 * \text{GVOL SQR} + 2.58 * \text{BD}\%/100 + 2.70 * (\text{DS}-150)/100$$

Where CONSTANT =

Region/District	Biogeoclimatic Zone		
	ESSF	SBS	All Other
Fort Nelson/Peace (FNP)	36.81	33.98	35.72
Cariboo	29.40	26.57	28.31
Nelson	33.50	30.67	32.41
All Others	31.13	28.30	30.04

For the above equation, the following definitions apply:

- if DS is less than or equal to 150 km, then (DS-150) = 0,
- GVOL = Gross volume per tree (m³) computed as VOLTREE / (1 - DEFECT%/100),
- GVOLSQR = GVOL squared,
- if BD% is less than or equal to 15, then BD% = 0

b. Skyline and Intermediate Support Skyline

Skyline yarding estimates will be recognized where the average horizontal yarding distance is greater than 300 meters, or intermediate supports are required.

The Average Yarding Distance is determined by:

- drawing a series of transects (minimum four) with their origin at the landing, being equi-angle apart and measured to the back-line. This is done for each block; blocks will not be amalgamated for the purpose of Average Yarding Distance Calculation. The volume for the system is the sum of the volumes of qualifying blocks.
- yarding distance will be measured as horizontal distance from the centre of the landing to the falling boundary.
- the sum of transect lengths divided by the number of transects equals the Average Yarding Distance.
- the exception to the above; where the ministry and the licensee agree that Forest and Land Management is better served by the use of a skyline system in a particular logging chance, then the Average Yarding Distance greater than 300 meters requirement is waived.

The tree-to-truck cost estimate is determined from the equation as follows:

$$\$/m^3 = \text{Constant} + 7.08 * \text{SLOPE}\%/100 - 5.43 * \text{VOLHA}/1000 - 1.80 * \text{GVOL} + 0.17 * \text{GVOL SQR} + 2.58 * \text{BD}\%/100 + 2.70 * (\text{DS}-150)/100$$

Where CONSTANT =

Region	Biogeoclimatic Zone		
	ESSF	SBS	All Other
Ft. Nelson/Peace	45.08	42.25	43.99
Cariboo	37.67	34.84	36.58
Nelson	46.20	43.37	45.11
Prince Rupert	38.27	35.44	37.18
All Other	39.40	36.57	38.31

For the above equation, the following definitions apply:

- if DS is less than or equal to 150 km, then $(DS-150) = 0$,
- $GVOL$ = Gross volume per tree (m^3) computed as $VOLTREE / (1 - DEFECT\%/100)$,
- $GVOLSQR$ = $GVOL$ squared,
- if $BD\%$ is less than or equal to 15, then $BD\% = 0$

4.4.4 Tree-to-Truck Additive for Damaged Timber

The following cost estimate additives are recognized for heavy fire damage (HFD), and dead useless snags (DUS). The data is collected as specified by the Forest Service Cruising Manual. The additional costs incurred to harvest blowdown timber are recognized in the Tree-to-Truck ground skidding and overhead cable logging equations (Sections 4.4 (3), 4.4 (4)).

The following additive is determined for all cable and ground skidding harvesting methods and is added to the Tree to Truck cost estimate.

$$$/m^3 = 0.04 * (DT - 15)$$

Where: DT is the Damaged Timber percent

$$DT = HFD + DUS$$

If: DT is less than 15 percent, $DT = 15$

If: DT is more than 100 percent, $DT = 100$

$$\text{Heavy Fire Damage \%} = \frac{\text{Conifer HFD Volume}(m^3) * 100}{\text{Total Net Conifer Volume}(m^3)}$$

$$\text{Dead Useless Snags \%} = \frac{\text{Conifer DUS Snags / ha} * 100}{\text{Net Merchantable Conifer Stems / ha} + \text{Conifer DUS Snags / ha}}$$

4.4.5 Prorating Tree-to-Truck Cost Estimates

Where more than one harvesting method is required, a proration of costs is necessary.

The variables for each required harvesting method must be based on a cruise compilation of only those plots located within the area to be harvested by the method.

The additive for damaged timber is also determined for each applicable method.

The final prorated tree-to-truck cost estimate is determined according to the following equation where each component is rounded to the nearest cent before totalling:

$$\frac{(\text{Cost Heli(C)})(\text{V Heli(C)})}{(\text{TNCV})} + \frac{(\text{Cost Heli(P)})(\text{V Heli(P)})}{(\text{TNCV})} + \frac{(\text{Cost Horse})(\text{V Horse})}{(\text{TNCV})} + \frac{(\text{Cost OC})(\text{V OC})}{(\text{TNCV})} +$$

$$\frac{(\text{Cost GS(P)})(\text{V GS(P)})}{(\text{TNCV})} + \frac{(\text{Cost GS(C)})(\text{V GS(C)})}{(\text{TNCV})} + \frac{(\text{Cost SK})(\text{V SK})}{(\text{TNCV})} = \$ / \text{m}^3$$

Where:

Cost	=	cost estimate (\$/m ³) including any damaged timber additive
V	=	volume (m ³) required to be logged by each system
Heli (C)=		helicopter logging (clear-cut)
Heli (P)=		helicopter logging (partial cut)
Horse	=	horse logging
GS (C)=		ground skidding (clear-cut)
GS (P)=		ground skidding (partial cut)
OC	=	overhead cable logging
SK	=	skyline logging
TNCV	=	Total Net Cruise Volume (m ³)

4.5 Log Transportation

The log transportation phase covers all aspects of log movement from the place of initial loading to the point of appraisal, including truck haul, rail, water and other specialized transportation.

4.5.1 Truck Haul Variables

For appraisal purposes, the following variables are recognized:

1. **Weighted Average Cycle Time (CT):** the estimated time in hours (rounded to the nearest 0.1 hour) from the center of a cutting authority area to the point of appraisal or the appraisal place of unloading (water or rail transport).

To determine weighted average cycle time:

- a. establish the geographical center point of each cut block and project this point to the nearest road for measurement purposes,
- b. from this center point, determine the cycle time to the nearest junction serving all cut blocks,
- c. weight the cycle time for each cut block by the volume on the cut block and determine the average weighted cycle time to the junction. If the cut block volume is not available, the cut block area is used, and
- d. determine the cycle time from the junction to the point of appraisal or the first place of unloading and add this to the average weighted cycle time.

The cycle consists of loading, hauling, weighing, unloading, return time, and unavoidable delays. The cycle time will normally be determined by taking into consideration all the factors that may affect it: distance, expected rate of speed, necessary delays, expected standard of roads and their maintenance, traffic density, and seasonal weather conditions.

In many cases standard cycle time schedules from specific road junctions to the point of appraisal have been developed and should be used (Sector times).

Unavoidable delays are periods when the truck is on the job but not operating due to unpredictable delays such as; tightening binder chains, minor repairs made by driver, checking and adjusting brakes, minor delays prior to loading and unloading, refuelling, etc. Unavoidable delay time does not include any breakdown which requires shop repair, the services of a skilled mechanic, or a spilled load of logs. The default time for load, unload and unavoidable delay is 75 minutes for cable yarding systems (see Section 4.4.3 (4)) and 60 minutes for all other systems (see Section 4.4.3 (1), (2), & (3)).

2. Haul Method

Cost estimates do not recognize different types of logging trucks. The estimate is based upon the possible haul method, either highway or off-highway and not specifically on the licensee's particular method.

Highway hauling is assumed when loaded logging trucks must travel in part over roads administered under the Highway Act, without truck-to-truck transfer, to the point of appraisal, or on roads administered under the Highway (Industrial) Act where prolonged known road restrictions prevent the use of oversize loads, or in all instances where the volume per tree (Section 4.4.2) is less than 0.20 m³.

Off-highway hauling is assumed when loaded logging trucks can travel over roads administered under the Highway (Industrial) Act to the point of appraisal, or to a recognized reload. Where prolonged known restrictions (e.g., bridge load limit, narrow road, through rock cut, etc.), prevent the use of oversize loads, highway haul is assumed.

4.5.2 Truck Haul Cost Estimates

4.5.2.1 Primary Haul

The primary truck haul cost estimate is determined from the following equation.

1. Highway Haul

For all highway haul equations if the CT is greater than 0 then the minimum is \$1.08/m³.

$$\$/\text{m}^3 = 0.45 + (1.85 * \text{CT}) - (1.22 * \text{CE}/100) + (2.85 * \text{HE}/100) + \\ (1.44 * \text{LA}/100) - (0.27 * \text{LO}/100) - (0.62 * \text{SP}/100) - (1.73 * \text{WH}/100)$$

If:

CT = 0 then \$/m³ = 0.

2. Off-Highway Haul

For all off-highway haul equations if CT is greater than 0 then the minimum is \$1.54/m³.

$$\$/\text{m}^3 = 1.28 + (1.50 * \text{CT}) - (0.026 * (\text{CT})^2) - (0.53 * \text{BA}/100) - (0.83 * \text{CE}/100) - \\ (0.66 * \text{HE}/100) - (0.88 * \text{LO}/100) - (1.21 * \text{SP}/100)$$

If:

CT = 0 then \$/m³ = 0.

Where: CT Cycle time to the nearest 0.1 hour

BA = Balsam

LO = Lodgepole Pine

CE = Cedar

SP = Spruce

HE = Hemlock

WH = White Pine

LA = Larch

For both hauling equations, the species listed are the species percents taken from the appraisal data sheet to the nearest 1.0%.

4.5.2.2 Secondary Haul

The secondary haul cost estimate is made when logs must be truck hauled between the dewater and reload site to the appraisal point.

$$$/m^3 = 1.646 * CT$$

CT for the secondary haul is determined using the method described in Section 4.5.1,(1).

4.5.3 Water Transportation Cost Estimate

A water transportation cost estimate is made when logs must be transported by water between the cutting authority and the point of appraisal or reload. The estimate includes the costs of strapping logs on the truck, dumping, booming, developing and operating dumping and booming grounds, and towing. The cost estimate for reservoir lakes applies to all marine appraisals and to Arrow, Kinbasket, Ootsa, Revelstoke and Williston Lakes. All other lakes receive the natural lake cost estimate.

1. Dump and Boom:

Reservoir Lakes and Marine:	\$3.23
Natural Lakes:	\$1.87

2. Tow:

$$\text{All} \quad \$/m^3 = 0.4559 + 0.006541 * d$$

Where; d = one-way tow distance in kilometres

3. Dewater and Reload:

All lakes	\$2.83
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Only considered if the mill infeed is not located on the same lake, otherwise dewatering is part of the manufacturing cost estimate.

4.5.4 Special Transportation Systems

A special transportation system is recognized in the appraisal where geographic conditions dictate its use.

The cost estimates include all costs associated with servicing the appropriate cutting authorities, excluding all on-site costs of owning and operating a camp facility.

The recognized special transportation systems are as follows:

1. Railway
 - a. Truck to Rail Transfer

When logs are appraised by railway for part of the way between the cutting authority and the point of appraisal, the cost estimate for the truck-to-rail transfer part of the phase is:

B.C. Rail - Dease Lake Extension: \$5.79/m³

All Other Railways: \$3.01/m³

b. Railway Transportation

The railway transportation cost estimate is based on the following table for the points of origin shown. Otherwise, the best information on hand is used.

B.C. Rail Log Transportation

Origin	Cost Estimate (\$/m ³)	Point of Appraisal
Leo Creek	8.77	Fort St. James
Lovell	11.62	Fort St. James
Bear Lake	15.01	Fort St. James
Minaret Creek	16.05	Fort St. James
Niteal	14.43	Fort St. John

2. Barge/Ferry Used for Truck Haul (Private)

When a truck haul road is interrupted by a body of water and the operation of a barge system is feasible to provide the road link for logging trucks, the cost estimate for this phase, regardless of ownership is:

Reservoir Lakes \$3.25/m³

Natural Lakes \$2.14/m³

3. Barge/Ferry Not Used for Truck Haul (Private)

The cost estimate includes all costs associated with the operation of the systems and includes bubble systems where applicable.

When a cutting authority can be served only by water, and daily (operating days only) ferry/barge services are feasible for crew transportation, the cost estimate for this phase, regardless of ownership is:

All lakes \$0.68/m³

4.6 Road Maintenance

Where the licensee is obliged to carry out road maintenance, routine road maintenance includes but is not limited to, the following:

- grading
- snowplowing and freezing in
- sanding
- spot gravelling (< 0.3 km distance)
- culvert repairs and thawing
- culvert removal (< 950 mm)
- culvert replacement (< 950 mm)
- non-structural maintenance of bridges
- bridge re-decking/wearing surface replacement
- ditching
- snow road reconstruction
- road use charges paid to other licensees
- seasonal erosion control
- roadside treatments
- sign maintenance
- dust control
- brushing
- minor flood and storm damage repair
- slough removal (restricted to 250 m³ or less material volume per slough)
- water bar construction (seasonal)
- road ripping
- cross ditch construction
- grass seeding

The cost estimate for all routine maintenance carried out on logging operations depends on the geographic location of the cutting authority area

For a management unit, other than Timber Supply Areas or Tree Farm Licence (for example Woodlot Licences), the routine road maintenance cost estimate is \$1.88/m³.

The geographic location is recognized by Forest Region, Timber Supply Area and Supply Block, and Tree Farm Licence as follows.

Routine Road Maintenance Cost Estimates

Region	TFL #	TSA	TSA #	Supply Block	\$/m3
Prince Rupert	1 41	Bulkley	3	All	2.72
		Cassiar	4	All	2.19
		Cranberry	42	All	2.19
		Kalum	10	All	2.19
		Kispiox	12	All	1.64
		Lakes	14	All	1.13
		Morice	20	All	1.53
		Nass	43	All	2.19
					2.19
					2.19

Region	TFL #	TSA	TSA #	Supply Block	\$/m3
Kamloops		Kamloops	11	1	2.52
		Kamloops	11	2, 3, 4	0.93
		Lillooet	15	All	1.89
		Merritt	18	All	1.58
		Okanagan	22	1, 2, 3	1.73
		Okanagan	22	4, 5	1.81
		Okanagan	22	6, 7, 8, 9	2.69
	15				1.73
	18				2.52
	33				2.69
	35				0.93
	49				1.81

Region	TFL #	TSA	TSA #	Supply Block	\$/m3
Prince George		Dawson Creek	41	All	2.81
		Fort Nelson	8	All	3.29
		Fort St. John	40	All	2.30
		Mackenzie	16	All	2.54
		Prince George	24	G, H	2.64
		Prince George	24	E, F, I	1.32
		Prince George	24	D	0.98
		Prince George	24	A, B, C	1.16
		Robson Valley	17	All	4.88
	48				2.81
	30				2.64
	53				2.64
	42				1.16

Region	TFL #	TSA	TSA #	Supply Block	\$/m3
Nelson		Arrow	1	All	3.35
		Boundary	2	All	2.29
		Cranbrook	5	All	2.53
		Golden	7	All	5.20
		Invermere	9	All	2.23
		Kootenay Lake	13	All	2.48
		Revelstoke	27	All	4.47
	3				3.35
	23				3.35
	8				2.29
	13				2.53
	14				2.23
	55				4.47
	56				4.47

Region	TFL #	TSA	TSA #	Supply Block	\$/m3
Cariboo		Quesnel	26	A, B, C, D	0.53
		Quesnel	26	E, F, G, H, I	1.22
		Williams Lake	29	A, B, C, D, E, I	0.73
		Williams Lake	29	F, G, H, J,	1.30
		Williams Lake	29	K, L	1.09
		Williams Lake	29	M, N	1.51
		100 Mile House	23	All	1.42
	5				0.53
	52				1.22

4.7 Road and Land Use Charges

Prior to a road or land use charge being included in an appraisal, the licensee must:

- a. submit a "Request for Approval of a Road Use Charge" form with the data sheet; and
- b. receive written approval of the road or land use charge from the Regional Manager.

1. Charges as a Share of Road Maintenance

No recognition is made of such charges. The routine road maintenance cost estimate, Section 4.6, includes all relevant costs whether incurred directly by the licensee or by payment to another party for services performed.

2. Charges Other Than for Road Maintenance

There are three main categories of road status:

a. Forest Service Roads

A road that is declared, determined, built, maintained or modified by the Ministry, as defined in forest legislation. No road use charges will be considered in appraisals,

b. Permitted Roads

Roads built on Crown land, authorized by road permit or other cutting authority documents. This category also includes foreshore leases, camp areas and dryland sorts. No road use charges will be considered in appraisals,

c. Other Roads

Road use charges for roads on Indian Reserves or on private land owned by an arm's length third party and not subject to a lease held by the licensee, his affiliate or an agent of either, may be considered in appraisals provided there is no lower cost route capable of development through Crown land.

The charges recognized must be reasonable, must not exceed compensation that might be determined under forest legislation and must be proven through the presentation of auditable documents.

3. Other Land Use Charges

Only non-governmental land use charges will be considered in appraisals.

4.8 Administration and Other Costs

4.8.1 Overhead

Overhead cost estimates are for the related administration and supervisory activities attributed to development, tree-to-truck, transportation and basic silviculture that occur at the head office, branch office and camp or operation.

Overhead costs include:

- Office Operations,
- Scaling,
- Cruising,
- Environmental Protection,
- Archaeological surveys,
- Waste and Residue surveys,
- Right-of-way easements,
- Foreshore and other land leases,
- Consultants fees (Section 4.3.3).
- Engineering (road layout, survey (including geotechnical surveys), and design), other than those applicable as Engineered Cost Estimate,

Cost estimates by forest district are shown in the following table:

District	\$/m ³	District	\$/m ³
100 Mile House	6.81	Kispiox	7.72
Arrow	9.98	Kootenay Lake	9.73
Boundary	8.93	Lakes	5.58
Bulkley (Cassiar)	6.09	Lillooet	9.42
Chilcotin	4.42	Mackenzie	5.89
Clearwater	8.72	Merritt	6.45
Columbia (Golden, Revelstoke)	10.80	Morice	5.54
Cranbrook	9.96	Penticton	6.80
Dawson Creek	6.36	Prince George	5.62
Fort Nelson	4.30	Quesnel	5.81
Fort St. James	4.89	Robson Valley	7.89
Fort St. John	4.95	Salmon Arm	8.36
Horsefly	6.39	Vanderhoof	4.98
Invermere	9.30	Vernon	7.12
Kalum	10.60	Williams Lake	6.74
Kamloops	7.12		

4.8.2 Isolated Cutting Authority Areas

An isolated cutting authority area has no continuous road access to the nearest support centre (listed in Section 4.4.2 (7)). Continuous road access includes public ferry service, private daily ferry and daily barge service. The exception is where there is continuous road access, but the route is not routinely used to transport people, equipment or supplies to the cutting authority area.

For isolated cutting authorities not serviced by camps the isolation cost estimate covers, the costs of moving people, equipment and supplies to and across the non-road portions of the route to the camp (or cutting authority area where there is no camp) whether by crew boat, periodic barge service, air, or rail. Also covered are the depreciation, maintenance and operating costs of any camp facilities and the non-recoverable costs incurred for a cookhouse, family quarters, bunk houses, shop, office and other pertinent buildings.

For isolated cutting authorities serviced by camps, the costs of moving people, equipment or supplies by road from the isolated camp location to the cutting authority are covered by the distance variable in the tree-to-truck equation.

The cost estimates for isolated cutting authorities at the following locations are:

Rail access: $\$6.71/\text{m}^3$

Lake/ocean access: $\$6.41/\text{m}^3$

4.8.3 Low Volume Additive

All fully appraised cutting authorities are eligible for a specific low volume cost estimate in addition to all other phase cost estimates.

1. Where the licence to which the cutting authority belongs has an Allowable Annual Cut of Crown timber greater than 0 m^3 and less than $3\,000 \text{ m}^3$,

The additive is: $\$/\text{m}^3 = 11.64$

2. Where the cutting authority net cruise volume is less than $3\,000 \text{ m}^3$ and the cutting authority does not belong to a licence eligible for the AAC additive in 1. above,

The additive is: $\$/\text{m}^3 = 5.01$

4.9 Post-Logging Treatment Costs

Post-logging costs are those which are incurred after logging because of treatments specified in the cutting authority. All post-logging requirements are included in the tree-to-truck phase.

4.10 Basic Silviculture Cost Estimate

Basic silviculture cost estimates are made for all cutting authorities where basic silviculture is required.

Basic silviculture treatment regime(s) cost estimates include all treatment costs that are required to achieve the free-growing stocking standards, as referred to in the Silviculture Practices Regulation (B.C. Reg. 42/94).

The following table lists the treatment regimes and associated cost estimates (\$/ha) for each Group of Forest Districts.

Forest District Groupings

Group 1	Group 2	Group 3	Group 4
Columbia Kalum (Revelstoke) (Golden)	Arrow Cranbrook Kootenay Lake Lillooet	Invermere Boundary Salmon Arm	Clearwater Robson Valley Kispiox

Group 5	Group 6	Group 7	Group 8
Vernon Kamloops Penticton	Horsefly Merritt 100 Mile House Williams Lake Bulkley Dawson Creek Mackenzie Quesnel Morice Lakes Prince George (Cassiar)	Fort St. James Vanderhoof Fort St. John	Fort Nelson Chilcotin

Treatment Regime Cost Estimates Table

Regime	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
	\$/ha	\$/ha	\$/ha	\$/ha	\$/ha	\$/ha	\$/ha	\$/ha
A	3606	2583	2438	2716	2209	2405	2032	2507
B	3041	2214	2043	2322	1809	2018	1674	2006
C	2321	1476	1350	1731		1291	1136	1207
D	2536	1292	1175	1830	1148	1044	1012	877
E	2512	1840	1650	1902	1416	1645		1508
F	2306			1800		1614	1340	1595
G	1645	883	825	1270	841	716		620
H	2455	1983	1889	1973	1788	1923	1734	2085
I		1398	1281	1345	1210	1339	1216	1391
J	495			376		247		189
K		81	66	61	59			
L								
M	1899	1346	1403	1355	1285	1312	1260	1437

All Regimes assume a combination of manual and chemical brushing and weeding (i.e., a blended cost estimate).

Where stump removal for root disease control is required, a cost estimate may be determined as a specified operation as described in Section 4.1.1.

The area requiring basic silviculture treatment includes only the portion of the land on which the licensee is required to establish a free-growing crop of trees, as specified in the *Forest Practices Code of British Columbia Act*. Basic silviculture treatment may not be required on some cutting authorities (e.g., right-of-way, licence-to-cut (gravel pit)).

Basic silviculture cost estimates will not be included in the appraisal where silviculture is specified as not required in the licence document, cutting authority or by applicant's agreement.

If available, the net area to be reforested is to be taken from the "Silviculture Prescription" (SP); otherwise the best information at hand (i.e., cruise area with appropriate net down factors) will be used.

Individual areas of non-commercial brush (NCBR) of less than four hectares growing on productive forest land are included in the applicable treatment regime(s) used to calculate the basic silviculture cost estimate. Subject to approval by the District Manager, these areas are eligible for a cost estimate of 1.2 times the applicable treatment regime(s) cost. Individual areas of NCBR greater than 4 ha in size must not be included in the appraisal.

In the case of mixed stands where the cutting authority document requires mandatory utilization of deciduous timber, the deciduous area is included in the applicable treatment regime(s) used to calculate the basic silviculture cost estimate and the deciduous volume is included in the total net merchantable volume for the calculation of silviculture cost estimates.

Each treatment regime cost estimate is determined as follows:

$$(\$) = \text{treatment regime cost } (\$/\text{ha}) * [\text{Net merchantable area} + (\text{NCBR} * 1.2)] * R$$

Where:

Net merchantable area = Net area to be reforested - NCBR

NCBR = individual areas of non-commercial brush of 4 hectares or less in size.

R = volume removal factor and is calculated for each treatment regime area.

$$R = \frac{\text{Volume Required to be Harvested}}{\text{Total Net Cruise Volume}}$$

Where:

R = 1 if the entire volume is required to be harvested (i.e., clear-cut).

R = 1 for treatment regime G in all cases.

The Basic Silviculture Cost Estimate is determined as follows:

$$\$/\text{m}^3 = \frac{\text{Summation of Treatment Regime Cost Estimates}}{\text{Total Net Cruise Volume}(\text{m}^3)}$$

Each portion, by area, of a cutting authority that requires less than 90 percent volume removal must have one or more separate treatment regime cost estimates (i.e., partial cut areas and clear-cut areas may not be combined). Any areas with 90 percent or more removed will be considered a clearcut. and deemed equal to 100%.

4.11 Manufacturing Cost Estimates

In the Interior, appraisal calculations include estimates of the cost of manufacturing lumber and chips. Manufacturing cost estimates are developed from a survey of sawmills and encompass all phases of manufacturing beginning with the dewatering of logs or unloading of logging trucks at the mill log yard, (land or water or satellite log yards), and ending when the lumber and chips have been loaded on rail cars or trucks for transport to market.

The survey collects actual costs to the licensee, including wages, benefits, overtime, depreciation, fuel, supplies, repair, maintenance, applicable licences, insurance, etc. from a representative sample of Interior operations.

The cost estimates reflect average conditions, operating practices, and phase accounting allocations experienced in the survey data. Because of this averaging, no additions to or subtractions from these estimates are permitted to reflect operation-specific conditions.

The estimates have an effective cost base date of July 1, 1995.

Untrended Manufacturing Cost Estimates (\$/m ³) 1995 Cost Survey Base		
	Species	Manufacturing cost (\$/m ³) 0% Decay
Northern Interior (Zone 5)	LO	34.21
	SP	29.84
	BA	34.83
	FI, LA, WH, YE	43.66
	CE	41.95
	HE	40.22

Skeena (Zone 6)	LO	30.34
	SP	26.12
	BA	30.91
	CE	37.12
	HE	33.93

Southern Interior (Zone 7)	LO	39.67
	SP	33.92
	BA	39.82
	FI, LA, WH, YE	49.86
	CE	48.34
	HE	46.86

Untrended Manufacturing Cost Estimates (\$/m ³) 1995 Cost Survey Base		
	Species	Manufacturing cost (\$/m ³) 0% Decay
Southern Cariboo (Zone 8)	LO	33.30
	SP	28.82
	BA	33.94
	FI, LA, WH, YE	41.85
	CE	36.97
	HE	36.58

Fort Nelson/Peace (Zone 9)	LO	33.28
	SP	28.99
	BA	33.21

To derive the manufacturing cost estimate for decay % from 1 to 50, use the above table values in the following equation:

The cost estimate is calculated to four decimal places, then rounded to the nearest cent. Where decay exceeds 50 percent, the manufacturing cost estimate for 50 percent decay is used.

Manufacturing cost (\$/m³) = decay% * 0.1671 + base value from table.

For a list of points of appraisal by zone, refer to Section 2.5.

4.12 Cost Trend

Cost trend factors are separately applied to the total logging, silviculture and manufacturing cost estimates. The factors cover the period from the effective date of the cost base to the effective date of the rate calculation. Cost trend factors are applied at the appraisal effective date and at the date of each stumpage adjustment.

For trend factors applicable prior to October 1, 1997, refer to the August 1, 1996 *Interior Appraisal Manual*.

Appraisal Effective Dates From January 1, 1990 to May 31, 1992 Inclusive

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.51	1.320
January 1 to March 31, 1998	1.54	1.625
April 1 to June 30, 1998	1.55	1.638
July 1 to September 30, 1998	1.56	1.650
October 1 to December 31, 1998	1.57	1.663

Appraisal Effective Dates From June 1, 1992 to October 31, 1992 Inclusive

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.51	1.260
January 1 to March 31, 1998	1.54	1.625
April 1 to June 30, 1998	1.55	1.638
July 1 to September 30, 1998	1.56	1.650
October 1 to December 31, 1998	1.57	1.663

Appraisal Effective Dates From November 1, 1992 to September 30, 1993 Inclusive

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.47	1.260
January 1 to March 31, 1998	1.50	1.425
April 1 to June 30, 1998	1.51	1.438
July 1 to September 30, 1998	1.52	1.450
October 1 to December 31, 1998	1.53	1.463

Appraisal Effective Dates From October 1, 1993 to September 30, 1994

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.45	1.200
January 1 to March 31, 1998	1.48	1.325
April 1 to June 30, 1998	1.49	1.338
July 1 to September 30, 1998	1.50	1.350
October 1 to December 31, 1998	1.51	1.363

Appraisal Effective Dates From October 1, 1994 to July 31, 1995

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.41	1.178
January 1 to March 31, 1998	1.44	1.275
April 1 to June 30, 1998	1.45	1.288
July 1 to September 30, 1998	1.46	1.300
October 1 to December 31, 1998	1.47	1.313

Appraisal Effective Dates From August 1, 1995 to July 31, 1996

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.31	1.140
January 1 to March 31, 1998	1.34	1.225
April 1 to June 30, 1998	1.35	1.238
July 1 to September 30, 1998	1.36	1.250
October 1 to December 31, 1998	1.37	1.263

Appraisal Effective Dates From August 1, 1996 to November 30, 1997

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
October 1 to December 31, 1997	1.19	1.130
January 1 to March 31, 1998	1.22	1.175
April 1 to June 30, 1998	1.23	1.188
July 1 to September 30, 1998	1.24	1.200
October 1 to December 31, 1998	1.25	1.213

Appraisal Effective Dates On or After December 1, 1997

<u>Appraisal Effective Date or Stumpage Adjustment Date</u>	<u>Trend Factor</u>	
	<u>Logging and Silviculture</u>	<u>Manufacturing</u>
December 1 to December 31, 1997	1.11	1.113
January 1 to March 31, 1998	1.12	1.125
April 1 to June 30, 1998	1.13	1.138
July 1 to September 30, 1998	1.14	1.150
October 1 to December 31, 1998	1.15	1.163

Stumpage Rate Determination

5

5.1 Indicated Stumpage Rate

The Indicated Stumpage Rate is determined by comparing the Value Index of the stand being appraised to the Value Index of other stands, as explained in the following sections.

5.2 Value Index

The stumpage rate charged on each cutting authority is tied to the estimated Value Index of the stand to be harvested. The Value Index is defined as the Selling Price less the Operating Cost, both of which are estimates expected for an average operator in that stand. The formula to be used is:

$$VI = SP - OC$$

Where:

- VI = Value Index for the cutting authority.
- SP = estimated stand Selling Price determined in accordance with Chapter 3.
- OC = estimated Operating Cost applicable to the timber being appraised, and determined in accordance with Chapter 4.

5.3 Mean Value Index

The Interior Mean Value Index is the benchmark against which individual stands of timber are compared. The Interior Mean Value Index is recalculated and published by Revenue Branch at the time of each quarterly stumpage adjustment and becomes an integral part of this manual.

5.4 Market Value Indexing

At the times specified in Section 1.6, target rates are adjusted upwards or downwards to reflect changes in the value of softwood lumber as indicated by Statistics Canada. Beginning with the month of September 1997 the British Columbia Softwood Lumber Index Number P2459 is used for the Interior. This Index is a measure of the changes in market value for a “basket” of lumber products representative of the normal production in the interior. Quarterly indexing is based on averages of StatsCan values for the three-month periods ending January, April, July, and October each year. The base of (1992 = 100) is adjusted back to the base of 1981 = 100.

New Interior Target Rate Calculation

1. If the INDEX is less than or equal to 161 then,
$$TR = \frac{INDEX}{139.0} * 8.59$$
2. If the INDEX is greater than 161, but less than or equal to 186 then,
$$TR = 9.95 + \left[\frac{(INDEX - 161)}{25} * 9.35 \right]$$
3. If the INDEX is greater than 186 then,
$$TR = 19.30 + \left[\frac{(INDEX - 186)}{49} * 6.74 \right]$$

Where: TR = New Target Rate (\$/m³)

Quarterly Stumpage Rate Adjustment Date	New Statistics Canada Index based on index values for the months of:
January 1 April 1 July 1 October 1	Preceding August, September, October Preceding November, December, January Preceding February, March, April Preceding May, June, July

The applicable Statistics Canada Index is published by Revenue Branch at the time of each quarterly stumpage adjustment and becomes an integral part of this manual.

5.5 Base Rate

The Interior Base Rate is redetermined and published by Revenue Branch at the time of each quarterly stumpage rate adjustment and becomes an integral part of this manual.

5.6 Calculation of Stumpage Rate

5.6.1 Calculation of Indicated Stumpage Rate

The Indicated Stumpage Rate for a cutting authority is defined as:

$$IR = BR + (VI - MVI)$$

Where:

IR = Indicated Stumpage Rate

BR = Interior Base Rate as defined in Section 5.5

VI = Value Index for the cutting authority as defined in Section 5.2

MVI = Interior Mean Value Index, as defined in Section 5.3

5.6.2 Prescribed Minimum Stumpage Rate

The Minimum Stumpage Rate is prescribed by the *Minimum Stumpage Rate Regulation* (B.C. Reg. 354/87). The current Minimum Stumpage Rate is \$0.25 per cubic metre.

5.6.3 Reserve Stumpage Rate

For each cutting authority area, except those containing timber licence volume, the Reserve Stumpage Rate is determined by selecting the greater of:

- the indicated stumpage rate, or
- the prescribed minimum stumpage rate.

For each cutting authority area that contains timber licence volume, the Reserve Stumpage Rate is determined by selecting the greater of:

- the indicated stumpage rate adjusted according to Table 5-1 (Section 105 of the *Forest Act*), or
- the prescribed minimum stumpage rate.

Table 5-1 Timber Licence Stumpage Rate Adjustment Schedule

Time Period	Percentage of ^① Stumpage Rate
on and after April 1, 1995 to and including March 31, 1996	60
on and after April 1, 1996 to and including March 31, 1997	67
on and after April 1, 1997 to and including March 31, 1998	73
on and after April 1, 1998 to and including March 31, 1999	80
on and after April 1, 1999 to and including March 31, 2000	87
on and after April 1, 2000 to and including March 31, 2001	93
on and after April 1, 2001	100

^① The percentage of stumpage rate opposite the time period will be applied to appraisals, reappraisals and stumpage adjustments that fall within the time period.

5.6.4 Upset Stumpage Rate

The Upset Stumpage Rate is the total of the Reserve Stumpage Rate plus any silviculture and development levies which may be charged as defined in Section 6.6.

5.6.5 Total Stumpage Rate

The Total Stumpage Rate is the Upset Stumpage Rate plus any Bonus Bid.

Miscellaneous Timber Pricing

Policies

6

6.1 Average Value Indexes by District and Species

A new table of Average Value Indexes by District and Species is prepared at the time of each quarterly stumpage adjustment and becomes an integral part of this manual at that time.

This table may be used by the Forest Officer to determine the Value Index for cutting authorities of less than 2 000 m³, as explained in Section 6.2.

6.2 Cutting Authorities With 5 000 m³ or Less Volume

1. Total Coniferous Volume of less than 2 000 m³
 - a. An indicated stumpage rate may be determined by estimating the species volumes, prorating the appropriate Average Value Indexes by District and Species according to those volumes, and then using the resulting stand value index in the stumpage rate formula as described under Section 5.6. For cutting authorities where the licensee is not required to establish a free growing crop of trees, the Value Indexes must be adjusted by adding a basic silviculture cost estimate. (District Average Value Indexes are based on full appraisals of areas requiring basic silviculture.) The total stumpage rate is fixed for the term. For extensions of the cutting authority see Section 2.4 (4).
 - b. Alternatively, an indicated stumpage rate may be determined through a full appraisal. The stand data may be site-specific (i.e., timber cruised or scaled) or obtained from one or more comparable cutting authorities (e.g., similar stand and terrain characteristics, etc.) The total stumpage rate is adjustable for the term of the cutting authority, except as provided in Section 6.5.

Each full appraisal is made as described in Chapters 3, 4 and 5.

2. Total Coniferous Volume of 2 000 m³ to 5 000 m³ except Right-of-Way cutting authorities (see Section 6.3)

An indicated stumpage rate is determined on the basis of full appraisal data. The data may be site-specific or the data may be obtained from comparable cutting authorities, as determined by the Regional Manager.

Each appraisal is made as described in Chapters 3, 4 and 5.

These cutting authorities are cruised if specified by the Regional Manager in accordance with Section 4.2 of this manual.

The total stumpage rate is adjustable for the term of the cutting authority, except as provided in Section 6.5.

6.3 Right-of-Way Cutting Authorities

A right-of-way cutting authority is defined as any cutting authority issued for the sole purpose of harvesting right-of-way timber, including but not limited to road permits, right-of-way cutting permits, timber sale licences, and licences-to-cut.

Right-of-way cutting authorities are appraised under one of the following scenarios.

1. Total Volume of Less than 2 000 m³

The indicated stumpage rate is determined according to Section 6.2 (1) (District Average Value Index method).

2. Total Volume of 2 000 m³ or Greater

A full appraisal is required. Species distribution, total volume and most phase costs are determined either from site-specific cruise data or from a fully appraised cutting authority of the same inventory type and similar site conditions.

A cost estimate for development is included in the appraisal, and should be borrowed from the representative cutting authority as defined above.

Log haul cycle time may be determined from site specific data or the cycle time from a nearby representative cutting authority as defined above.

The costs of roads constructed under right-of-way cutting authorities are recognized in the appraisal of a tributary cutting authority (i.e., the roads are deemed to be non-existing for the purposes of appraising the tributary cutting authority.)

Basic silviculture estimates are not included in the appraisal of right-of-way cutting authorities.

6.4 Partially Harvested Timber

Where decked timber, or timber which has been felled and bucked, such as on right-of-way, is sold without competition; and where the stumpage value is over \$3,000 or volume exceeds 300 m³, a full cost estimate appraisal is completed upon an "as is, where is" basis.

Phase costs may be based on borrowed data from a representative cutting permit, adjusted for partial phase.

If the timber volume is being sold competitively, the timber may be priced according to the procedures in Section 6.2.

6.5 Small Business Forest Enterprise Program (SBFEP) Sales

For appraisal purposes, the SBFEP includes:

- All timber sale licenses (TSL) issued under the *Forest Act*, Sections 20 and 21, and
- all TSLs issued under the *Forest Act*, Section 23 except 23 (1) (a) and 23 (1) (b).

Fixed/Adjustable Stumpage Rates for SBFEP Cutting Authorities

The adjustable stumpage rate option can be provided to a licensee only if the upset rate has been determined by means of a full appraisal. The data for the full appraisal may be site-specific or may be obtained from a comparable cutting authority. Once a selection has been made, it remains in effect for the term and all extensions. If the District Average Value Index method is used, the upset and hence the total stumpage rate must be fixed for the term of the cutting authority and all extensions. The only exceptions are if a reappraisal is done under Section 2.3 (1) or Section 2.3 (5).

During the term of the cutting authority and all extensions, a licensee's election of fixed or adjustable stumpage rates also precludes any correction to the upset stumpage rate determination that would otherwise be warranted because of an error in the appraisal.

Section 20 Timber Sale Licences (Prior to May 1, 1994)

A licensee who holds a timer sale licence issued under Section 20 of the *Forest Act* that was advertised or awarded prior to May 1, 1994 may elect to have the stumpage rate on that licence fixed at the April 30, 1994 level for the term and all extensions. The election must have been made prior to July, 1, 1994.

Section 21 Timber Sale Licences (Prior to May 1, 1994)

For a timber sale licence issued under Section 21 of the *Forest Act*, the licensee may have elected to have the stumpage rate fixed at the April 30, 1994 level until April 30, 1996 on timber marks issued under that licence if:

- the timber sale licence was advertised or awarded prior to May 1, 1994,
- the timber mark was issued prior to May 1, 1994, and
- the election to fix rates was made before July, 1, 1994.

The above timber marks with rates fixed until April 30, 1996 will be reappraised effective May 1, 1996. All subsequent reappraisals for those timber marks will be as per Section 2.3.

6.6 Levies

1. Basic Silviculture Levy:

A basic silviculture cost estimate is made for every cutting authority that will require basic silviculture, including those with a volume of less than 2 000 m³.

A basic silviculture levy may be added to the Reserve Stumpage Rate. The levy is \$0.00/m³ if no Crown expenditures are anticipated for basic silviculture, or the District Manager may set the levy at \$0.00/m³ if the sale is offered under the *Forest Act*, Section 20, and the District Manager is satisfied that there will be competition for the sale. Otherwise the silviculture levy is equal to the appraisal estimate of basic silviculture costs (trended at the time of the appraisal).

2. Development Levy:

A development cost estimate is made for every cutting authority that requires development.

A development levy may be added to the Reserve Stumpage Rate. The levy is \$0.00/m³ if no Crown expenditures are anticipated for road construction and other services, or the District Manager may set the levy at \$0.00/m³ if the sale is offered under the *Forest Act*, Section 20, and the District Manager is satisfied that there will be competition for the sale. Otherwise, the development levy is equal to the appraisal cost estimate of road construction and other extraordinary services provided by the Crown as approved by the Regional Manager (trended at the time of the appraisal).

The amount of any levy may be re-determined at reappraisal only.

6.7 Miscellaneous Stumpage Rates

For the purpose of determining stumpage rates for certain special forest products, including deciduous species, low grade logs and timber in specified areas listed under this section, the miscellaneous stumpage rates tables are to be used.

6.7.1 Special Forest Products and Other Miscellaneous Rates

Table 6-1 is to be used for determining stumpage rates for the specified products from all sources of Crown timber when scaled.

Table 6-1 Miscellaneous Stumpage Rates*All Forest Regions*

Species	Product	Reserve Stumpage Rate
Cedar	Shakes	\$6.00/m ³
Cedar	Blanks	\$7.20/m ³
Cedar	Fence Posts	\$3.00/m ³
Cedar	Mining Timbers & Fence Rails	\$3.00/m ³
All Species	Firewood	\$0.50/m ³
All Species	Bolts/Blocks	\$5.30/m ³
Yew	All	\$0.25/m ³
All Species	Grades: 3, 4, 5 and 6	\$0.25/m ³
All Deciduous	All (except grades 3, 4, 5 and 6)	\$0.50/m ³
All Species (except Cedar)	Fence Rails, Mining Timbers, Fence Posts	\$1.20/m ³
All Species	Pickets & Palings, Mine Cribbing, Car Stakes, Round Stakes & Sticks, Rails (Split), Lagging (Split), Orchard Props	\$1.20/m ³
All Species	Christmas Tree: under 3m	\$0.20/each
	3-5 m	\$1.00/each
	over 5 m	\$1.50/each
All Species	Logs salvaged below the high water levels of Reservoir Lakes and the Slocan, Kootenay, Mineral Babine and Ootsa Lakes	\$0.25/m ³
All Species	Trees classified as "Dead Potential" on Cruise-based cutting authorities	\$0.25/m ³

Forest District Specific

Description	District	Reserve Stumpage Rate
Gross area cleared for seismic lines, gas or oil well sites and right-of-way to well sites	Cranbrook	\$1,147/ha
	Dawson Creek	\$1,640/ha
	Ft. Nelson	\$1,640/ha
	Ft. St. John	\$1,640/ha

*For pipe line rights-of-way a stumpage rate may be determined by using the above rates for cutting authorities containing less than 1 000 m³ of merchantable volume. For cutting authorities of 1 000 m³ and over see Section 6.2.

6.7.2 Miscellaneous Stumpage Rates for Timber Licences

The stumpage rates in Table 6-2 apply only to timber licence cutting authorities that are not appraised and have a cutting authority term that began before May 1, 1995.

For each species of timber in column 1 of Table 6-2, the stumpage rate immediately opposite that species in columns 2, 3 and 4 respectively, apply to sawlogs scaled in the indicated forest regions on and after April 1, 1997.

Table 6-2 Miscellaneous Stumpage Rates for Timber Licences

Column 1 Species of timber	Forest Region		
	Column 2 Vancouver except the Mid-Coast and Queen Charlotte forest districts (that part west of the Cascades Mountains) \$/cubic metre	Column 3 Prince Rupert and the Mid-Coast and Queen Charlotte forest districts (that part west of the Cascades Mountains) \$/cubic metre	Column 4 All forest regions and those parts of regions east of the Cascade Mountains \$/cubic metre
Fir	44.00	35.10	31.50
Spruce	53.00	44.00	30.80
Balsam	24.70	21.70	27.10
Cedar	22.50	18.70	34.90
Hemlock	24.00	20.00	29.10
Cypress	39.80	32.50	30.80
White pine	24.10	21.70	37.00
Yellow pine	24.10	21.70	28.90
Larch	24.10	21.70	31.50
Lodgepole pine	13.00	11.00	28.40
Other conifers	24.10	21.70	30.80
All non-conifers	1.00	1.00	0.50
All species Grades 3, 4, 5, and 6	N/A	N/A	0.25
All species Firmwood reject	Nil	Nil	Nil
All species Grade Y	0.25	0.25	N/A

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Appendices

Appendix I Equipment and Labour Rates

(Cost Base July 1, 1995)

MACHINE DESCRIPTION	TYPICAL MODEL	\$/HOUR
Bulldozer	Cat D-9N, Flat Allis FD30B	172.00
Bulldozer	Cat D-8K/N, FD20, Komatsu D150A-1	161.75
Bulldozer	Cat D-7H, TD20G, Komatsu D85A-21	132.25
Bulldozer	Cat D-6H, TD15E, Komatsu D65E	113.00
Rock Drill (includes labour)	Compressor: 600 cfm - 750 cfm	165.88
Grader	Cat 14G, Komatsu GD705, 725	98.75
Front End Loader (Gravel)	Cat 970F, Komatsu WA470-1	122.75
Front End Loader (Logs)	Cat 980C, Komatsu WA500-1	131.00
Heel Boom Loader	All Cable	218.59
Heel Boom Loader	All Hydraulic	188.14
Hydraulic Excavator incl. Brush Guard & Thumb	Cat 235C, Hitachi EX400.	206.80
Hydraulic Excavator incl. Brush Guard & Thumb	Cat 235B, Hitachi UH171	170.78
Hydraulic Excavator incl. Brush Guard & Thumb	Cat 229D/L, Hitachi EX300	150.70
Hydraulic Excavator incl. Brush Guard & Thumb	Cat 225D, Hitachi EX270, UH121	138.33
Hydraulic Excavator incl. Brush Guard	JD 490/590/690, Hitachi EX150	93.71
Gradall	31,752 - 34,020 kg	138.00
Logging Truck (Highway)	All Triaxle	87.50
Logging Truck (Off Highway)	All	152.20
Self Loading Log Truck	Highway log truck + 4.5 t deck crane	100.00
Gravel Truck	9.9 m ³ +	72.82
Gravel Truck Articulated (labour included)	20 - 30 tonne: Cat D250, Terex 2366	111.44
Lowbed	5 axle unit: tandem tractor and lowbed	79.00
Lowbed	150 tonne (Same as Off-Hwy Truck)	152.20
Concrete Mix Truck	6 m ³	83.00
Concrete Vibrator (labour not included)	5 m ³	3.96
Concrete Mixer (labour not included)	0.17 m ³	6.25
Crane - Truck Mounted	18 tonne	86.00
Soft Track Skidder	KMC 2100/2400, Cat D5H, 480BT	113.50
Rubber Tired Skidder	Clark F68, Franklin 595	78.25
Vibrator Compactor	Clark 668 + 2.7 - 3.6 t roller	90.15
Tractor and Grid Roller	Clark 668 + grid roller	90.35
Labourer	Includes 40% payroll loading	26.92
Roadman	Includes 40% payroll loading	27.14
Crib/Culvert Maker, Powderman	Includes 40% payroll loading	28.50
Landingman	Includes 40% payroll loading	28.86
Rockdriller & Powderman (for load & blast only)	Includes 40% payroll loading	62.05
Bridgeman	Includes 40% payroll loading	33.53
Powersaw (labour not included)	All	4.50
Faller, including powersaw cost	Includes 40% payroll loading	52.59

NOTES

1995 cost surveys, Province of British Columbia Hydro and Power Authority and B.C. Rail Equipment Rental Rate Guide, (rates based on a 3 year old machine), and IWA Agreement Rates including payroll loading.

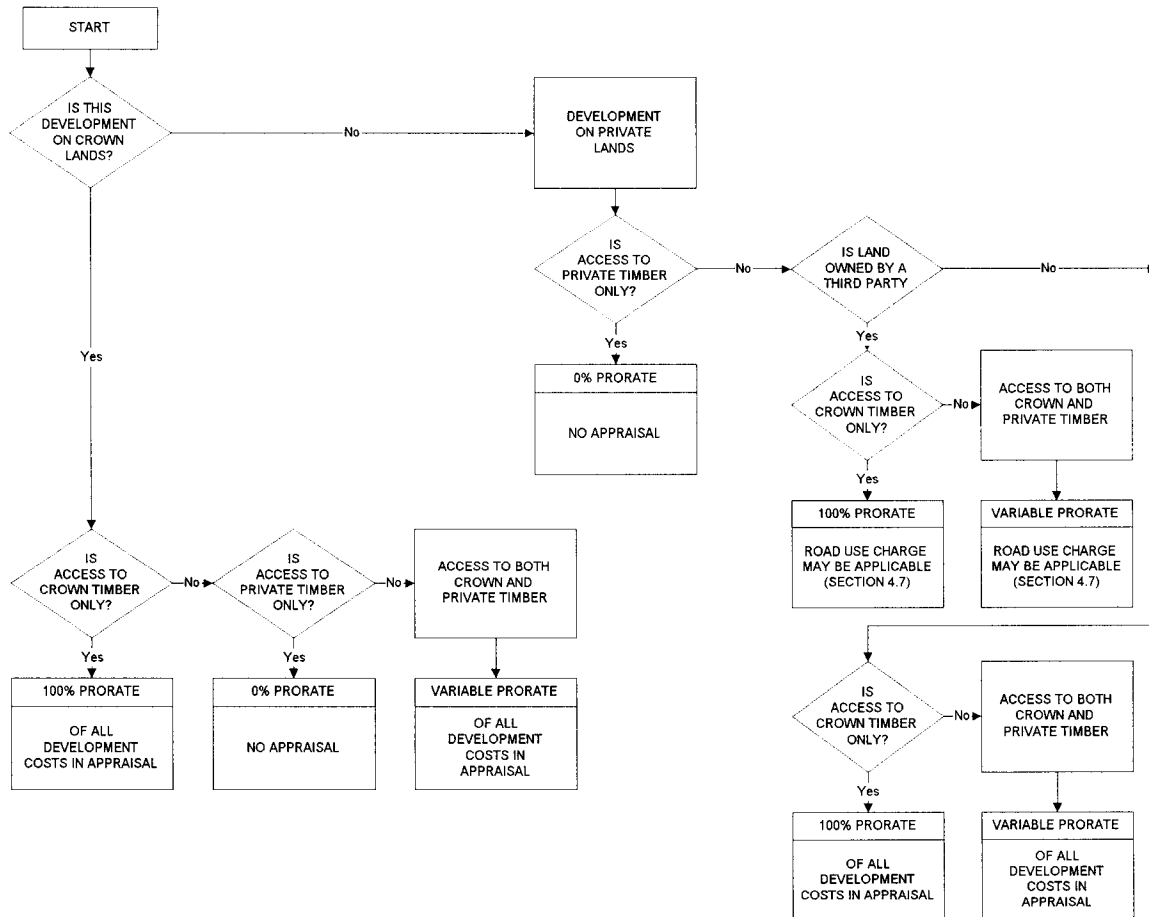
- The above rates will be used for all engineered estimates made under this manual.
- The rates include labour, crew transportation, supervision and camp and cookhouse where applicable. No additions are required.
- Use of equipment rates not listed in this appendix must be approved by the Regional Appraisal Co-ordinator.

Appendix II Lumber Recovery Factors (board feet/cubic metre)

Species

Log Top Diameter (cm)	Cedar	Hemlock, Cypress, White Pine, Dry Belt Fir	All Others
4.5 - 5.49	91	91	91
5.5 - 6.49	97	102	103
6.5 - 7.49	103	111	113
7.5 - 8.49	108	120	123
8.5 - 9.99	115	129	134
10.0 - 14.9	132	151	158
15.0 - 19.9	156	172	185
20.0 - 24.9	177	187	202
25.0 - 29.9	197	199	217
30.0 - 34.9	215	210	226
35.0 - 39.9	227	217	234
40.0 - 44.9	235	222	240
45.0 - 49.9	238	228	246
50.0 - 54.9	239	233	252
55.0 - 59.9	239	237	258
60.0 - 64.9	237	240	263
65.0 - 69.9	233	241	266
70.0 - 74.9	228	240	267
75.0 - 79.9	223	237	265
80.0 - 84.9	217	234	263
85.0 - 89.9	210	231	261
90.0 - 94.9	201	227	259
95.0 - 99.9	193	224	257
100.0 +	184	221	254

Appendix III Development Cost Allocation



Crown Timber = Appraised timber including appraised Timber Licences

Private Timber = Non-appraised timber

Variable Prorate = A tributary-volume type prorate between appraised and non-appraised timber

Appendix IV: Glossary

Blanket salvage permits	Cutting permits issued over a broad area composed of small patches or single trees for salvage logging and created to facilitate the expeditious extraction of damaged timber.
Commercial Thinning	Partial cutting of immature stands where the timber is sold or utilized.
Deactivation	Measures taken to stabilize roads, landings and logging trails during periods of inactivity. Includes the control of drainage, the removal of sidecast and the reestablishment of vegetation for permanent deactivation. Defined in the Forest Practices Code.
Destumping	The uprooting and/or removal of stumps for the purpose of root disease control. Stumps may or may not be piled and burned.
End Haul	The removal of excavated material from a road or landing right of way to a separate area to avoid side-casting on steep and/or sensitive sites.
Pushover Logging	Felling trees by pushing them over to expose the root ball for root disease control purposes. The root ball may or may not be piled and burned.
Remedial Fencing	A fence that is required to remedy or reduce the impact of timber harvesting activities on range management. Remedial fencing will be required most frequently in instances where harvesting and road construction has removed a natural barrier so as to negatively affect livestock distribution.
Salvage Logging	The harvesting of timber damaged by fire, insects or blowdown.
Single tree harvest	Harvesting of individual trees which may or may not be damaged usually requiring construction of access to the tree site. Removal may be by helicopter.
Swinging	Recognized as the secondary method of skidding or yarding which is required under the cutting authority in order for the logs to reach the landing. This may be combined with any primary skidding or yarding method.

Trap Trees

Trees as individuals or in small scattered clumps, standing or down, used to attract and entrap destructive insect pests. May be of two types:

- a) "conventional" are healthy uninfested trees felled prior to the beetle flight period and left to absorb insects, must be removed or treated after catching beetles.
- b) "lethal" used in inaccessible areas. Lethal trees are treated with insecticide.

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Index

A

Access Management, 4-7, 4-23
Adjustable Stumpage Rates, 6-6
Administration and Other Costs, 4-47
Administrative line, 1-3
Amendments, 2-6
AMVs for Licences which Require
Utilization of Small Logs, 3-2
Applicable Licences, 4-2
Appraisal Data Submission (Interior
Appraisal Data Sheet), 2-3
Appraisal LRF, 3-8
Area, 4-4
Average Cost Estimates, 4-6
Average Stumpage Rate, 1-7

B

Barge/Ferry, 4-41
Barge/Ferry Not Used for Truck Haul, 4-41
Basic Silviculture, 4-50
Basic Silviculture Levy, 6-7
Benefits, 4-2, 4-53
Biogeoclimatic Zone, 4-28
Biogeoclimatic Zones, 4-13
Blasting, 4-12
Block Roads, 4-12
Bonus Bid, 1-6, 5-8
Boom, 4-40
Borrow Pit, 4-19
Boulders, 4-12
Breakage, 4-4
Bridge Removal, 4-23
Bridges, 4-23
Brushing, 4-51

Burned Timber, 3-4

C

Calculation of Total Species End Product
Selling Price, 3-8
Camp, 4-40
Canadian Lumber Standard/American
Lumber Standard, 3-2
Cascade Mountains, 1-3
Cattle Guards, 4-21
Charges as a Share of Road Maintenance, 4-46
Charges Other Than for Road Maintenance, 4-46
Chip Value, 3-8
Chip Yield, 3-8
Chip Yield Derivation, 3-7
Chip Yield Factors, 3-7
Chips, 4-53
Clear Cut, 4-31
Clearing, 4-11
Combined product recovery factors, 3-5
Continuous Road Access, 4-48
Corduroy, 4-23
Cost Trend, 4-56
Cost Trend Factors, 4-56
Crib Back Fills, 4-18
Cruise Compilation, 4-4
Cruise Data, 4-4
Cruising Manual, 4-4
Culverts, 4-11, 4-16
Cut/Fill Slope Stabilization, 4-23
Cutting Authority, 1-4
Cutting Authority Document, 4-3
Cycle Time, 4-37

D

Dead Useless Snags, 4-35
Debris Disposal, 4-11
Decay, 4-4
Deciduous, 4-52
Decked Timber, 6-5
Deep Fill, 4-24
Depreciation, 4-2, 4-53

Detailed Engineering Cost Estimates, 4-5, 4-6

Determination of Stud Log Percent, 3-7

Development Costs, 4-5

Development Costs on Private Land, 4-9

Development Levy, 6-7

Dewater, 4-40, 4-53

Dewater and Reload, 4-40

Distance to Support Centre, 4-29

District Average Value Index, 2-10

District Manager, 2-3

Ditch Construction, 4-11

Drain Structure Cost Estimates, 4-6

Drainage Structures, 4-16

Drilling, 4-12

Dump, 4-40

E

Effective Date, 4-56

End Haul Construction, 4-22

Existing Roads and Structures, 4-10

Extended Road Amortization, 4-10

F

Fences, 4-21

Fire Damage, 4-35

Fixed Stumpage Rates, 6-6

Forest Act, 1-2

Forest Development Plan, 4-3

Forest District Specific, 6-10

Forest Service Cruising Manual, 4-35

Forest Service Roads, 4-46

Free-Growing Stocking Standards, 4-50

Fuel, 4-2, 4-53

Full Appraisal, 2-2

G

Geo-tech Fabric, 4-23

Gravel, 4-19

Gross Volume, 4-30

Ground Skidding, 4-27, 4-31

Grubbing, 4-11

Gullies, 4-22

H

Haul Method, 4-38

Helicopter, 4-27

Helicopter Logging, 4-31

Highway Haul, 4-39

Highway Hauling, 4-38

Horse, 4-27

Horse Logging, 4-31

I

Indicated Stumpage Rate, 1-6, 5-7

Installation, 4-18

Insurance, 4-2, 4-53

Interior Appraisal Data Sheet, 4-4

Interior Base Rate, 1-6, 1-8, 5-7

Interior Mean Value Index, 1-8, 5-7

Interior Target Rate, 1-6, 5-5

Interior, Area of Application, 1-3

Isolated Cutting Authorities, 4-30

Isolated Cutting Authority Areas, 4-48

L

Landings, 4-11

Least Total Harvesting Cost Estimate, 4-2

Log Bridges, 4-18

Low Volume Additive, 4-48

LRF update add-ons, 3-5

Lumber, 4-53

Lumber Market Values, 1-7

Lumber Recovery Factors, 3-4

M

Main Service Road, 4-5

Maintenance, 4-2, 4-53

Major Culvert Removal, 4-23

Manufacturing Cost Differential, 3-8

Manufacturing Costs, 1-2

Material Costs, 4-11

Mathematical Error, 2-7

Mean Value Index, 1-6

Minimum Stumpage Rate, 1-6

Minister's Direction, 2-8

Miscellaneous Stumpage Rates, 1-7, 2-10

Moving Assistance, 4-2

N

New Construction, 4-6

New Construction and Upgrading, 4-22

New Cutting Authority, 2-3

Non-Commercial Brush (NCBR), 4-52

Non-Log Bridges, 4-23

O

Off-Highway Haul, 4-39

Off-Highway Hauling, 4-38

Operating Cost, 1-6, 5-3

Operational Roads, 4-12

Order, 2-2

Other Land Use Charges, 4-46

Other Roads, 4-46

Overhead, 4-2

Overhead Cable Logging, 4-27, 4-33

Overland Construction, 4-22

Overtime, 4-2, 4-53

P

Partial Cut, 4-31

Partial Cutting, 4-28

Percent (%) Stud AMV, 3-7

Percent Blowdown, 4-28

Percent Partial Cut, 4-28

Percent Rock, 4-12

Percentage of the Indicated Stumpage Rate,
1-6, 5-8

Permitted Roads, 4-46

Pipe Line Rights-of-Way, 6-10

Pipeline Crossings, 4-21

Point of Appraisal, 4-37

Primary Haul, 4-39

Profit and Risk Margins, 4-2

Pull Back Unstable Sidecast, 4-23

Pushover Logging, 4-3

R

Railway, 4-40

Railway Transportation, 4-41

Random Lumber, 3-2

Random Lumber AMVs, 3-3

Reappraisal, 2-2, 2-3, 2-5

Reappraisal at Anniversary Date, 2-6

Reconstruction, 4-23

Reconstruction and Replacement, 4-7

Recontouring, 4-23

Regional Manager, 2-2

Regional Manager's Rates, 2-10

Regional Revenue Staff, 2-2

Reload, 4-40

Repair, 4-2, 4-53

Request for Approval for a Road Use
Charge, 4-46

Reserve Stumpage Rate, 1-6

Retaining Walls, 4-23

Right-of-Way, 6-3

Right-of-Way Felling, 4-11

Rip Rap, 4-18

Road Type, 4-12

Road Use Charges, 4-46

Roads, 4-5

Rock, 4-12

Rock Drilling, 4-19

Root Disease Control, 4-3

Routine Road Maintenance Cost Estimate, 4-43

S

SBFEP, 6-6

Secondary Haul, 4-40

Section 20 Timber Sale Licences, 6-6

Section 21 Timber Sale Licences, 6-6

Section Length, 4-11

Sector Times, 4-37

Selling Price, 1-6, 5-3

Shipping Differential, 3-8

Side Slopes, 4-22

Silviculture Prescription, 4-3, 4-52

Site Preparation, 4-18

Skidder Swinging, 4-3

Skyline, 4-34

Slope, 4-28

Slough Removal, 4-24

Small Business Forest Enterprise Program, 2-9

Small Log, 3-2

Small Log AMVs, 3-2

Snow Road Reconstruction, 4-21
Snow Roads, 4-12, 4-14
Soil Moisture Regime (SMR), 4-13
Special Structures, 4-23
Stabilizing Material, 4-19
Statistics Canada, 5-5
Statistics Canada Softwood Lumber Index,
1-8
Stripping, 4-11
Stud, 3-2
Stud Lumber, 3-3
Stump Removal, 4-3, 4-11
Stumpage Rate Calculations, 2-13
Subgrade Construction, 4-11
Subgrade Cost Estimate, 4-14
Sudden and Severe Damage, 2-5
Supplies, 4-2, 4-53
Supply and Delivery, 4-18

T

Tabular Cost Estimates, 4-5
Tally Sheets, 4-4
The British Columbia Softwood Lumber
Index, 5-5
Timber Licence, 2-10
Timber Supply Areas, 4-42
Total Coniferous Volume of 2 000 m³ to
5000 m³, 6-3
Total Coniferous Volume of Less than 2000
m³, 6-3
Total Merchantable, 4-4
Total Stumpage Rate, 1-6
Total Volume of 2 000 m³ or Greater, 6-4
Total Volume of Less than 2 000 m³, 6-4
Tow, 4-40
Treatment Regimes, 4-50
Tree Farm Licence, 4-42
Tributary Cutting Authorities, 4-5
Truck Hauling, 4-20
Truck to Rail Transfer, 4-40
Turnout Construction, 4-11

U

Unloading, 4-53
Uphill Side Slope, 4-12
Upset Stumpage Rate, 1-6

V

Value Index, 1-6, 5-2, 5-7
Volume per Hectare, 4-4, 4-28
Volume Per Tree, 4-30
Volume Removal Factor, 4-52

W

Wages, 4-2, 4-53
Waste, 4-4
Weeding, 4-51
Woodlot Licences, 4-42
Woodlots, 2-9

Appraisal Data Sheets are available from the
Regional Appraisal Coordinator

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