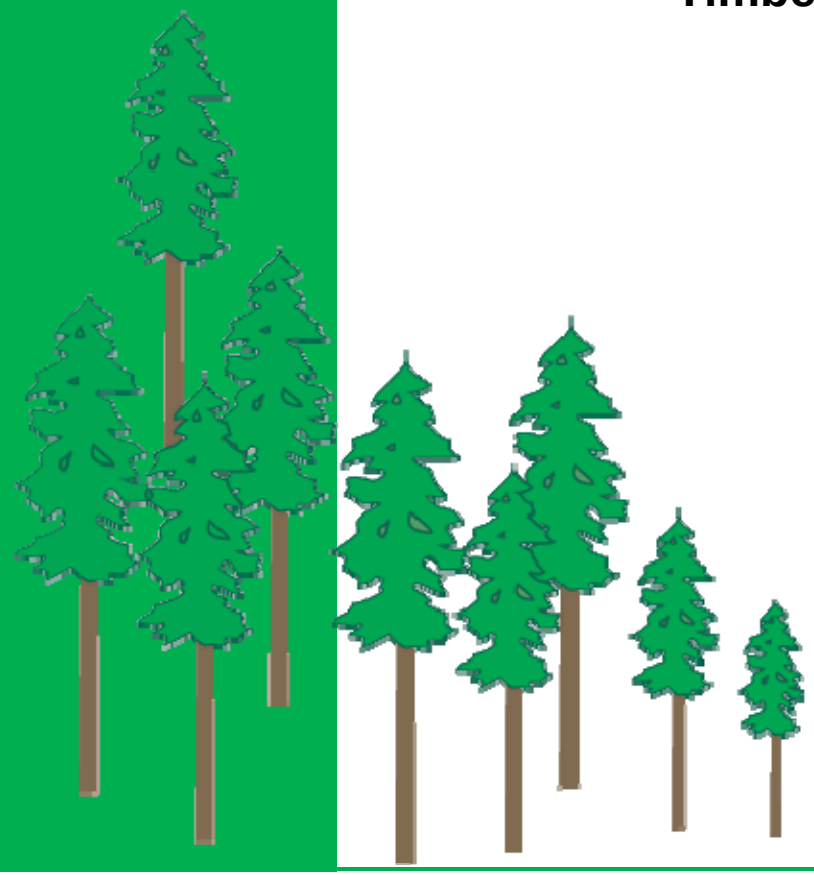
MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS

TIMBER PRICING OPERATIONS

Timber Measurement Information

August 20, 2013



INTRODUCTION

The information in this document is provided as background to promote a better understanding of the volume estimates that can affect the variation between the cruise estimate and the scale + waste (experienced) in a cutting authority. This paper addresses some of the reasons why the cruise net volumes can vary from the scale + waste assessment net volumes.

The information in this report does not provide legal or policy advice.

For more information on the standards and methods used to measure timber for appraisal, clients may wish to reference such documents as the *Cruising Manual*, *Scaling Manual* and the *Provincial Logging Residue and Waste Measurement Procedures Manual.*

TIMBER CRUISE

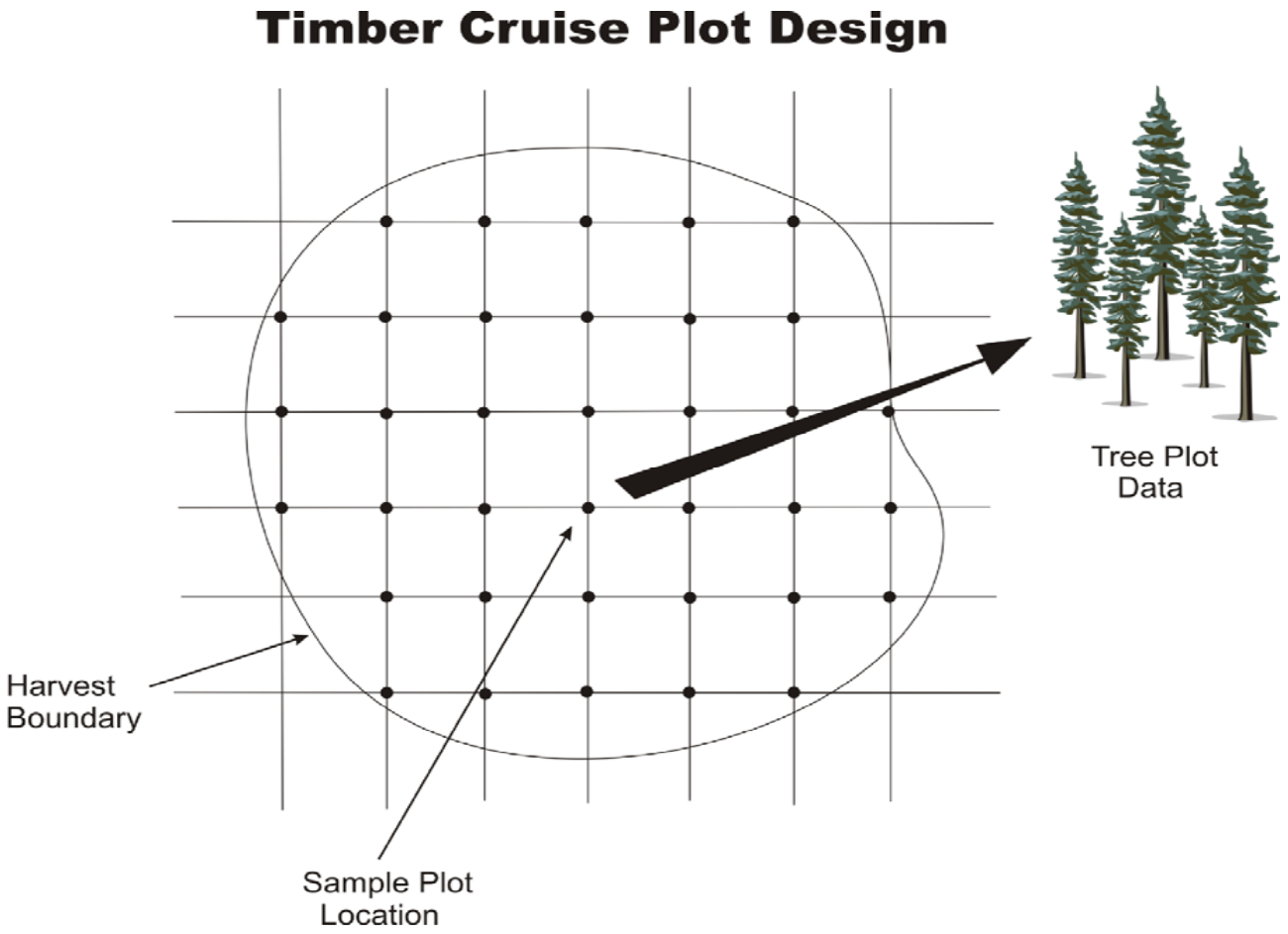
The timber cruise provides an estimate of the net merchantable volume (volume) and quality of the timber in the harvest area. In the Interior, quality is reported on a lumber recovery factor (LRF) basis in board feet per cubic meter (LRF), while the Coast uses statutory log grades. The volume approximates wood that is in live (excluding live useless trees) and dead potential trees that are at least 50% sound wood, inclusive of saw logs, pulp logs (chips) and firm wood rejects with the following general merchantability specifications:

- Maximum stump height: 30 cm

- Minimum diameter at breast height (DBH = 1.3m above high side ground): Coast and Interior = 17.5 cm, except 12.0 cm in immature cut blocks on the Coast and 12.5 cm for Lodgepole pine in the Interior.

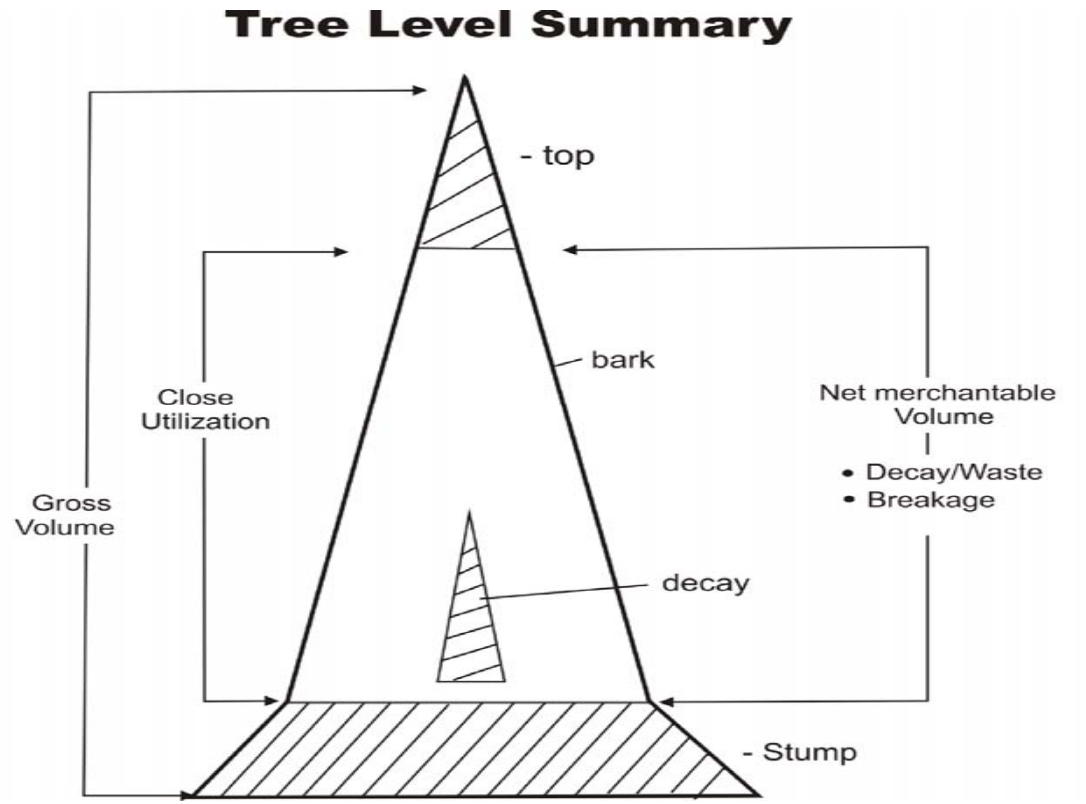
- Minimum log top diameter (inside bark), Coast and Interior: 10.0 cm, except 15.0 cm for mature cut blocks on the Coast and Interior cedar >141 years of age.

The cruise estimates are derived by establishing plots on a random grid throughout the harvest area. Within each plot, a number of trees are carefully measured for such attributes as height, diameter and age; other information such as species and quality indicators are also collected. The *Cruising Manual* specifies cruise design and measurement error standards for the quality of the field information. For example, tree count can vary by 1 tree in 50 measured, tree heights can vary by 5%, and tree species identification can vary by 1 tree in 50 sampled.



The attribute information collected from the trees within the plots is summarized in a timber cruise compilation program. The program estimates the gross volume of the trees in the plots using equations that predict the form or shape of the tree and coastal grade or interior lumber algorithms to estimate the quality. The program also applies factors to reduce the gross volume of the tree to account for losses due to decay, waste, breakage and the top and stump merchantability specifications. This is the estimated net merchantable volume.

Coastal BC cruises also report volumes and grade estimates using the call grade net factor standards; however, this information is not used for appraisal. The information for the trees within the plots is then summarized for the harvest area. The reliability of the summary information is a function of such factors as the number of plots, the variability of the timber and the ability of the volume equations and algorithms to accurately predict the volume and quality of the timber in the total harvest area.



The program generates statistics of the average net volume per hectare for the harvest area and the range or variability of that volume that may be expected from the cruise estimate. The amount of variability around the average volume is expressed as the sampling error. In BC, the common sampling error target for scale based sales is 15.0% at two standard errors, or 19 times out of 20 for all species combined.

This means that the expected volume per hectare, estimated using the information collected in the field, merchantability standards, tree volume equations used within the compiler, should be within 15.0% of the estimated average cruise volume, 19 times out of 20. For Mountain Pine cruise based sales the standard is 12.0% and for general cruise based sales the standard is 8.0%.

The *Cruising Manual* also allows for the sampling error to be waived if a minimum number of plots per hectare and tree count per plot are achieved. In these cases, the sampling error standards may be exceeded. The sampling error for individual species volume per hectare is higher than the sampling error for all species combined. Refer to Appendix I and II for some definitions and practical uses for the interior and coast cruise compilation reports.

The cruise is therefore an estimate of the net merchantable volume and quality of the trees on the harvest area and may not reflect the actual volume or quality of timber harvested.

HARVEST OPERATIONS

Harvesting operations may utilize and process logs to specifications that differ from the merchantability specifications (e.g. different top size, log length, bucking practices, and stump height) which may increase the variation between the predicted net cruise and experienced volume.

For example; changing log top size utilization from a 10.0 cm top to a 12.0 cm top may reduce the net volume by 5%. The magnitude of the volume loss will vary significantly by species, stand type, stand age and other variables.

SCALING

Weight scaling is a sampling method where all of the truck loads of logs are weighed and some of the loads are selected for sampling. The sample loads are piece scaled to determine a volume-to-weight ratio. The ratios derived for the sample loads are multiplied by the weight of all of the truckloads of timber to calculate the volume and grade to bill for each timber mark in the population. The target sampling error for a weight scale population is 1%.

The scaling regulations allow for 3% measurement variation between the original and check scale net volume and value for each sample load.

If all of the timber is scaled then the procedure is known as piece scaling.

Species distribution and log grade can vary by scaling site and over time due to the stratum, weight to volume ratio, number of sample loads and other factors.

WASTE

The *Provincial Logging Residue and Waste Measurement Procedures Manual* uses sampling and reporting methods to measure the logging waste. Statistics are calculated to provide an estimate of the range in the total net merchantable volume that can be expected from the sample plots. The waste survey procedures allow a 24-40% sampling error for dispersed and 52-55% sampling error for accumulations (Table 4-2 to 4-5).

The waste assessment standards allow for a 10 percent measurement error in the net volume estimate.

Waste is measured using timber merchantability specifications in the *Waste Manual*, which are different for the Interior and the Coast. On the Coast, a plot sampling process is commonly used with the precision that is specified in the *Waste Manual*. In the Interior, an ocular estimate method augmented with transect is used.

The waste survey procedures separate waste into avoidable and unavoidable waste. Both types of waste are charged to cut control, but the unavoidable waste is not billed. Waste benchmarks are used to exclude a portion of the avoidable residue and waste volumes from billing. These benchmarks vary between 10 m^3/ha to 35 m^3/ha on the Coast and 4 m^3/ha to 20 m^3/ha in the Interior.

The waste survey fibre measurements do not necessarily coincide with the cruise or scale measurements.

*****Scale-based = the billing is based on the scale and waste volume by species & grade. Lump sum or cruise-based = billing is based on the cruise volumes by species and grade.

SUMMARY

The Ministry uses commonly applied statistically based sampling methods to provide estimates of timber volume and quality information to support stumpage appraisals, billing and general client information.

The timber cruise provides an estimate of trees with an estimated net firm wood volume that is at least 50% sound. This volume is further reduced to account for merchantability and estimates of decay, waste and breakage. On the Coast, the cruise provides an estimate of log grade, while the Interior does not provide an estimate of log grade. The information from the cruise is an estimate and can be impacted by the many factors noted above.

The estimated volumes of timber are derived from field measurements and computer compilation systems; there are no representations or warranties concerning the profitability of timber harvesting operations to be carried out under the Licence.

The scale plus waste volume may be higher or lower than the volume reported for the timber cruise.

Some of the Reasons for Variances in Timber Volume Estimates

1. Tree volume form equations.
2. Decay, waste and breakage loss factors and log grade or lumber algorithms.
3. Sampling intensity and sampling error.
4. Differences between cruise and harvest utilization.
5. Scaling populations, strata and volume to weight ratios.
6. Waste measurements or estimates and sampling error.

APPENDIX I - INTERIOR

This purpose of this document is to describe the key attributes that are found in some of the cruise compilation reports and to enhance the reader's understanding of the reported attributes. Approved compilation programs generate the same information; however, where and how the information is presented may differ. The following descriptions illustrate the reports generated by the CruiseComp program.

1.0 Appraisal Summary Report (ASR)

The appraisal summary report provides most of the cruise attributes that are used to derive the indicated stumpage rate. Some of the attributes are described in this section of the report. An example of the report is shown in figure #1.

1. Report Header Information - The administrative, ownership and utilization specifications for the cutting authority are described in the text box in the example report.
2. Net Area: (All Treatment Units: XXX.X) – This is the total area in hectares for the cutting authority from which timber may be harvested and the area that has been sampled.
3. Net Volume (m^3) – This is the total net merchantable volume in cubic meters for each species that was sampled in the cruise plots. The term 'merchantable' describes the volume between a 30cm stump and a 10 or 15cm top that is reduced to account for decay, waste and breakage. The volumes by species are listed for the live trees, the dead potential trees that are at least 50% firm-wood and the live and dead potential trees combined.
4. Net Volume/ha (m^3) – This is the total net merchantable volume expressed on a per hectare basis.
5. LRF – This is the average cruise lumber recovery factor for each species of timber expressed in board feet per m^3. In calculating the stumpage rate, the cruise LRF is increased by an LRF add-on recognizes the changes in milling efficiencies over time and in different areas of the province.
6. Average slope (%) – This is the average slope in percent for each harvest method and for the total cutting authority area. The slope is an average of the maximum slope readings taken at 15m slope distance in each cruise plot.
7. Net Volume/Tree – This is the net merchantable volume per tree for all trees. The net volume/tree is useful to estimate the felling and log handling costs.
8. All Fire % - This is the percentage of the net merchantable volume that has recent scorching and charring on the bole of the tree and includes all fire damage coded trees. Most of the light and moderate fire damage is superficial scorching of the bark and stem, while heavy damage reduces the lumber recovery.
9. Heavy Fire % - This is the percentage of the net merchantable volume that has recent charring on the bole of the tree. This category describes the proportion of the volume that can be expected to contain significant losses to timber volume and quality.

(10) Down Tree % - This is the percentage of the net merchantable volume that is in trees that are on the ground or standing with breakage in the merchantable portion of the tree.

(11) Dead Useless % - This is the percentage of the net merchantable volume that is in dead standing trees (snags) that are at least 3m tall and dead useless (less than 50% firm wood).

(12) Insect Damage Net Volume (m^3) - This is the net merchantable volume in the total cutting authority that is in trees that are:

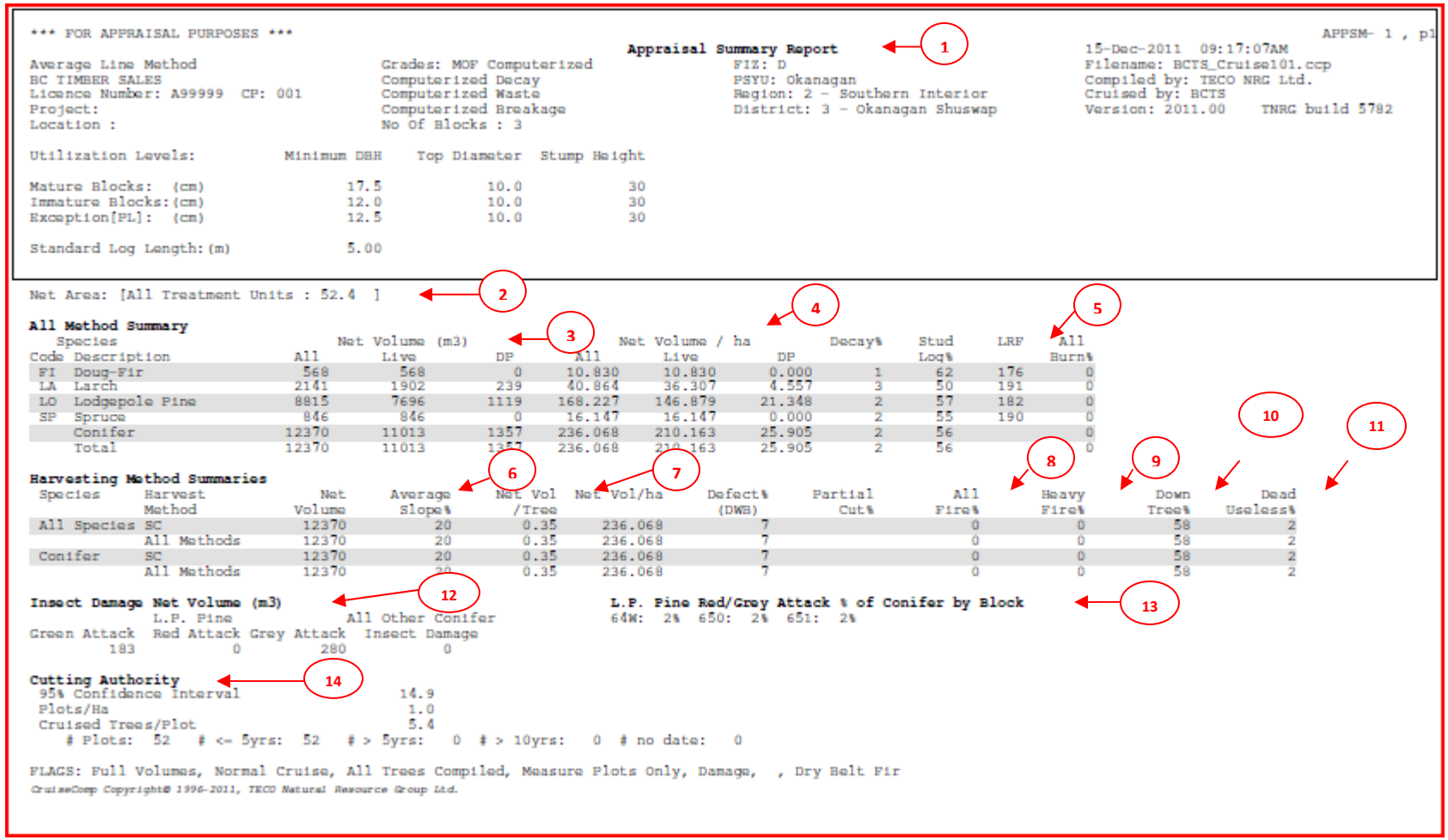
- Lodgepole pine trees and recently killed by the Mountain Pine Beetle (at least 5% green needles) = Green Attack.
- Lodgepole pine trees killed in the previous couple of years by the Mountain Pine Beetle (< 5% green & at least 5% red needles) = Red Attack.
- Lodgepole pine trees killed several years previously by the Mountain Pine Beetle (less than 5% red needles) = Gray Attack.
- All other conifers attacked by insects.

(13) Lodgepole pine Red/Grey Attack - % of Conifer by Block (m^3) - This is the percentage of the coniferous species net merchantable volume in each block that has red or gray attack in lodgepole pine.

(14) Cutting Authority – 95% Confidence Interval - This is the sampling error in percent that can be expected 19 times out of 20 (95%) for the 'All species net merchantable volume per hectare' weighted by timber type volume for all of the cruise plots in the cutting authority. For example:

- The all species volume per hectare for the cruise in Figure #1 is = 236.068 m^3/ha.
- The sampling error is 14.9%.
- The upper limit of the volume per hectare that can be expected 19 times out of 20 is = 236.068 + (236.068 * 14.9%) = 271 m^3/ha.
- The lower limit of the volume per hectare that can be expected 19 times out of 20 is = 236.068 - (236.068 * 14.9%) = 201 m^3/ha.
- The administrative, ownership and some cruise control information for the cutting authority are described in the text box in figure #1.

APPRAISAL SUMMARY REPORT – FIGURE #1



*** FOR APPRAISAL PURPOSES ***

Appraisal Summary Report (1)

APPSM- 1 , p1

Average Line Method
BC TIMBER SALES
Licence Number: A99999 CP: 001
Project:
Location :

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage
No Of Blocks : 3

FIZ: D
PSYU: Okanagan
Region: 2 - Southern Interior
District: 3 - Okanagan Shuswap

15-Dec-2011 09:17:07AM
Filename: BCTS_Cruise101.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Utilization Levels:	Minimum DBH	Top Diameter	Stump Height
Mature Blocks: (cm)	17.5	10.0	30
Immature Blocks: (cm)	12.0	10.0	30
Exception[PL]: (cm)	12.5	10.0	30
Standard Log Length: (m)	5.00		

Net Area: [All Treatment Units : 52.4] (2)

All Method Summary (3) (4) (5)

Species Code	Description	Net Volume (m3) All	Live	DP	Net Volume / ha All	Live	DP	Decay%	Stud Log%	LRF	All Burn%
FI	Doug-Fir	568	568	0	10.830	10.830	0.000	1	62	176	0
LA	Larch	2141	1902	239	40.864	36.307	4.557	3	50	191	0
LO	Lodgepole Pine	8815	7696	1119	168.227	146.879	21.348	2	57	182	0
SP	Spruce	846	846	0	16.147	16.147	0.000	2	55	190	0
	Conifer	12370	11013	1357	236.068	210.163	25.905	2	56		0
	Total	12370	11013	1357	236.068	210.163	25.905	2	56		0

Harvesting Method Summaries (6) (7) (8) (9) (10) (11)

Species	Harvest Method	Net Volume	Average Slope%	Net Vol /Tree	Net Vol/ha	Defect% (DWB)	Partial Cut%	All Fire%	Heavy Fire%	Down Tree%	Dead Useless%
All Species	SC	12370	20	0.35	236.068	7		0	0	58	2
	All Methods	12370	20	0.35	236.068	7		0	0	58	2
Conifer	SC	12370	20	0.35	236.068	7		0	0	58	2
	All Methods	12370	20	0.35	236.068	7		0	0	58	2

Insect Damage Net Volume (m3) (12)

L.P. Pine Green Attack	L.P. Pine Red Attack	All Other Conifer Grey Attack	All Other Conifer Insect Damage
183	0	280	0

L.P. Pine Red/Grey Attack % of Conifer by Block (13)

64W: 2% 650: 2% 651: 2%

Cutting Authority (14)

95% Confidence Interval	14.9
Plots/Ha	1.0
Cruised Trees/Plot	5.4

Plots: 52 # <= 5yrs: 52 # > 5yrs: 0 # > 10yrs: 0 # no date: 0

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage, , Dry Belt Fir

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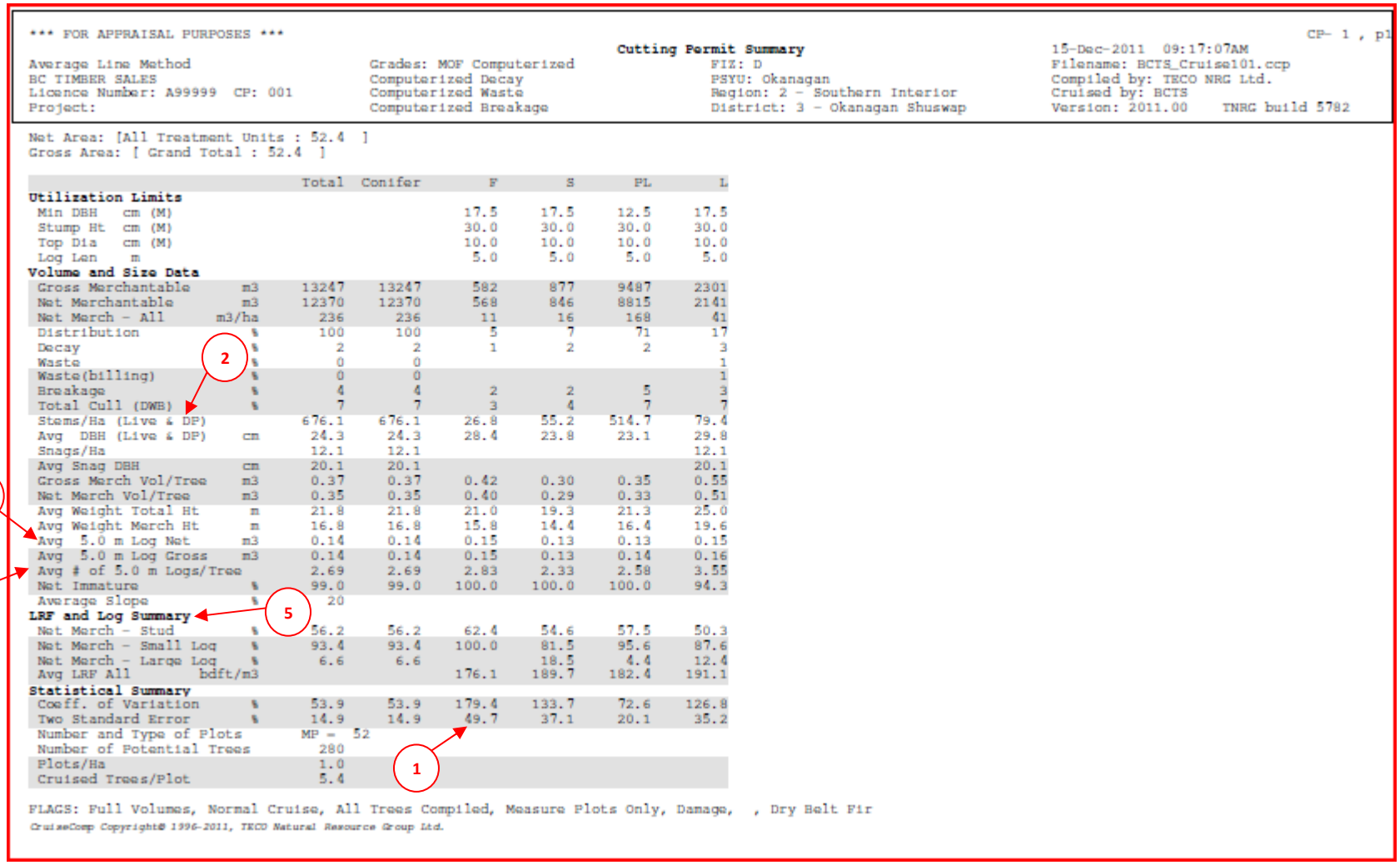
2.0 Cutting Permit Summary Report (all cut-blocks in the cutting authority)

The main attributes found in the Cutting Permit Summary Report are described in this section of the report. An example of the report is shown in figure #2.

The Cutting Permit Summary Report contains some detail that is not found in the Appraisal Summary Report, including species sampling errors, plot frequencies and average tree count information. It is important to emphasize that there can be high sampling error variations for each individual species in a cruise compilation and particularly for minor species components. The following example uses the Cutting Permit Summary report in figure #2:

1. Species – 95% Confidence Interval - This is the sampling error in percent that can be expected 19 times out of 20 (95%) for each species net merchantable volume per hectare weighted by timber type volume for the cruise plots in the cutting authority. For example:
   - The fir net volume per hectare for the cruise in Figure #2 is = 11 m^3/ha.
   - The sampling error (two standard error) is 49.7%.
   - The upper limit of the volume per hectare that can be expected 19 times out of 20 is = 11 + (11 * 49.7%) = 16.5 m^3/ha.
   - The lower limit of the volume per hectare that can be expected 19 times out of 20 is = 11 - (11 * 49.7%) = 5.5 m^3/ha.
2. Stems/Ha (Live & DP) – This is the number of trees per hectare for each species and all species combined in the cutting authority. The number of stems in the cutting authority can be calculated to provide an estimate of the log handling costs. A detailed description of the stems/ha is provided in the Stand Table Report in section 3.0.
3. Interior - Average 5m Log Net (m^3) – This is the average net merchantable volume for 5 meter log lengths that can be expected for each species and all species combined in the cutting authority.
4. Interior – Average# 5m Log/Tree – This is the average number of 5 meter log lengths that can be expected for each species and all species combined in the cutting authority.
5. Interior - LRF and Log Summary (%) – This is an estimate of some common end products for each species and all species combined in the cutting authority. For example:
   - Net Merch – Stud %: This attribute estimates the percentage of 5m logs that will make studs (8 foot 2” by 4”s) and includes logs with top diameters less than 20cm.
   - Net Merch – Small Log %: This attribute estimates the percentage of 5m logs and includes logs with top diameters less than 30cm.
   - Net Merch – Large Log %: This attribute estimates the percentage of 5m logs and includes logs with top diameters 30cm and larger.
   - LRF (fbm/m^3): This is the cruise lumber recovery factor for each species of timber. The LRF describes the number of board feet that can be produced for each cubic metre of timber (fbm/m^3). The appraisal program assigns an LRF add-on to the cruise LRF to recognize the milling efficiencies over time.

CUTTING PERMIT SUMMARY REPORT – FIGURE #2



*** FOR APPRAISAL PURPOSES ***

CP- 1 , p1

Cutting Permit Summary

Average Line Method
BC TIMBER SALES
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: D
PSYU: Okanagan
Region: 2 - Southern Interior
District: 3 - Okanagan Shuswap

15-Dec-2011 09:17:07AM
Filename: BCTS_Cruise101.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Net Area: [All Treatment Units : 52.4]
Gross Area: [Grand Total : 52.4]

		Total	Conifer	F	S	PL	L
Utilization Limits							
Min DBH cm (M)				17.5	17.5	12.5	17.5
Stump Ht cm (M)				30.0	30.0	30.0	30.0
Top Dia cm (M)				10.0	10.0	10.0	10.0
Log Len m				5.0	5.0	5.0	5.0
Volume and Size Data							
Gross Merchantable	m3	13247	13247	582	877	9487	2301
Net Merchantable	m3	12370	12370	568	846	8815	2141
Net Merch - All	m3/ha	236	236	11	16	168	41
Distribution	%	100	100	5	7	71	17
Decay	%	2	2	1	2	2	3
Waste	%	0	0				1
Waste(billing)	%	0	0				1
Breakage	%	4	4	2	2	5	3
Total Cull (DWB)	%	7	7	3	4	7	7
Stems/Ha (Live & DP)		676.1	676.1	26.8	55.2	514.7	79.4
Avg DBH (Live & DP)	cm	24.3	24.3	28.4	23.8	23.1	29.8
Snags/Ha		12.1	12.1				12.1
Avg Snag DBH	cm	20.1	20.1				20.1
Gross Merch Vol/Tree	m3	0.37	0.37	0.42	0.30	0.35	0.55
Net Merch Vol/Tree	m3	0.35	0.35	0.40	0.29	0.33	0.51
Avg Weight Total Ht	m	21.8	21.8	21.0	19.3	21.3	25.0
Avg Weight Merch Ht	m	16.8	16.8	15.8	14.4	16.4	19.6
Avg 5.0 m Log Net	m3	0.14	0.14	0.15	0.13	0.13	0.15
Avg 5.0 m Log Gross	m3	0.14	0.14	0.15	0.13	0.14	0.16
Avg # of 5.0 m Logs/Tree		2.69	2.69	2.83	2.33	2.58	3.55
Net Immature	%	99.0	99.0	100.0	100.0	100.0	94.3
Average Slope	%	20					
LRF and Log Summary							
Net Merch - Stud	%	56.2	56.2	62.4	54.6	57.5	50.3
Net Merch - Small Log	%	93.4	93.4	100.0	81.5	95.6	87.6
Net Merch - Large Log	%	6.6	6.6		18.5	4.4	12.4
Avg LRF All	bdft/m3			176.1	189.7	182.4	191.1
Statistical Summary							
Coeff. of Variation	%	53.9	53.9	179.4	133.7	72.6	126.8
Two Standard Error	%	14.9	14.9	49.7	37.1	20.1	35.2
Number and Type of Plots		MP - 52					
Number of Potential Trees		280					
Plots/Ha		1.0					
Cruised Trees/Plot		5.4					

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage, , Dry Belt Fir

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1
2
3
4
5

3.0 Stand Table Report

Some of the main attributes found in the Stand Table Report are described in this section of the report. An example of the report is shown in figure #3.

The Stand Table reports the average number of trees per hectare for each species in 5cm diameter at breast height (DBH) classes and the tables are segregated by treatment unit for each timber type, cut block and for the whole cutting authority. The tables are often used to model partial harvest prescriptions and report the number of trees per hectare that will be harvested. The number of stems/ha that will remain standing after harvest are reported in the Leave Tree Report. Partial harvest prescription and percent reduction input scenarios are available at the following web site:

http://www.for.gov.bc.ca/hva/manuals/percentreductionscenarios.htm

1. Species Codes - each species, total (all species combined), DU (dead useless snags), DP (dead potential) and LU (live useless) number of trees/ha are reported separately.
2. DBH Classes - the mid-point of the 5cm diameter classes of the average number of trees/ha of trees in the cruise plots. For example, the 50 cm DBH class includes trees that have a DBH that are from 47.5 to 52.4 cm.
3. Stems/ha – refer to figure #3 for an example of the stems/ha. The 35cm class shows Douglas fir has 3.7 stems per hectare in the cutting authority. The cutting authority is 52.4 hectares, so we could expect 194 fir trees in the 35cm class in the cutting authority.
4. Average DBH at 5 Levels - the average DBH is reported for trees that are above 5 different DBH limits.

STAND TABLE REPORT – FIGURE #3

*** FOR APPRAISAL PURPOSES ***

Cutting Permit Stand Table (stems/ha)

CSTND- 1 , p1

Average Line Method
BC TIMBER SALES
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: D
PSYU: Okanagan
Region: 2 - Southern Interior
District: 3 - Okanagan Shuswap

15-Dec-2011 09:17:07AM
Filename: BCTS_Cruise101.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

[All Treatment Units : 52.4]

	F	S	PL	L	Total	DF	DU	LU
Utilization Limits								
Min DBH cm (M)	17.5	17.5	12.5	17.5	17.5	17.5	17.5	17.5
Stump Ht cm (M)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Top Dia cm (M)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Log Len m	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
DBH Class								
5								
10								
15			167.2		167.2			
20		46.1	154.4	14.2	214.7	10.9	12.1	
25	20.0		55.9	15.5	91.4	8.4		
30			38.8	26.5	65.3	29.8		
35	3.7	4.2	40.1		48.0	4.2		
40	3.0		12.6	3.1	18.7	6.5		
45		4.9		2.2	7.1			
50				4.0	4.0			
55								
60								
65								
70								
75								
80								
85								
90								
95								
100								
105								
110								
115								
120								
125								
130								
135								
140								
145								
150								
175								
200								
225								
250								
275								
Total	26.8	55.2	468.9	65.5	616.4			
Dead P			45.8	14.0		59.7		
Dead U				12.1			12.1	
Live U								
Average DBH(cm) at 5 Levels								
12.5 +	28.4	23.8	22.2	30.5	23.7	29.5	20.1	
17.5 +	28.4	23.8	25.6	30.5	26.3	29.5	20.1	
22.5 +	28.4	40.2	30.4	32.4	31.1	31.0		
27.5 +	38.1	40.2	33.2	35.1	34.4	32.3		
32.5 +	38.1	40.2	35.3	46.0	37.6	37.1		

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage, , Dry Belt Fir

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4.0 Stock Table Report

Some of the main attributes found in the Stock Table Report are described in this section of the report. An example of the report is shown in figure #4.

(1) The Stock Table reports the average volume per hectare for each species in 5cm diameter at breast height (DBH) classes and the tables are segregated by treatment unit for each timber type, cut block and for the whole cutting authority. The tables are often used to model partial harvest prescriptions and report the net merchantable volume per hectare that will be harvested. The number of stems/ha that will remain standing after harvest are reported in the Leave Tree Report.

STOCK TABLE REPORT – FIGURE #4

*** FOR APPRAISAL PURPOSES ***

Block Stock Table (m3/ha)

BSTCK- 1 , p1

Average Line Method
BC TIMBER SALES
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: D
PSYU: Okanagan
Region: 2 - Southern Interior
District: 3 - Okanagan Shuswap

15-Dec-2011 09:17:07AM
Filename: BCTS_Cruise101.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Block : (M) - 64W:, Plots in Block: 19, TUs: [All Treatment Units : 24.3]

	F	S	PL	L	Total	DP	DU	LU
Utilization Limits								
Min DBH cm (M)	17.5	17.5	12.5	17.5	17.5	17.5	17.5	17.5
Stump Ht cm (M)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Top Dia cm (M)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Log Len m	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
DBH Class								
5								
10								
15			14.3		14.3			
20		6.8	35.5	3.3	45.6	2.2		
25	5.4		24.8	5.8	36.0	2.6		
30			25.3	15.4	40.7	13.0		
35	2.8	3.4	32.9		39.1	2.7		
40	2.6		13.9	2.8	19.4	5.4		
45		6.0		3.2	9.2			
50				5.8	5.8			
55								
60								
65								
70								
75								
80								
85								
90								
95								
100								
105								
110								
115								
120								
125								
130								
135								
140								
145								
150								
175								
200								
225								
250								
275								
Total	10.8	16.1	146.8	36.3	210.1			
Dead P			21.3	4.6		25.9		
			Total Volumes for 7 Levels					
17.5 +	10.8	16.1	132.5	36.3	195.8	25.9		
22.5 +	10.8	9.4	97.0	33.1	150.2	23.7		
27.5 +	5.4	9.4	72.2	27.3	114.2	21.1		
32.5 +	5.4	9.4	46.9	11.9	73.5	8.0		
37.5 +	2.6	6.0	13.9	11.9	34.5	5.4		
42.5 +		6.0		9.0	15.0			
47.5 +				5.8	5.8			

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage, , Dry Belt Fir

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5.0 Extended Stand & Stock Table Report

The Extended Stand & Stock Table Report attributes are described in this section of the report. An example of the report is shown in figure #5.

(1) and (2) The Extended Stand & Stock Report indicates the average volume per tree and stems per hectare for each species in 5cm diameter at breast height (DBH) classes for the various tree classes and risk groups. The tables are segregated by treatment unit for each timber type, cut block and for the whole cutting authority. The tables are often used to model partial harvest prescriptions and report the net merchantable volume per hectare that will be harvested.

EXTENDED STAND & STOCK TABLE REPORT – FIGURE #5

*** FOR APPRAISAL PURPOSES ***

XTS&S- 1 , p1

Extended Type Stand & Stock Table

Average Line Method	Grades: MOF Computerized	FIZ: D	15-Dec-2011 09:17:07AM
BC TIMBER SALES	Computerized Decay	PSYU: Okanagan	Filename: BCTS_Cruise101.ccp
Licence Number: A99999 CP: 001	Computerized Waste	Region: 2 - Southern Interior	Compiled by: TECO NRG Ltd.
Project:	Computerized Breakage	District: 3 - Okanagan Shuswap	Cruised by: BCTS
			Version: 2011.00 TNRG build 5782

Type : 1 (M) PlLw(SxBl) [Species:Doug-Fir][A : 8.1]

	AVERAGE			LIVING TREES							
DBH (cm)	Height (m)	Gross Volume Per Tree (m3)	Net Volume Per Tree (m3)	Risk Group 1 (stems/ha)	Risk Group 2 (stems/ha)	Risk Group 3 (stems/ha)	Dead Potential (stems/ha)	Total (stems/ha)	Live Veterans (stems/ha)	Dead Useless (stems/ha)	Live Useless (stems/ha)
5											
10											
15											
20											
25	19.2	0.275	0.269	20.03				20.03			
30											
35	23.4	0.774	0.751	3.74				3.74			
40	22.3	0.905	0.877	3.00				3.00			
45											
50											
55											
60											
65											
70											
75											
80											
85											
90											
95											
100											
105											
110											
115											
120											
125											
130											
135											
140											
145											
150											
175											
200											
225											
250											
275											
Total of Averages				26.77				26.77			
Percent by Tree Class				100.00				100.00			

Average DBH(cm) at 5 Levels

Trees 12.5 +	28.37		28.37
Trees 17.5 +	28.37		28.37
Trees 22.5 +	28.37		28.37
Trees 27.5 +	38.13		38.13
Trees 32.5 +	38.13		38.13

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage, , Dry Belt Fir

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6.0 Damage Summary Reports

(1) The Damage Summary Report attributes are described in this report. An example of the blow-down damage report is shown in figure #6.

(2) The damage types are listed in Table #1. The reports are summarized for each species and damage type for the cutting permit, block and timber type. The damage codes are reported in each of the damage categories as follows:

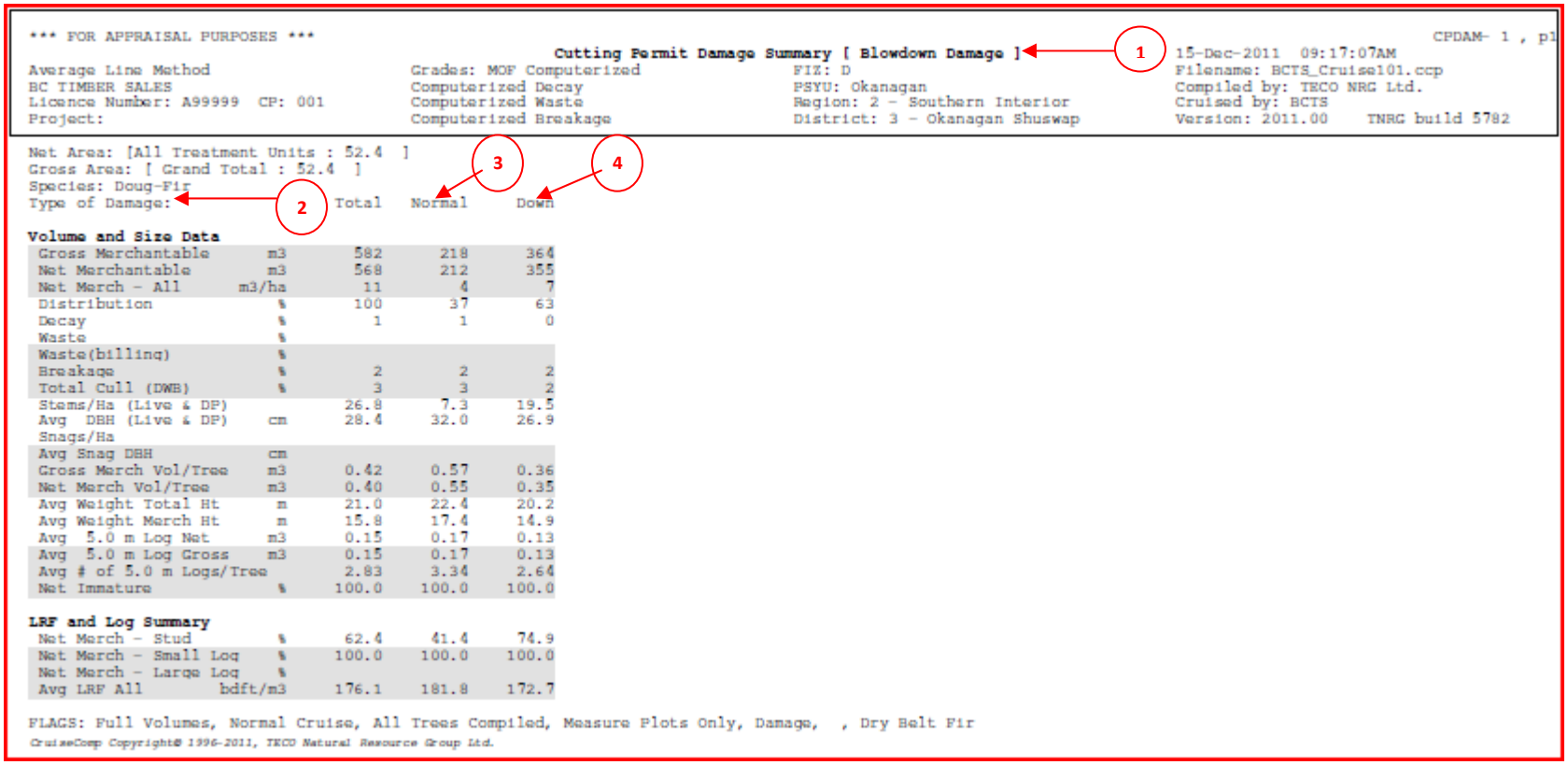
TABLE #1

DAMAGE REPORTS					
Damage Type	**Category**				
Blowdown	Total	(3) Normal	(4) Down	Shatter	N/A
Fire	Total	Normal	Light	Moderate	Heavy
Insect (Pine/Bal)	Total	Normal	Green	Red	Grey
Insect (Fir/Sp)	Total	Normal	Green Live	Green Dead	Grey Dead
Blister Rust (Pw)	Total	Normal	Blister	N/A	N/A
Root Rot	Total	Normal	Light	Moderate	Heavy
Defoliator	Total	Normal	Dry	Green	N/A

The root rot switch must be turned on in the 'Compilation Standard Screen' in Cruise Comp to generate the root rot summary reports by block and timber type.

Clients should be aware that the cutting authority may have been cruised several years prior to the date when the timber sale was advertised unless the timber sale is in mountain pine beetle stands and could have updated insect damage information. The client should field review the timber sale to estimate any additional deterioration that may have occurred after the timber cruise.

DAMAGE SUMMARY REPORTS (BLOWDOWN) – FIGURE #6



```
*** FOR APPRAISAL PURPOSES ***                                                                                  CPDAM- 1 , p1
                                                  Cutting Permit Damage Summary [ Blowdown Damage ]   1   15-Dec-2011  09:17:07AM
Average Line Method                      Grades: MOF Computerized                FIZ: D                          Filename: BCTS_Cruise101.ccp
BC TIMBER SALES                          Computerized Decay                      PSYU: Okanagan                  Compiled by: TECO NRG Ltd.
Licence Number: A99999  CP: 001          Computerized Waste                      Region: 2 - Southern Interior   Cruised by: BCTS
Project:                                 Computerized Breakage                   District: 3 - Okanagan Shuswap  Version: 2011.00    TNRG build 5782

Net Area: [All Treatment Units : 52.4  ]
Gross Area: [ Grand Total : 52.4  ]
Species: Doug-Fir
Type of Damage:                  2   Total   Normal    Down
                                                 3        4

Volume and Size Data
 Gross Merchantable       m3       582      218      364
 Net Merchantable         m3       568      212      355
 Net Merch - All       m3/ha        11        4        7
 Distribution              %       100       37       63
 Decay                     %         1        1        0
 Waste                     %
 Waste(billing)            %
 Breakage                  %         2        2        2
 Total Cull (DWB)          %         3        3        2
 Stems/Ha (Live & DP)             26.8      7.3     19.5
 Avg  DBH (Live & DP)     cm      28.4     32.0     26.9
 Snags/Ha
 Avg Snag DBH             cm
 Gross Merch Vol/Tree     m3      0.42     0.57     0.36
 Net Merch Vol/Tree       m3      0.40     0.55     0.35
 Avg Weight Total Ht       m      21.0     22.4     20.2
 Avg Weight Merch Ht       m      15.8     17.4     14.9
 Avg  5.0 m Log Net       m3      0.15     0.17     0.13
 Avg  5.0 m Log Gross     m3      0.15     0.17     0.13
 Avg # of 5.0 m Logs/Tree         2.83     3.34     2.64
 Net Immature              %     100.0    100.0    100.0

LRF and Log Summary
 Net Merch - Stud          %      62.4     41.4     74.9
 Net Merch - Small Log     %     100.0    100.0    100.0
 Net Merch - Large Log     %
 Avg LRF All          bdft/m3     176.1    181.8    172.7

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,  , Dry Belt Fir
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```

7.0 Lumber Recovery Reports

The cruise Lumber Recovery Report attributes are described in this report. An example of the report is shown in figure #7.

The reports are summarized for each species by risk group for the cutting permit, block and timber type. The cruise lumber recovery factors are expressed in board feet/m^3 and the cruise species LRFs receive an appraisal LRF add-on depending on the timber pricing zone where the cutting authority is located.

The appraisal add-ons are used to update the cruise LRFs to recognize the current milling efficiencies. Any modelling of lumber production should include the appraisal LRF add-ons for each species by timber pricing zone.

LUMBER RECOVERY REPORT – FIGURE #7

*** FOR APPRAISAL PURPOSES ***

CP Volume And Lumber Recovery Information

CLRF- 1 , p1

Average Line Method	Grades: MOF Computerized	FIZ: D	15-Dec-2011 09:17:07AM
BC TIMBER SALES	Computerized Decay	PSYU: Okanagan	Filename: BCTS_Cruise101.ccp
Licence Number: A99999 CP: 001	Computerized Waste	Region: 2 - Southern Interior	Compiled by: TECO NRG Ltd.
Project:	Computerized Breakage	District: 3 - Okanagan Shuswap	Cruised by: BCTS
			Version: 2011.00 TNRG build 5782

Doug-Fir [Interior Dry Belt Fir]

Log Top Dia(cm)	LRF	RISK GROUP #1 Gross Merch	Decay %	Net Merch	FBM	RISK GROUP #2 Gross Merch	Decay %	Net Merch	FBM	RISK GROUP #3 Gross Merch	Decay %	Net Merch	FBM
0.1 - 4.4	0												
4.5 - 5.4	91												
5.5 - 6.4	102												
6.5 - 7.4	111												
7.5 - 8.4	120												
8.5 - 9.9	129												
10.0 - 14.9	151	104	0.2	101	15281								
15.0 - 19.9	172	259	0.2	253	43435								
20.0 - 24.9	187	91	1.0	88	16361								
25.0 - 29.9	199	129	1.0	126	24850								
30.0 - 34.9	210												
35.0 - 39.9	217												
40.0 - 44.9	222												
45.0 - 49.9	228												
50.0 - 54.9	233												
55.0 - 59.9	237												
60.0 - 64.9	240												
65.0 - 69.9	241												
70.0 - 74.9	240												
75.0 - 79.9	237												
80.0 - 84.9	234												
85.0 - 89.9	231												
90.0 - 94.9	227												
95.0 - 99.9	224												
100.0+	221												
All Logs		582	0.5	568	99926								

LRF and Log Summary

Risk Groups		1	2	3	1+2	2+3	1+2+3
Average LRF		176			176		176
Decay	%	0.5			0.5		
Stud Log Net Merch	%	62.4			62.4		
Small Log Net Merch	%	100.0			100.0		
Large Log Net Merch	%						

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage, , Dry Belt Fir

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8.0 Practical Uses for the Reports

The examples in this report demonstrate some practical uses for some of the attributes in the cruise compilation reports.

Example #1

A licensee wants to estimate the volumes that may be produced for several sorts. The preferred specifications for the sorts are as follows:

a. Small Sawlogs – Coniferous logs with top diameters less than 30cm. Refer to the Cutting Permit Summary (figure 2):

- 93.4% * 12370 m^3 = **11554 m^3**

b. Large Sawlogs – Coniferous logs with top diameters at least 30cm and do not qualify as fir peeler. Refer to the Cutting Permit Summary:

- 6.6% * 12370 m^3 – (c) = 816 – 285 = **531 m^3**.

c. Fir Poles – Douglas fir volume from live trees that are risk group #1 (no pathological indicators) and have a diameter at breast height (DBH) of at least 30cm.

- Refer to the Extended Stand & Stock Table Report: 4 timber types:

Type 1 = (0.751m^3/tree * 3.74 stems/ha) + (0.877m^3/tree * 3.00 stems/ha) * 8.1 ha = **44.0 m^3**

Type 2 = (0.751m^3/tree * 3.74 stems/ha) + (0.877m^3/tree * 3.00 stems/ha) * 20.7 ha = **112.6 m^3**

Type 3 = (0.751m^3/tree * 3.74 stems/ha) + (0.877m^3/tree * 3.00 stems/ha) * 3.7 ha = **20.1 m^3**

Type 4 = (0.751m^3/tree * 3.74 stems/ha) + (0.877m^3/tree * 3.00 stems/ha) * 19.9 ha = **108.2 m^3**

Total = **285 m^3**

Example #2

A licensee wants to estimate the number of highway truck loads of logs that they can expect to load out from the timber sale and how many logs that they will average per load. Assume that the trucks average 40 m^3 per load and 15 m long logs.

a. Number of truckloads – Refer to the 'Total Net Volume' on the *Cutting Permit (figure 2) or Appraisal Summary Reports (figure 1)*:

- 12370 m^3 / 40 m^3 per load = **309 loads.**

b. Number of logs per load – Refer to the 'Average Weighted Merch Height' and the 'Net Merch Vol/Tree' on the *Cutting Permit Summary Report*:

- 40 m^3 per load/ 0.35 m^3 per tree = 114 trees per load.
- 114 trees per load * 16.8 m merch height/15 m logs = **128 logs per load.**

Example #3

A licensee has finished logging their timber sale and they question why the 100% stick scale plus waste assessment for the Douglas fir component is nearly 1.5 times the fir cruise volume.

Refer to the two standard error (%) for the Douglas fir component in the *Cutting Permit Summary*:

- 49.7% * 11 m^3 /ha * 52.4 ha = 286 m^3.
- 568 m^3 + 286m^3 = **854 m^3** is 1.5 times the cruise volume estimate.

It is important to note that the minor species net volumes can have high standard errors because the cruise design standards apply to the all species total net merchantable volume before any percent reductions are applied to the cruise compilation. If fixed grid intervals and minimum tree counts are used for the cruise design in lieu of the minimum sampling error standards, then the standard errors may be even higher for each species and the whole cutting authority.

Example #4

A licensee wants to estimate the number of board feet that they can produce from the SPF profile on their timber sale. The licensee is confident that only the live trees in risk group 1 are of sufficient quality to produce # 2 or better lumber grades. The timber sale is located in the Headwaters forest district, which is in Zone 7 with the following appraisal LRF add-ons in Table 3-1 of the *Interior Appraisal Manual*:

Spruce = 112 fbm/m^3

Fir = 75 fbm/m^3

Lodgepole Pine = 88 fbm/m^3

Larch = 75 fbm/m^3

TABLE #2

	SPF LRF Summary – Risk Group 1				
Species	**A - Cruise FBM**	**B - Cruise Net Merch Vol**	**C - Appraisal LRF Add - On**	**B X C = D Add-On FBM**	**A + D = Total FBM**
Spruce	160489	846	112	94752	255241
Fir (figure #7)	99926	568	75	42600	142526
Lodgepole Pine	1631289	8815	88	775720	2407009
Larch	409103	2141	75	160575	569678
				Total FBM	***3374454**

***3374454** fbm = **3374 MBF** (thousand board feet)

Example #5

A licensee wants to estimate the pulp volumes from their timber sale. The preferred specifications for the sorts are as follows:

a. Pulp Logs – Grey attack and red attack MPB Pl trees. Refer to the Interior Appraisal Summary Report (figure 1) and read the grey and red attack volumes from the report:

- 0 m^3 (red) + 280 m^3 (grey) = 280m^3

b. Dead Potential Coniferous Logs (minus Pl DP = grey trees). Refer to the Interior Appraisal Summary Report and read the dead potential volume from the report:

- 1119m^3 - 280 m^3 (deduct grey Pl only because red attack is from the live tree classes) = 839 m^3

c. Total Pl Pulp as percentage of the coniferous volume:

- 1119 m^3/12370 m^3 = 9% of the coniferous volume on the timber sale.

APPENDIX II - COAST

This purpose of this document is to describe the key attributes that are found in some of the cruise compilation reports and to enhance the reader's understanding of the reported attributes.

1.0 Appraisal Summary Report (ASR)

The appraisal summary report provides most of the cruise attributes that are used to derive the indicated stumpage rate. Some of the attributes are described in this section of the report. An example of the report is shown in figure #1.

1. The report header reads; '***For Appraisal Purposes***'. This indicates that the cruise compilation is suitable for use in a stumpage appraisal. If the cruise is compiled using Call Grading & Net Factoring (CGNF) data then the header will read; '***For MPS Purposes***'.

   The header also reads; '*Grades: MOF Computerized*'. This indicates that the cruise is compiled using the loss factor deductions for decay, waste and breakage and the log grade algorithms to determine the statutory log grade percentages. If the cruise is compiled using CGNF data then the header will read; '***Cruise Called Alpha***' and '*Estimated decay*', '*Estimated waste*' and '*CGNF Breakage Table*'.

   Report Header Information: The administrative, ownership and utilization specifications for the cutting authority are described in the text box in the example report.

2. Net Area: (All Treatment Units: XXX.X): This is the total area in hectares for the cutting authority from which timber may be harvested and sampled.

3. Net Volume (m^3): This is the total net merchantable volume expressed on per hectare basis.

4. Net Volume/ha (m^3): This is the average net merchantable volume in cubic metres per hectare for each species that was sampled in the cruise. The volumes by species are listed for live trees, the dead potential trees and then all trees combined.

5. Grades: The statutory log grades are reported for each species of timber. The cruise grades are used in the calculation of the stumpage rate for BCTS timber sales. Some major licensee cutting authorities use historic scale grades for their appraisals.

6. Average slope (%): This is the average slope in percent for each harvest method and for the total cutting authority area. The slope is an average of the maximum slope readings taken at 15m slope distance in each cruise plot.

7. Heavy Fire %: This is the percentage of the net merchantable volume that has recent charring on the bole of the tree. This category describes the proportion of the volume that can be expected to contain significant losses to timber volume and quality.

8 Down Tree %: This is the percentage of the net merchantable volume that is in trees that are on the ground or standing with breakage in the merchantable portion of the tree.

9 Cutting Authority

10 95% Confidence Interval: This is the sampling error in percent that can be expected 19 times out of 20 (95%) for the all species net merchantable volume per hectare weighted by timber type volume for all of the cruise plots in the cutting authority. For example:

- The all species volume per hectare for the cruise in Figure #1 is = 816.929 m^3/ha.
- The sampling error is 10.2 %.
- The upper limit of the volume per hectare that can be expected 19 times out of 20 is = 816.929 + (816.929 * 10.2 %) = 900m^3/ha.
- The lower limit of the volume per hectare that can be expected 19 times out of 20 is = 816.929 - (816.929 * 10.2 %) = 734m^3/ha.
- The administrative, ownership and some cruise control information for the cutting authority are described in the text box in figure #1.

11 Net 2nd Growth - Conifer - %: This is the percentage of the second growth net merchantable volume that is compiled for the cutting authority and includes all of the trees that are less than 141 years old. If the % 2nd growth is at least 80%, then the second growth average log prices are used in the calculation of the indicated stumpage rate.

12 Net Immature by Block - %: This is the percentage of the immature net merchantable volume that is compiled for each block in the cutting authority and includes all of the trees that are less than 121 years old. The block maturity is used to set the minimum timber merchantability specifications that will be used for the cruise compilation and for waste assessments. The threshold for determining block maturity is 50%.

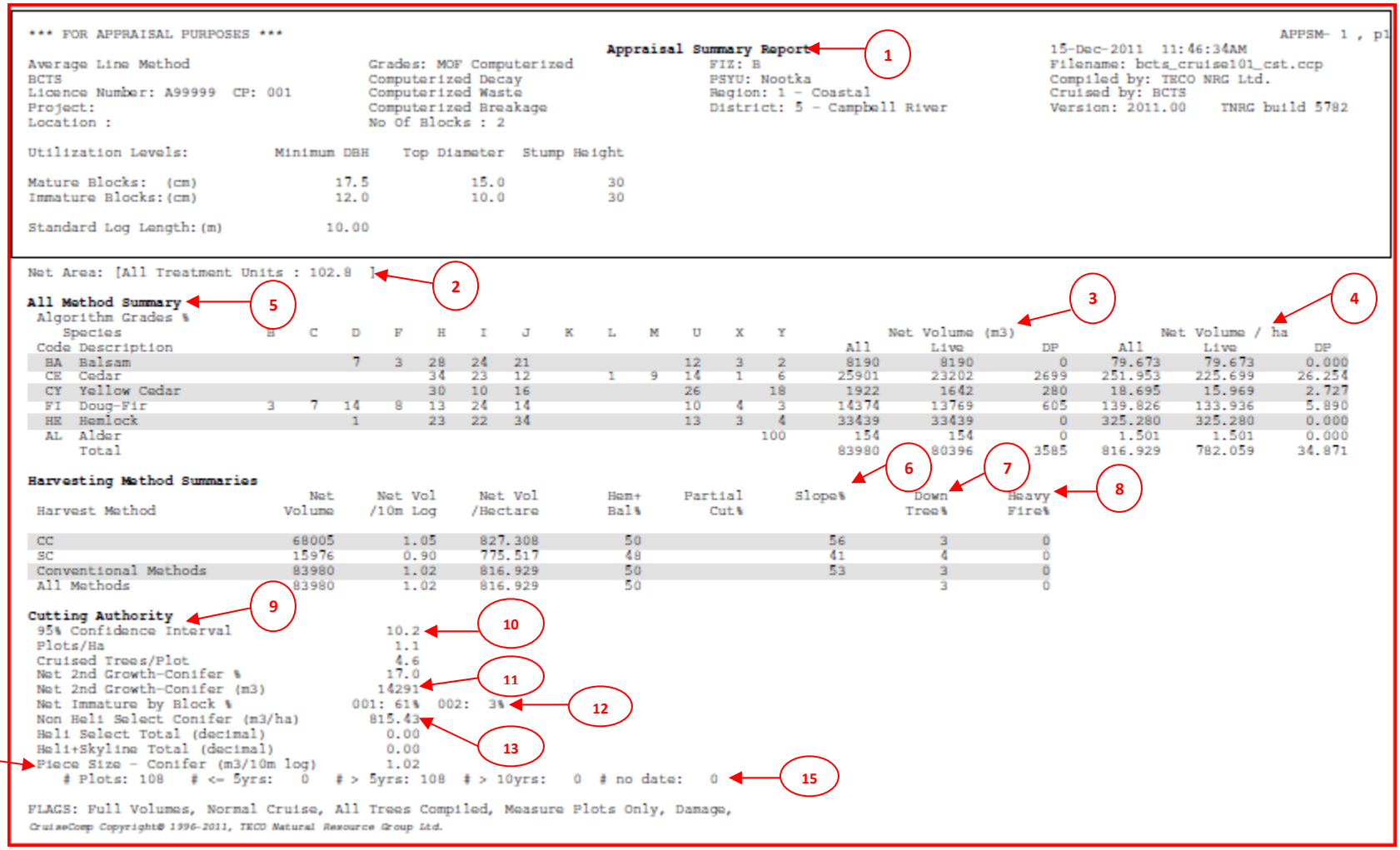
Block Utilization Limits		
Maturity	Immature	Mature
Minimum DBH	12.0	17.5
Top DIB	10.0	15.0

13 Non-heli select conifer (m^3/ha): This is the average net merchantable volume per hectare of all coniferous trees in the cutting authority that will not be harvested using a helicopter selection harvesting method. This value is used in the calculation of the indicated stumpage rate.

14 Piece Size - Conifer (m^3/10m Log): This is the average net merchantable volume per 10 metre log for all coniferous trees in the cutting authority. This attribute can be useful to estimate yarding, loading and other log handling costs.

15 # Plots: This is the number of plots that were cruised less than or equal to 5 years, greater than 5 years and greater than 10 years prior to the cruise compilation date. This information is useful to determine if the field data has exceeded the shelf life standards (5 years for immature and 10 years for mature cruise data).

APPRAISAL SUMMARY REPORT – FIGURE #1



*** FOR APPRAISAL PURPOSES ***

Appraisal Summary Report (1)

APPSM- 1 , p1

15-Dec-2011 11:46:34AM
Filename: bcts_cruise101_cst.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Average Line Method
BCTS
Licence Number: A99999 CP: 001
Project:
Location :

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage
No Of Blocks : 2

FIZ: B
PSYU: Nootka
Region: 1 - Coastal
District: 5 - Campbell River

Utilization Levels:	Minimum DBH	Top Diameter	Stump Height
Mature Blocks: (cm)	17.5	15.0	30
Immature Blocks:(cm)	12.0	10.0	30

Standard Log Length:(m) 10.00

Net Area: [All Treatment Units : 102.8] (2)

All Method Summary (5)

Algorithm Grades %

Species Code	Description	B	C	D	F	H	I	J	K	L	M	U	X	Y	Net Volume (m3) (3) All	Live	DP	Net Volume / ha (4) All	Live	DP
BA	Balsam			7	3	28	24	21				12	3	2	8190	8190	0	79.673	79.673	0.000
CE	Cedar					34	23	12		1	9	14	1	6	25901	23202	2699	251.953	225.699	26.254
CY	Yellow Cedar					30	10	16				26		18	1922	1642	280	18.695	15.969	2.727
FI	Doug-Fir	3	7	14	8	13	24	14				10	4	3	14374	13769	605	139.826	133.936	5.890
HE	Hemlock			1		23	22	34				13	3	4	33439	33439	0	325.280	325.280	0.000
AL	Alder													100	154	154	0	1.501	1.501	0.000
	Total														83980	80396	3585	816.929	782.059	34.871

Harvesting Method Summaries (6) (7) (8)

Harvest Method	Net Volume	Net Vol /10m Log	Net Vol /Hectare	Ham+ Bal%	Partial Cut%	Slope%	Down Trees%	Heavy Fire%
CC	68005	1.05	827.308	50		56	3	0
SC	15976	0.90	775.517	48		41	4	0
Conventional Methods	83980	1.02	816.929	50		53	3	0
All Methods	83980	1.02	816.929	50			3	0

Cutting Authority (9)

95% Confidence Interval (10)	10.2
Plots/Ha	1.1
Cruised Trees/Plot	4.6
Net 2nd Growth-Conifer %	17.0
Net 2nd Growth-Conifer (m3) (11)	14291
Net Immature by Block % (12)	001: 61% 002: 3%
Non Heli Select Conifer (m3/ha)	815.43
Heli Select Total (decimal) (13)	0.00
Heli+Skyline Total (decimal)	0.00
Piece Size - Conifer (m3/10m log) (14)	1.02

Plots: 108 # <= 5yrs: 0 # > 5yrs: 108 # > 10yrs: 0 # no date: 0 (15)

FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,

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2.0 Cutting Permit Summary Report

1. The main attributes found in the Cutting Permit Summary Report are described in this section of the report. An example of the report is shown in figure #2.

   The Cutting Permit Summary Report contains some detail that is not found in the Appraisal Summary Report, including species sampling errors, plot frequencies and average tree count information. It is important to emphasize that there can be high sampling error variations for each species in a cruise compilation and particularly for minor species components. The following example uses the Cutting Permit Summary report in figure #2.

2. Species – 95% Confidence Interval - This is the sampling error in percent that can be expected 19 times out of 20 (95%) for each species net merchantable volume per hectare weighted by timber type volume for the cruise plots in the cutting authority. For example:
   - The fir net volume per hectare for the cruise in Figure #2 is = 140 m^3/ha.
   - The sampling error is 32.2%.
   - The upper limit of the volume per hectare that can be expected 19 times out of 20 is = 140 + (140 * 32.2%) = **185 m^3/ha.**
   - The lower limit of the volume per hectare that can be expected 19 times out of 20 is = 140 - (140 * 32.2%) = **95 m^3/ha.**

3. Stems/Ha (Live & DP) – This is the number of trees per hectare for each species and all species combined in the cutting authority. The number of stems in the cutting authority can be calculated to provide an estimate of the log handling costs. A detailed description of the stems/ha is provided in the Stand Table Report in section 3.0.

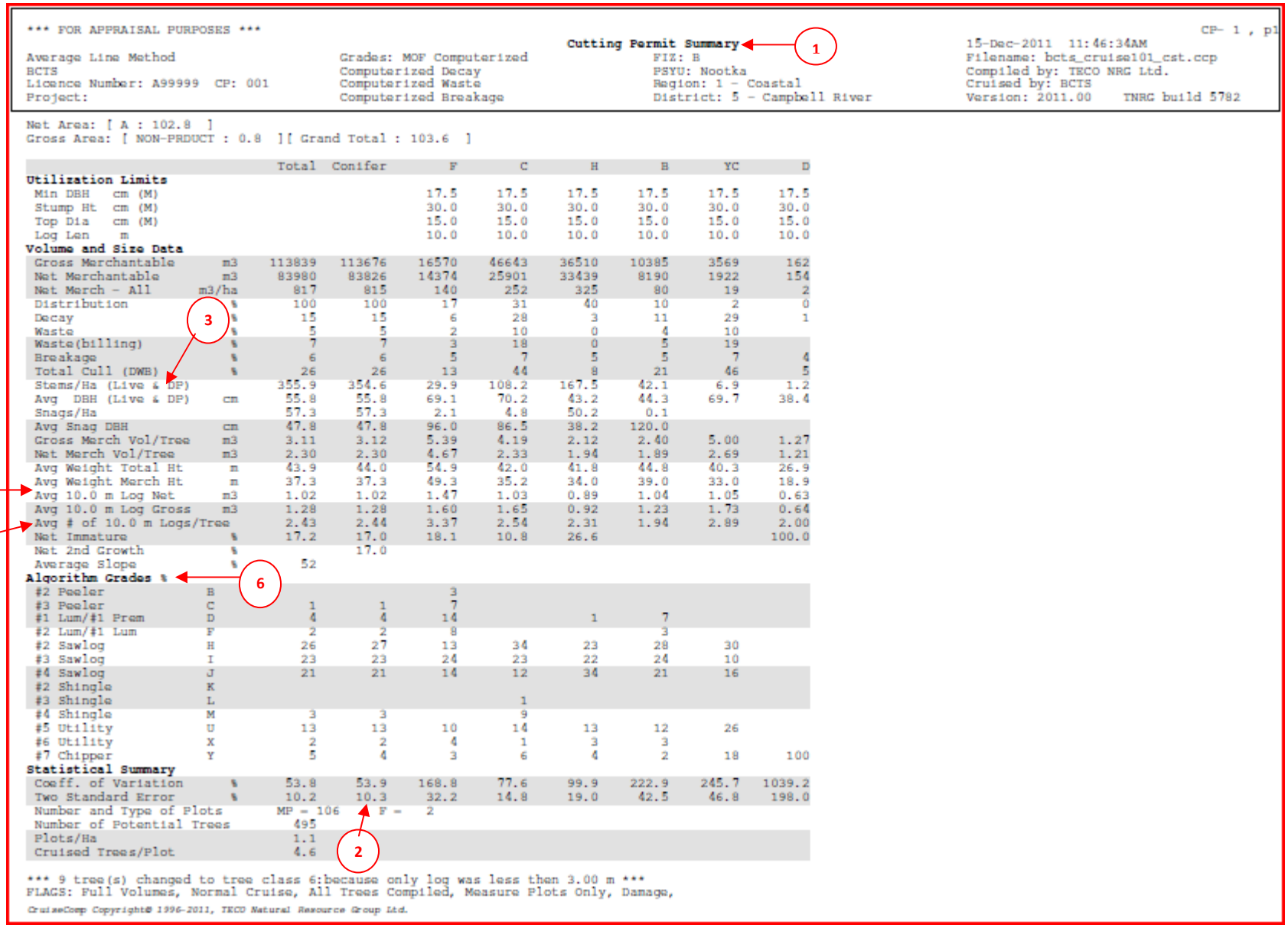
4. Average 10m Log Net (m^3) – This is the average net merchantable volume for 10 meter log lengths that can be expected for each species and all species combined in the cutting authority.

5. Average# 10m Log/Tree – This is the average number of 10 meter log lengths that can be expected for each species and all species combined in the cutting authority.

6. Algorithm Grade (%) – This is an estimate of the statutory log grade percentages for the cruised trees for each species and all species combined in the cutting authority. For example, the predicted net merchantable volumes for the Douglas fir grades in figure #2 are:

   3% B-grade * 14374m^3 = 431.2m^3 / 7% C-grade * 14374m^3 = 1006.2m^3 / 14% D-grade * 14374m^3 = 2012.4m^3 / 8% F-grade * 14374m^3 = 1114.9m^3 / 13% H-grade * 14374m^3 = 1868.6m^3 / 24% I-grade * 14374m^3 = 3449.8m^3 / 14% J-grade * 14374m^3 = 2012.4m^3 / 10% U-grade * 14374m^3 = 1437.4m^3 / 4% X-grade * 14374m^3 = 575.0m^3 / 3% Y-grade * 14374m^3 = 431.2m^3

CUTTING PERMIT SUMMARY REPORT – FIGURE #2



*** FOR APPRAISAL PURPOSES ***

Cutting Permit Summary (1)

CP- 1 , p1

Average Line Method
BCTS
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: B
PSYU: Nootka
Region: 1 - Coastal
District: 5 - Campbell River

15-Dec-2011 11:46:34AM
Filename: bcts_cruise101_cst.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Net Area: [A : 102.8]
Gross Area: [NON-PRDUCT : 0.8][Grand Total : 103.6]

		Total	Conifer	F	C	H	B	YC	D
Utilization Limits									
Min DBH cm (M)				17.5	17.5	17.5	17.5	17.5	17.5
Stump Ht cm (M)				30.0	30.0	30.0	30.0	30.0	30.0
Top Dia cm (M)				15.0	15.0	15.0	15.0	15.0	15.0
Log Len m				10.0	10.0	10.0	10.0	10.0	10.0
Volume and Size Data									
Gross Merchantable	m3	113839	113676	16570	46643	36510	10385	3569	162
Net Merchantable	m3	83980	83826	14374	25901	33439	8190	1922	154
Net Merch - All	m3/ha	817	815	140	252	325	80	19	2
Distribution	%	100	100	17	31	40	10	2	0
Decay	%	15	15	6	28	3	11	29	1
Waste	%	5	5	2	10	0	4	10	
Waste(billing)	%	7	7	3	18	0	5	19	
Breakage	%	6	6	5	7	5	5	7	4
Total Cull (DWB)	%	26	26	13	44	8	21	46	5
Stems/Ha (Live & DP)		355.9	354.6	29.9	108.2	167.5	42.1	6.9	1.2
Avg DBH (Live & DP)	cm	55.8	55.8	69.1	70.2	43.2	44.3	69.7	38.4
Snags/Ha		57.3	57.3	2.1	4.8	50.2	0.1		
Avg Snag DBH	cm	47.8	47.8	96.0	86.5	38.2	120.0		
Gross Merch Vol/Tree	m3	3.11	3.12	5.39	4.19	2.12	2.40	5.00	1.27
Net Merch Vol/Tree	m3	2.30	2.30	4.67	2.33	1.94	1.89	2.69	1.21
Avg Weight Total Ht	m	43.9	44.0	54.9	42.0	41.8	44.8	40.3	26.9
Avg Weight Merch Ht	m	37.3	37.3	49.3	35.2	34.0	39.0	33.0	18.9
Avg 10.0 m Log Net	m3	1.02	1.02	1.47	1.03	0.89	1.04	1.05	0.63
Avg 10.0 m Log Gross	m3	1.28	1.28	1.60	1.65	0.92	1.23	1.73	0.64
Avg # of 10.0 m Logs/Tree		2.43	2.44	3.37	2.54	2.31	1.94	2.89	2.00
Net Immature	%	17.2	17.0	18.1	10.8	26.6			100.0
Net 2nd Growth	%		17.0						
Average Slope	%	52							
Algorithm Grades %									
#2 Peeler	B			3					
#3 Peeler	C	1	1	7					
#1 Lum/#1 Prem	D	4	4	14		1	7		
#2 Lum/#1 Lum	F	2	2	8			3		
#2 Sawlog	H	26	27	13	34	23	28	30	
#3 Sawlog	I	23	23	24	23	22	24	10	
#4 Sawlog	J	21	21	14	12	34	21	16	
#2 Shingle	K								
#3 Shingle	L				1				
#4 Shingle	M	3	3		9				
#5 Utility	U	13	13	10	14	13	12	26	
#6 Utility	X	2	2	4	1	3	3		
#7 Chipper	Y	5	4	3	6	4	2	18	100
Statistical Summary									
Coeff. of Variation	%	53.8	53.9	168.8	77.6	99.9	222.9	245.7	1039.2
Two Standard Error	%	10.2	10.3	32.2	14.8	19.0	42.5	46.8	198.0
Number and Type of Plots		MP = 106		F = 2					
Number of Potential Trees		495							
Plots/Ha		1.1							
Cruised Trees/Plot		4.6							

(2) (3) (4) (5) (6)

*** 9 tree(s) changed to tree class 6:because only log was less then 3.00 m ***
FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,

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3.0 Stand Table Report

1. Some of the main attributes found in the Stand Table Report are described in this section of the report. An example of the report is shown in figure #3.
   The Stand Table reports the average number of trees per hectare for each species in 5cm diameter at breast height (DBH) classes and the tables are segregated by treatment unit for each timber type, cut block and for the whole cutting authority. The tables are often used to model partial harvest prescriptions and report the number of trees per hectare that will be harvested. The number of stems/ha that will remain standing after harvest are reported in the Leave Tree Report. Partial harvest prescription and percent reduction input scenarios are available at the following web site:
   http://www.for.gov.bc.ca/hva/manuals/percentreductionscenarios.htm
   Species Codes - each species, total (all species combined), DU (dead useless snags), DP (dead potential) and LU (live useless) number of trees/ha are reported separately.
   DBH Classes - the mid-point of the 5cm diameter classes of the average number of trees/ha of trees in the cruise plots. For example, the 50 cm DBH class includes trees that have a DBH that are from 47.5 to 52.4 cm.
2. Stems/ha – refer to figure #3 for an example of the trees/ha. The 35cm class shows Douglas fir has 20.0 stems per hectare in the cutting authority. If the cutting authority is only 1.0 hectare, we could expect 20 fir trees in the cutting authority. The total number of live and dead potential Douglas fir trees/ha is 73.6 trees/ha.
3. Average DBH at 5 Levels - the average DBH is reported for trees that are above 5 different DBH limits.

The number of stems/ha that are projected to remain standing after harvest are reported in the Leave Tree Report.

STAND TABLE REPORT – FIGURE #3

*** FOR APPRAISAL PURPOSES ***

Cutting Permit Stand Table (stems/ha) ← 1

CSTND- 1 , p1

Average Line Method
BCTS
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: B
PSYU: Nootka
Region: 1 - Coastal
District: 5 - Campbell River

15-Dec-2011 11:46:34AM
Filename: bcts_cruise101_cst.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

[A : 102.8]

	F	C	H	B	YC	D	Total	DP	DU	LU
Utilization Limits										
Min DBH cm (M)	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Stump Ht cm (M)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Top Dia cm (M)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Log Len m	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
DBH Class										
5										
10										
15										
20		8.7	42.1	16.3			67.1	4.5		31.6
25		5.4	23.1	3.9			32.3	7.5	3.2	
30	6.5	9.0	14.6	8.2			38.3			
35		3.6	14.3	2.1			20.0			
40	1.5	6.8	15.4		1.8	1.2	26.7		4.3	1.3
45	2.8	2.2	14.9	2.1			21.9	1.1	3.9	
50	1.5	4.7	8.9	2.2			17.2	0.7		
55	1.9	5.5	6.9	0.9			15.2	2.4	0.6	
60	2.2	7.2	4.9	1.1	1.3		16.8			
65	1.6	2.9	6.4		0.5		11.4	0.4	2.3	
70	0.8	4.1	4.9	1.0			10.7	1.1	2.3	
75	0.9	3.9	2.7	1.2			8.7	1.4	0.5	
80		4.2	2.6	0.8			7.5	0.7	1.5	
85	0.6	1.8	1.7	0.3	0.6		5.1	0.9	1.2	0.3
90	0.3	1.6	1.6				3.5	0.6	0.5	
95	0.8	2.9	0.6		0.3		4.6	1.2	0.4	
100		2.7	0.7	0.2	0.3		3.9	0.4	0.6	
105	0.4	2.3	0.2	0.6			3.4	0.4	0.7	
110	0.9	2.1		0.4	0.2		3.6	0.2	0.6	0.1
115	0.2	1.9	0.2	0.3			2.6			
120	0.2	1.3	0.1	0.3			2.0		0.6	
125	0.3	1.5	0.1		0.2		2.1		0.1	
130	0.3	0.5	0.1	0.2	0.1		1.3			
135	0.3	0.6		0.1			0.9		0.1	
140		1.1	0.2	0.1			1.5			0.1
145		0.5					0.5	0.1	0.1	
150	0.5	1.0					1.6	0.3	0.1	
175	0.6	0.6			0.1		1.3		0.1	
200		0.2					0.2			
225	0.1	0.0					0.2		0.1	
250										
275										
Total	25.1	90.6	167.5	42.1	5.4	1.2	331.9			
Dead P	4.8	17.6			1.5			23.9		
Dead U	2.1	3.0	18.6	0.1					23.9	
Live U		1.8	31.6							33.4
Average DBH(cm) at 5 Levels										
12.5 +	72.2	72.1	43.2	44.3	74.1	38.4	55.7	57.4	68.4	23.9
17.5 +	72.2	72.1	43.2	44.3	74.1	38.4	55.7	57.4	68.4	23.9
22.5 +	72.2	75.5	48.7	54.2	74.1	38.4	61.5	62.9	68.4	67.4
27.5 +	72.2	77.8	52.5	57.7	74.1	38.4	65.0	78.0	72.8	67.4
32.5 +	81.9	82.1	55.4	69.2	74.1	38.4	69.8	78.0	72.8	67.4

2 →

3 →

*** 9 tree(s) changed to tree class 6:because only log was less then 3.00 m ***
FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,

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4.0 Stock Table Report

Some of the main attributes found in the Stock Table Report are described in this section of the report. An example of the report is shown in figure #4.

The Stock Table reports the average volume per hectare for each species in 5cm diameter at breast height (DBH) classes and the tables are segregated by treatment unit for each timber type, cut block and for the whole cutting authority.

1. Volume/ha – refer to figure #4 for an example of the vol/ha. The 30cm DBH class shows Douglas fir has 4.2 m^3/ha in the cutting authority. The cutting authority is 102.8 hectares, so we could expect 432 m^3 in the cutting authority in the 30cm DBH class.
2. Average DBH at 7 Levels - the average volume per hectare is reported for trees that are above seven different DBH limits.

The tables are often used to model partial harvest prescriptions and report the net merchantable volume per hectare that will be harvested. The number of stems/ha that will remain standing after harvest are reported in the Leave Tree Report.

STOCK TABLE REPORT – FIGURE #4

*** FOR APPRAISAL PURPOSES ***

CSTCK- 1 , p1

Cutting Permit Stock Table (m3/ha)

Average Line Method
BCTS
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: B
PSYU: Nootka
Region: 1 - Coastal
District: 5 - Campbell River

15-Dec-2011 11:46:34AM
Filename: bcts_cruise101_cst.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

[A : 102.8]

	F	C	H	B	YC	D	Total	DP	DU	LU
Utilization Limits										
Min DBH cm (M)	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Stump Ht cm (M)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Top Dia cm (M)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Log Len m	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
DBH Class										
5										
10										
15										
20		1.1	5.1	2.3			8.5	0.4		
25		1.9	9.2	1.4			12.4	2.1		
30	4.2	3.3	10.3	5.3			23.1			
35		1.1	16.7	1.5			19.3			
40	1.9	7.4	23.2		1.9	1.5	35.9			
45	4.5	1.9	30.4	3.9			40.7	1.6		
50	3.1	5.3	20.8	5.4			34.6	0.6		
55	4.7	6.9	21.7	3.0			36.2	2.3		
60	7.6	11.9	19.7	5.0	3.3		47.6			
65	6.2	6.0	30.7		1.6		44.5	1.1		
70	3.4	9.5	28.1	6.2			47.2	2.2		
75	7.3	10.5	19.7	7.4			44.9	3.0		
80		12.8	20.0	5.1			37.9	1.9		
85	5.2	7.1	18.1	2.7	2.4		35.5	2.8		
90	2.8	6.4	14.9				24.1	2.6		
95	6.5	12.0	7.1		2.1		27.7	4.6		
100		11.9	9.2	1.7	1.2		24.1	1.7		
105	4.1	12.4	3.2	7.7			27.3	2.1		
110	11.0	12.8		4.1	1.1		29.0	1.0		
115	3.4	12.2	4.4	5.0			25.1			
120	4.6	8.5	2.5	4.2			19.9			
125	5.8	11.2	2.4		1.3		20.7			
130	5.0	4.3	1.6	3.5	0.5		14.9			
135	3.3	5.0		2.2			10.6			
140		11.1	6.3	2.1			19.5			
145		4.3					4.3	1.4		
150	13.1	12.4					25.5	3.6		
175	20.0	8.6			0.4		29.0			
200		4.6					4.6			
225	6.2	1.4					7.6			
250										
275										
Total	133.9	225.7	325.3	79.7	16.0	1.5	782.1			
Dead P	5.9	26.3			2.7			34.9		
			Total Volumes for 7 Levels							
17.5 +	133.9	225.7	325.3	79.7	16.0	1.5	782.1	34.9		
22.5 +	133.9	224.6	320.2	77.4	16.0	1.5	773.6	34.4		
27.5 +	133.9	222.7	311.0	76.0	16.0	1.5	761.2	32.3		
32.5 +	129.7	219.4	300.8	70.7	16.0	1.5	738.1	32.3		
37.5 +	129.7	218.3	284.1	69.2	16.0	1.5	718.8	32.3		
42.5 +	127.8	210.9	260.9	69.2	14.0		682.9	32.3		
47.5 +	123.4	209.0	230.6	65.3	14.0		642.2	30.7		

*** 9 tree(s) changed to tree class 6:because only log was less then 3.00 m ***
FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,

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5.0 Extended Stand & Stock Table Report

1 The Extended Stand & Stock Table Report attributes are described in this section of the report. An example of the report is shown in figure #5.

2 The Extended Stand & Stock Report indicates the average volume per tree and stems per hectare for each species in 5cm diameter at breast height (DBH) classes for the various tree classes and risk groups. The tables are segregated by treatment unit for each timber type, cut block and for the whole cutting authority. The tables are often used to model partial harvest prescriptions and report the net merchantable volume per hectare that will be harvested.

and

3

EXTENDED STAND & STOCK TABLE REPORT – FIGURE #5

*** FOR APPRAISAL PURPOSES ***

Extended Type Stand & Stock Table (1)

XTS&S- 2 , p2

Average Line Method
BCTS
Licence Number: A99999 CP: 001
Project:

Grades: MOF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: B
PSYU: Nootka
Region: 1 - Coastal
District: 5 - Campbell River

15-Dec-2011 11:46:34AM
Filename: bcts_cruise101_cst.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Type : 1 (M) F C [Species:Doug-Fir][A : 1.4]

	AVERAGE			LIVING TREES (3)							
DBH (cm)	Height (m)	Gross Volume Per Tree (m3)	Net Volume (2) Per Tree (m3)	Risk Group 1 (stems/ha)	Risk Group 2 (stems/ha)	Risk Group 3 (stems/ha)	Dead Potential (stems/ha)	Total (stems/ha)	Live Veterans (stems/ha)	Dead Useless (stems/ha)	Live Useless (stems/ha)
5											
10											
15											
20											
25											
30											
35											
40											
45											
50											
55											
60											
65											
70											
75											
80											
85											
90											
95	50.0	9.462	4.267				11.78	11.78			
100											
105											
110											
115											
120	58.7	17.135	16.039	7.34				7.34	7.34		
125											
130	69.3	25.024	23.423	5.85				5.85	5.85		
135											
140											
145											
150											
175											
200											
225											
250											
275											
Total of Averages				13.19			11.78	24.96	13.19		
Percent by Tree Class				52.82			47.18	100.00	52.82		
Average DBH(cm) at 5 Levels											
Trees 12.5 +				124.30			93.00	110.64	124.30		
Trees 17.5 +				124.30			93.00	110.64	124.30		
Trees 22.5 +				124.30			93.00	110.64	124.30		
Trees 27.5 +				124.30			93.00	110.64	124.30		
Trees 32.5 +				124.30			93.00	110.64	124.30		

*** 9 tree(s) changed to tree class 6:because only log was less then 3.00 m ***
FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,

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6.0 Damage Summary Reports

(1) The Damage Summary Report attributes are described in this report. An example of the blow-down damage report is shown in figure #6.

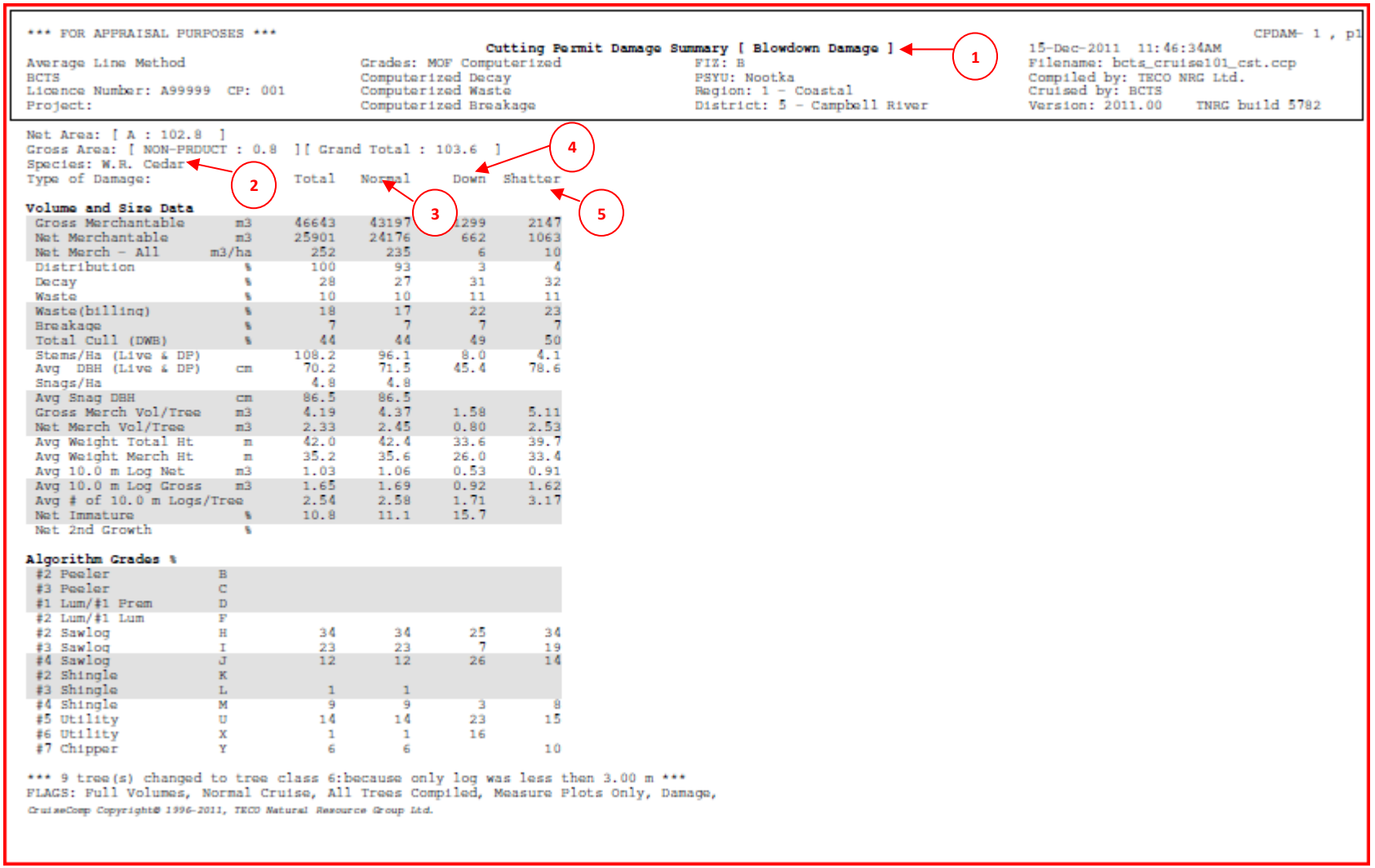
(2) The damage types are listed in Table #1. The reports are summarized for each species and damage type for the cutting permit, block and timber type. The damage codes are reported in each of the damage categories as follows:

TABLE #1

DAMAGE REPORTS					
Damage Type	**Category**				
Blowdown	Total	(3) Normal	(4) Down	(5) Shatter	N/A
Fire	Total	Normal	Light	Moderate	Heavy
Insect (Pine/Bal)	Total	Normal	Green	Red	Grey
Insect (Fir/Sp)	Total	Normal	Green Live	Green Dead	Grey Dead
Blister Rust (Pw)	Total	Normal	Blister	N/A	N/A
Root Rot	Total	Normal	Light	Moderate	Heavy
Defoliator	Total	Normal	Dry	Green	N/A

The root rot switch must be turned on in the Compilation Standard Screen in CruiseComp to generate the root rot summary reports by block and timber type.

DAMAGE SUMMARY REPORTS (BLOWDOWN) – FIGURE #6



*** FOR APPRAISAL PURPOSES ***

CPDAM- 1 , p1

Cutting Permit Damage Summary [Blowdown Damage] (1)

Average Line Method
BCTS
Licence Number: A99999 CP: 001
Project:

Grades: MDF Computerized
Computerized Decay
Computerized Waste
Computerized Breakage

FIZ: B
PSYU: Nootka
Region: 1 - Coastal
District: 5 - Campbell River

15-Dec-2011 11:46:34AM
Filename: bcts_cruise101_cst.ccp
Compiled by: TECO NRG Ltd.
Cruised by: BCTS
Version: 2011.00 TNRG build 5782

Net Area: [A : 102.8]
Gross Area: [NON-PRDUCT : 0.8][Grand Total : 103.6]
Species: W.R. Cedar
Type of Damage:

(2) (3) (4) (5)

Volume and Size Data		Total	Normal	Down	Shatter
Gross Merchantable	m3	46643	43197	4299	2147
Net Merchantable	m3	25901	24176	662	1063
Net March - All	m3/ha	252	235	6	10
Distribution	%	100	93	3	4
Decay	%	28	27	31	32
Waste	%	10	10	11	11
Waste(billing)	%	18	17	22	23
Breakage	%	7	7	7	7
Total Cull (DWB)	%	44	44	49	50
Stems/Ha (Live & DP)		108.2	96.1	8.0	4.1
Avg DBH (Live & DP)	cm	70.2	71.5	45.4	78.6
Snags/Ha		4.8	4.8		
Avg Snag DBH	cm	86.5	86.5		
Gross March Vol/Tree	m3	4.19	4.37	1.58	5.11
Net March Vol/Tree	m3	2.33	2.45	0.80	2.53
Avg Weight Total Ht	m	42.0	42.4	33.6	39.7
Avg Weight March Ht	m	35.2	35.6	26.0	33.4
Avg 10.0 m Log Net	m3	1.03	1.06	0.53	0.91
Avg 10.0 m Log Gross	m3	1.65	1.69	0.92	1.62
Avg # of 10.0 m Logs/Tree		2.54	2.58	1.71	3.17
Net Immature	%	10.8	11.1	15.7	
Net 2nd Growth	%				

Algorithm Grades %					
#2 Peeler	B				
#3 Peeler	C				
#1 Lum/#1 Prem	D				
#2 Lum/#1 Lum	F				
#2 Sawlog	H	34	34	25	34
#3 Sawlog	I	23	23	7	19
#4 Sawlog	J	12	12	26	14
#2 Shingle	K				
#3 Shingle	L	1	1		
#4 Shingle	M	9	9	3	8
#5 Utility	U	14	14	23	15
#6 Utility	X	1	1	16	
#7 Chipper	Y	6	6		10

*** 9 tree(s) changed to tree class 6:because only log was less than 3.00 m ***
FLAGS: Full Volumes, Normal Cruise, All Trees Compiled, Measure Plots Only, Damage,

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8.0 Practical Uses for the Reports

The examples in this report demonstrate some practical uses for some of the attributes in the cruise compilation reports.

Example #1

A licensee wants to estimate the volumes that may be produced for several sorts. The preferred specifications for the sorts are as follows:

a. Small Fir Sawlogs – Live Douglas fir logs with diameters less than the 32.5 cm DBH class. Refer to the CP Stock Table (figure #4):

- 4.2 m^3/ha * 102.8 ha = **432m^3**

b. Large Sawlogs – Live Coniferous logs with DBH that are in the 32.5 cm DBH class or larger. Refer to each coniferous species in the 32.5 class at the bottom of the CP Stock table (excluding alder (D)):

- (129.7 m^3/ha + 219.4 + 300.8 + 70.7 + 16.0) * 102.8 ha = **736.6m^3**

c. Immature Fir Peelers – Douglas fir volume.

- Refer to the Appraisal Summary Report (Figure #1), Grade Code C: 14374 m^3 * 7% = **1006m^3**

d. Cedar Poles – The licensee wants to determine the potential cedar volume that might produce poles. The rough criteria are live trees that are risk group #1 (no pathological indicators) and have a DBH of 45cm to 55cm.

Refer to cedar in all 11 timber types in the Extended Stand & Stock Table Reports (not shown):

Timber Type #2 (45cm class) – 1.162m^3/tree * 6.79 stems/ha * 14.8ha = 117m^3

Timber Type #3 (55cm class) – 1.948m^3/tree * 6.03 stems/ha * 11.0ha = 129m^3

Timber Type #10 (50cm class) – 2.022m^3/tree * 10.64 stems/ha * 5.7ha = 123m^3

Timber Type #10 (55cm class) – 2.968m^3/tree * 9.28 stems/ha * 5.7ha = 157m^3

Total = 526m^3

Example #2

A licensee wants to estimate the number of highway truck loads of logs that they can expect to load out from the timber sale and how many logs that they will average per load. Assume that the trucks average 40 m^3 per load and 15 m long logs.

c. Number of truckloads – Refer to the 'Total Net Volume' on the *Appraisal Summary Report*:

- 83980 m^3 / 40 m^3 per load = **2100 loads.**

d. Number of logs per load – Refer to the 'Net Merch Vol/Tree' and the 'Average Weighted Merch Height' on the *Cutting Permit Summary Report*:

- 40 m^3 per load/ 2.30 m^3 per tree = 17.4 trees per load.
- 17.4 trees per load * 37.3 m merch height per tree/15 m logs = **43 logs per load.**

Example #3

A licensee has finished logging their timber sale and they question why the 100% stick scale plus waste assessment for the yellow cedar component is less than ½ the yellow cedar cruise volume. The licensee did not utilize the dead potential yellow cedar component because it was Y-grade due to weather checking and dry Y-grade logs are not measured in the waste survey estimate.

Refer to two standard error (%) and the net volumes for the yellow cedar component in the *Appraisal Summary*:

- 46.8% * 1922 m^3 cruise volume = 899 m^3.
- 1922 m^3 – 899 m^3 = 1023 m^3, which approximates the cruise volume.

APPENDIX III

Cruise Compilation Report Nomenclature

IFS CruiseComp Report Name	Claymore Report Name
Appraisal Summary Report	Appraisal Summary
Cutting Permit Summary	Summary of Cruise Data
Timber Type Summary	Summary of Cruise Data by Type
Block Summary	Summary of Cruise Data by Block
All Method Summary	Summary of Cruise Data
Harvesting Method Summary	Summary of Cruise Data by Harvest Method
Plot Summary	Per Hectare Plot Summary (detailed)
Volume Statistical Analysis	Cruise Summary
Basal Area Statistical Analysis	Per Hectare Statistical Summary
CP, Type & Block Stand Table (stems/ha)	Stand and Stock Table
CP, Type & Block Stock Table (m^3/ha)	Stand and Stock Table
CP, Type & Block Basal Area Table (m^2/ha)	Stand and Stock Table
CP, Type & Block Stand Damage Table (stems/ha)	Stand and Stock Table
CP, Type & Block Stock Damage Table (m^3/ha)	Stand and Stock Table
CP, Type & Block Basal Area Damage Table (m^2/ha)	Stand and Stock Table
Extended Type Stand & Stock Table	Stand and Stock Tables
Leave Tree Reports –*when compiled*	Leave Tree Reports – *when compiled*
Percent Reductions Applied	Percent Reduction Applied
CP, Type & Block Volume & Lumber Recovery Info.	Lumber Recovery Report
CP, Type & Block Damage Summary (damage type)	Summary of Cruise Data by Damage
CP, Type & Block Root Rot Summary (root rot)	Summary of Cruise Data by Damage

GLOSSARY

Coniferous – softwood tree species (except Larch) that do not lose their needles during the winter.

Cutting Authority – the whole license or cutting permit identified by a unique timber mark.

DBH – diameter at breast height is measured for measured trees in cruise plots. The diameter is an outside bark measurement 1.3m from the high side of ground.

Deciduous – hardwood tree species that lose their leaves during the winter.

Grade – letters or numbers that describe the size and quality of a log and the potential products that can be made from the log.

Harvesting Method – describes the type of equipment or animal that is used for yarding the trees to roadside after they are felled.

Hectare – a metric unit of area that is 100m by 100m or 10,000 m^2.

Immature Timber – coniferous trees that are less than 121 years old and deciduous trees that are less than 41 years old.

Leave Tree Report – Reports the number of stems per hectare by species that will remain standing inside a cut-block after the harvesting is complete.

Loss Factors – the decay, waste and breakage volume (m^3) that is deducted from the gross merchantable volume of each measure tree in a compilation.

Mature Timber – coniferous trees that are at least 121 years old and deciduous trees that are at least 41 years old.

Merchantable Volume – this is the volume in a tree between the 30cm stump height and the minimum tree top diameter.

Partial Harvest Prescription – a professional assessment of the soil moisture, nutrient, plant communities and the preferred tree species that should be replanted. The prescription is a key document that supports the percent reduction (leave trees) on partial harvest cutting authorities.

Pathological Indicators – the 8 indicators of decay that cruisers record for loss factor cruises: conk, blind conk, scar, frost crack, fork/crook, mistletoe, large rotten branch and dead/broken top. The indicators are one component of the decay/waste and breakage deduction used in the cruise compilation.

Percent Reduction Input – this is the input data for the cruise compilation. The data describes the trees that are intended to be retained from harvesting.

Risk Groups – The cruise compilation program uses the cruise location, tree species, age, Dbh and pathological indicators to determine the loss factors that will reduce the net volume of each measure tree. The risk groups are sub-sets of the loss factors and the pathological indicators recorded for the tree to determine the risk group that will be used to compile each tree.

Second Growth - coniferous trees that are less than 141 years old.

Timber Type – A spatial grouping of trees with common species and age characteristics. Volumes and statistics are calculated for each timber type. Grouping similar timber characteristics can improve the sampling efficiency.

Timber Merchantability Requirements – the contractual cutting standards for a cutting authority. (e.g. - 30cm stump height, minimum Dbh = 12.0cm for immature and 17.5cm for mature cut-blocks).

Treatment Unit – spatial units that forest professionals use to describe common treatments on the land base. The cruise compilation reports provide a breakdown of the cruise attributes for each treatment unit for each of the reporting levels (Timber Type, Block, Harvesting Method, Cutting Permit).

Tree Classes – a tree class number is assigned to each tree in the measure cruise plots by the timber cruiser as follows:

Tree Class	Description - Using an age in 10s = 11 on the plot card for loss factor cruises
1	Older immature live trees without pathological indicators.
2	Older immature live trees with pathological indicators.
3	Dead potential trees that contain at least 50% sound wood.
4	Dead useless trees that contain less than 50% sound wood.
5	Mature live trees.
6	Live useless trees – live trees that are very defective (typically firmwood rejects).
7	Mature dead potential trees.
8	Younger immature live trees.
9	Younger immature dead trees.