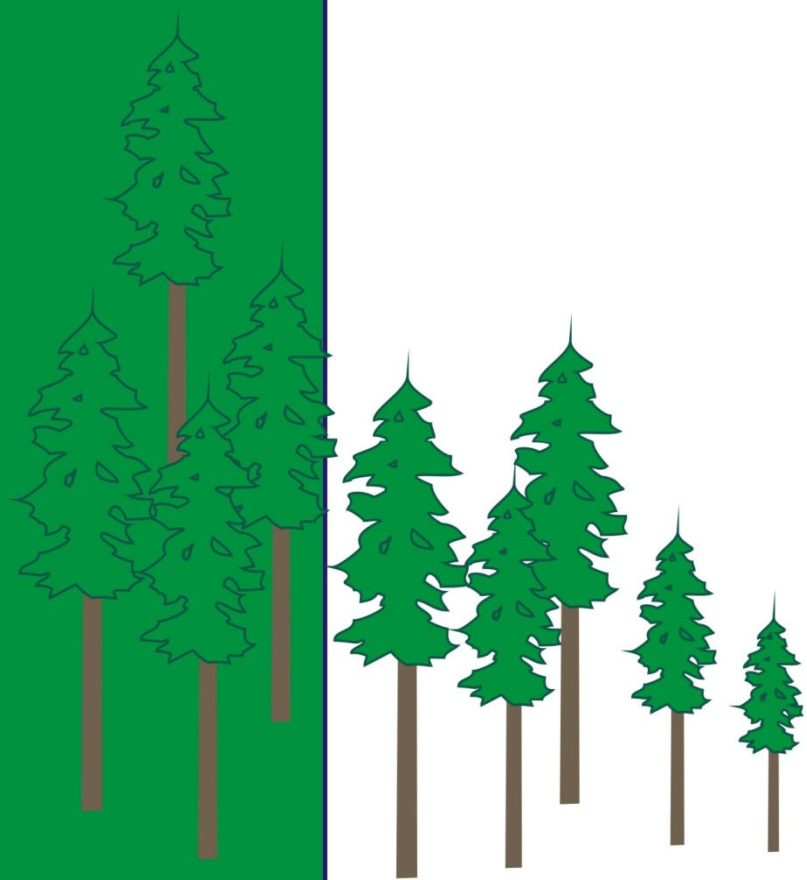
BRITISH COLUMBIA

Interior

MARKET PRICING SYSTEM

Update – 2022



July 1, 2022

Timber Pricing Branch

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Interior Market Pricing System: Update – 2022

1. INTRODUCTION

The purpose of this paper is to provide an overview of the July 1, 2022 update to the Interior Market Pricing System (MPS). [1]

2. AUCTION DATASET

The new auction dataset used in the update contains winning bids and data from 3784 sales over the 15.25 year period January 1, 2007 through March 31, 2022.

[1] This paper is not intended to provide the basis for calculating stumpage rates nor should it be used as guidance for interpreting the legal policies and procedures for calculating stumpage rates, which are contained in the *Interior Appraisal Manual*. The *Interior Appraisal Manual* contains the policies and procedures referred to in Section 105 of the *Forest Act*.

3. EQUATIONS

Estimated Winning Bid Equation

Variable	2022 Final Equation	
	Co-efficient	t – Statistic
LN (Number of Bidders)	8.501125	21.767140
Constant	40.288930	9.459855
Real Stand Selling Price (Scale Based)	0.370769	23.964504
Real Stand Selling Price (Cruise Based)	0.258002	13.982596
Cedar Fraction	18.671466	2.760150
Cedar Fraction*Cedar Decay	-129.634548	4.450164
Hemlock Fraction	-18.725119	-7.804748
Balsam Fraction 50 Hinge	-4.379429	-2.633052
Larch Fraction + Yellow Pine Fraction	-11.648498	-2.468090
Fir Fraction * Dry Belt	-5.010213	-1.314704
Cable Yarding post 2013	-22.372519	-8.339890
LN(Coniferous Volume/1000)	2.568849	7.908984
Net Decay Fraction	-20.374576	-2.858355
Fire Damaged Fraction	-28.367623	-8.936542
LN (Volume per Tree)	8.223022	12.76968
Cycle + 0.5 *(Cycle – 6.0 hours)	-1.695210	-10.763948
Zone 9	-5.321302	-5.176834
Cruise Based * (1 – RG35)	4.272538	3.304654
Decked Fraction	32.176866	1.766987
Slope (>15)	-0.139564	-3.529214
Latest Auction Year	6.223703	1.538437
Grey Fraction Hinge	-1.216720	-4.357217
Exchange Rate	-58.445200	-18.199437
Total Interior Harvest	0.358448	7.483126
Net Blowdown	-21.697357	-4.010160
Deciduous (Cruise Based)	-18.004382	-6.483091
Camp	-1.44873	0.438058
Distance to Support Centre	-0.203422	-8.353229
Partial Cut 20	-20.691642	-3.261601
Other Attack	-38.804763	-3.673958
Count of Sales:	3,784	
Adjusted R^2	0.746164	

LN means the natural logarithm

Number of Bidders Equation - dependent variable is LN(NB)

Variable	2022 Final Equation	
	Co-efficient	t - Statistic
Forecast Real Winning Bid	0.012247	28.746247
Constant	-0.383890	-8.100779
Auction Year	-0.634059	-10.555306
Cruise Based * (1 – (RG35))	0.070222	1.954888
Cruise Based * (RG35)	0.097833	4.437297
District Average Number of Bidders	0.264252	16.616728
Partial Cut Fraction	-0.499960	-4.027027
Slope (>15)	-0.007468	-7.927680
First and Second Quarter Auctions	0.102522	5.936121
Highway Haul	0.059551	2.500197
Count of sales:	3,784	
Adjusted R^2	0.267454	

LN means the natural logarithm

The new dataset is made up of 15.25 years of sales. The oldest year (2007) was preserved in order to make sure an entire market cycle is represented in the dataset, including the last major downturn.

The MPS regressions are much like previous years with a few minor changes. The Ground Skid Slope Squared (15-50) variable was changed to Slope 15 in order reflect the broader spectrum of slope values rather than limiting it to ground skid slope values only. The only other minor modification applies to the first 15 percent of slope is described in the Appendix 2. Secondly the variable describing poor pine and fir log quality with the dry belt definition was changed to fir only. Furthermore, the definition of dry belt has changed as well and is described in full in Appendix 2. Thirdly, Other Attack hinge uses a different reference date (Jan 2020). Finally, the distance to support center has been rehinged at 200 km instead of 100.

To implement the new equation in the *Interior Appraisal Manual (section* 3.1), the two equations are reduced to one MPS equation. This is done by substituting the Number of Bidders equation into the Estimated Winning Bid Equation (and thereby eliminating the variable: LN (Number of Bidders). See Appendix 1 for detailed statistics on the estimated winning bid and number of bidder's equations and variable definitions.

4. SPECIFIED OPERATIONS

The auction dataset used to develop the MPS equation is comprised of 3,784 auctions. There are some harvesting situations that are not accounted for in the data and equation, and therefore a specified operation cost estimate may be used for these situations in the calculation of stumpage rates.

The specified operations are shown below and described in Appendix 2.

Specified Operations	Current Adjustment	Update July 1, 2022
1. Rail Haul	Appraisal Manual	Appraisal Manual
2. Barge/Ferry	Appraisal Manual	Appraisal Manual
3. Dump, Boom, Tow, Dewater and Reload	Appraisal Manual	Appraisal Manual
4. Skyline Yarding	$1.21/m^3	$1.38/m3
5. Horse Logging	$8.67/m^3	$8.67/m^3
6. Market Logger Specified Operations Cost	$0.07/m^3 Combined in Final Tenure Obligation Adjustment	$0/07/m^3 Combined in Final Tenure Obligation Adjustment
7. Helicopter	$122.41	$124.37/m^3

5. TENURE OBLIGATION ADJUSTMENTS

As outlined in the Interior Tenure Obligations Adjustment paper (June 5, 2006), the adjustments are based on licensee data submitted in the Interior Log Cost Report.

The tenure obligation adjustments are shown below.

Tenure Obligation	Current Adjustment	Update July 1, 2022
Total Administration Cost	2018/19 Cost Base	2019/20 Cost Base
Development Cost	2018/19 Cost Base	2019/20 Cost Base
Total Road Management Cost	2018/19 Cost Base	2019/20 Cost Base
Market Logger Development Cost	$1.60/m3	$1.68/m3
Total Silviculture Cost	2018/19 Cost Base	2019/20 Cost Base
Return to Forest Management	$1.046	$1.057
Low Grade Percent Adjustment	Mark Specific 1/(1-%low grade/100)	Mark Specific 1/(1-%low grade/100)

6. SUMMARY

The new final equation, specified operations and tenure obligation adjustments will be used in the MPS for the Interior, starting July 1, 2022.

APPENDIX 1

DESCRIPTION OF SPECIFIED OPERATIONS

If sufficient auction data is not available for an activity employed by either BCTS or other licences, the ministry may, for those identified situations, implement a specified operations cost estimate in the calculation of the stumpage rate.

The specified operations will be used to adjust the MPS stumpage rate for the estimated incremental cost of the identified situation. The explicit assumption is that if a bidder was faced with a similar situation he or she would lower the bid by the extra cost incurred because of the identified situation.

The situations that may be eligible for specified operations adjustment will be determined according to the following principles:

- the expectation that a bid would be influenced by this situation;
- representation (number of samples, if any, in the auction data set);
- materiality of estimated cost differential (supported by verifiable financial data); and,
- statistical analysis (including the premise that other represented situations and variables in the MPS database and equations may serve as a proxy for the situation in question).

The ministry, after considering the above and any other relevant technical information, may or may not designate the situation as an identified situation eligible for specified operations and, if eligible, will specify the dollars per cubic meter adjustment.

The ultimate objective is to have a representative auction database and hence, few, if any, specified operations adjustments.

The following are identified as specified operations for the Interior MPS. Cost estimates from the updated *Interior Appraisal Manual* are used for the following:

- Rail Haul
- Rail haul including truck to rail transfer and rail transport.
- Barge/Ferry
- Barge/ferry used to truck haul (private).
- Barge/ferry not used for truck haul (private).
- Dump and boom
- Tow
- Dewater and reload
- Camp costs
- Skyline Yarding
- Horse Logging
- Market Logger Specified Operations Cost
- High Development Cost (BCTS only)
- Helicopter

APPENDIX 2

VARIABLES AND DEFINITIONS FOR EQUATIONS

Variable	Definition
Auction year	If the auction sold in the 12 months ending March 2020, then Auction Year = 1.
Modified Balsam Fraction	The balsam fraction plus 2 times the balsam fraction minus 0.5 if balsam fraction is greater than 0.5.
Blowdown	Blowdown fraction – grey fraction (can't be < 0)
Camp	1 if eligible for CAMP under IAM Section 3.2.30
Cable Yard Fraction	Fraction of harvest method volume that is appraised as overhead cable yarding, tethered or winch-assist, or skyline methods.
Cable Yarding	Cable Yard Fraction – from 2013 to present.
Cedar Decay Fraction	Cedar decay (%) from the appraisal summary report/100.
Cedar Fraction	Fraction of total net coniferous volume that is cedar.
Cedar Fraction * Cedar Decay Fraction	Fraction of total net coniferous volume that is cedar * Cedar decay (%) from the appraisal summary report/100.
Constant	Fixed value.
Cruise Based	1 if cruise based, 0 if scale based.
CYCLE	Hauling round trip cycle time (Primary CT (hrs) + Secondary CT (hrs). See sections 3.2.13 of the Interior Appraisal Manual.
CYCLE_INC6	CYCLE – 6.0 hours. If <0, then 0.
Decay Fraction	Decay fraction minus other attack fraction (can't be < 0).
Deciduous Fraction	Fraction of the total net cruise volume that is the total net deciduous volume
Deciduous (Cruise Based)	Same as Deciduous Fraction but applies to cruise based only.
Decked Fraction	Fraction of cutting authority volume that has been decked and/or partially harvested in the timber sale licence. Cutting authority volume = total net cruise volume + volume of decked/partially harvested timber + right-of-way volume.
DSC (Distance to Support Centre)	Distance to Support Centre: see IAM section 3.2.29
District Average Number of Bidders	Average number of bidders for the district, in which the cutting authority area is located (see Table 3-3, section 3.2.22 Appraisal Manual).
District DRM or DMH	See 'Dry Belt'

Dry Belt	Dry Belt = 1 if the cutting authority volume is located in the BEC zone is IDF or PP and the subzone is dh, dm, xh, xm, or xw. The final Dry Belt is a prorate of the above for all regimes.
Exchange Rate	US$/C$ (a stronger C$ leads to a higher value) in decimal form.
Fir Fraction + Yellow Pine Fraction	Fraction of total net coniferous volume that is Douglas fir and yellow pine.
Fire Damaged Fraction	Fraction of total net coniferous volume that is fire damaged.
First and Second Quarter Auctions	If the auction sold in January to June, D_Q1 + Q2 =1.
Forecast Real Winning Bid	Estimated winning bid from the estimated winning bid equation.
Grey	Fraction of total net coniferous volume that is grey Mountain Pine Beetle attacked lodgepole pine.
Grey Fraction Hinge	Grey Fraction*(Award_Year - 2008)*(Award_Year>=2008) *CB*D_RG35
Slope (>15)	See 'SLOPE15 definition in Section 3.2.24 'Estimated Winning Bid Variables' of the *Interior Appraisal Manual* for more information.
HemBal Fraction	Fraction of total net coniferous volume that is hemlock and balsam.
Hemlock Fraction	Fraction of the Total Net Coniferous Volume that is hemlock.
Highway Haul	1 if primary haul method is highway, otherwise HWY = 0.
Larch Fraction + Yellow Pine Fraction	Fraction of total net coniferous volume that is larch and yellow pine.
Other Attack	Other Attack is the fraction of the Total Net Coniferous Volume that is insect attack other than Mountain Pine Beetle attacked Lodgepole Pine. Hinged at pre Jan 2020 and post Jan 2020.
Partial Cut Fraction	Fraction of the harvest method volume that is appraised as partial cut. PC = (100-CAPCUT%)/100. See section 4.5 of Appraisal Manual for definition of CAPCUT%. The 80% limit in the definition of CAPCUT in section 4.5 does not apply.
Partial Cut 20	Partial Cut 20 is for cutting authorities with greater than 20% partial cut retention levels. See section 3.2.23 of the Appraisal Manual.
RBID	Real Winning bid ($/m3).

Real Stand Selling Price	Real estimated stand lumber value ($/m3). Weighted average of (LRF * Lumber price by coniferous species). See Appraisal Manual section 3.2.2
Red + Grey Attack Fraction	Fraction of total net coniferous volume that is red and grey mountain pine beetle attack.
RG35	1 if Total Net Coniferous Volume of timber on the cutting authority area is comprised of 35% or greater red and grey Mountain Pine Beetle attacked Lodgepole pine, otherwise RG35 = 0.
Slope	SLOPE15 = (SLOPE-15), if slope is < then SLOPE 15 then SLOPE15 = 0.
Total Interior Harvest	Total Interior harvest (million m3) in a recent 12 month period. Includes all species and tenure types. Excludes waste.
Volume	The zonal volume from Table 3-2 (See Appraisal Manual section 3.2.8) for the cutting authority unless: 1. The cutting authority is a BCTS cutting authority; if so then use the Total Net Coniferous Volume for the cutting authority. 2. The cutting authority is not a BCTS cutting authority and, the sum of all the AAC's for all the licences that the licensee has in the same TSA as the cutting authority being appraised is less than the zonal volume indicated in Table 3-3 for the selling price zone in which the cutting authority is located, if so, then use the greater of: - The Total Net Coniferous Volume, or The sum of the AAC volumes described above
Volume per Tree	- Cutting authority average net volume per tree, from appraisal summary report (m3).
Volume per hectare	Natural logarithm of volume per hectare.
YEM	Year ending March of 2021.
Zone 6	Skeena selling price zone variable. Zone 6 = 1 if cutting authority is appraised with selling price zone 6, otherwise Zone 6 = 0.
Zone 9	Fort Nelson – Peace selling price zone variable. Zone 9 = 1 if cutting authority is appraised with selling price zone 9, otherwise Zone 9 = 0.

APPENDIX 3 - REGRESSIONS

FINAL ESTIMATED WINNING BID

MODEL INFO:
Observations: 3784
Dependent Variable: RBID
Type: OLS linear regression

MODEL FIT:
$F(29,3754) = 384.460194$, $p = 0.000000$
$R^2 = 0.748110$
Adj. $R^2 = 0.746164$

Standard errors: Robust, *type* = HC3

	Est.	S.E.	t val.	p
(Intercept)	40.288930	4.258937	9.459855	0.000000
LOG_NB	8.501125	0.390549	21.767140	0.000000
RSPI_SB	0.370769	0.015472	23.964504	0.000000
RSPI_CB	0.258002	0.018452	13.982596	0.000000
CE	18.671466	6.764656	2.760150	0.005806
CE_CEDECAY	-129.634548	29.130287	-4.450164	0.000009
HE	-18.725119	2.399196	-7.804748	0.000000
BA_HINGE	-4.379429	1.663252	-2.633052	0.008497
LA_YE	-11.648498	4.719641	-2.468090	0.013628
DRY_FIR_PP_IDF_XH	-5.010213	3.810906	-1.314704	0.188690
CABLE_2013	-22.372519	2.682591	-8.339890	0.000000
LOG_CVOL_1000	2.568849	0.324801	7.908984	0.000000
FIRE	-28.367623	3.174340	-8.936542	0.000000
NET_DECAY_SB	-20.374576	7.128077	-2.858355	0.004282
LOG_VPT	8.223022	0.665092	12.363745	0.000000
Z9	-5.321302	1.027906	-5.176834	0.000000
CYCLE_HINGE	-1.695210	0.157490	-10.763948	0.000000
OTHER_POST2020.01	-38.804763	10.562115	-3.673958	0.000242
GREY_HINGE.ST	-1.216720	0.279242	-4.357217	0.000014
CB_1_D_RG35	4.272538	1.292885	3.304654	0.000960
DECKED	32.176866	18.210019	1.766987	0.077312
SLOPE_15	-0.139564	0.039545	-3.529214	0.000422
FX_3_1	-58.445200	3.211374	-18.199437	0.000000
HARVOL_S	0.358448	0.047901	7.483126	0.000000
NET_BLOWDOWN	-21.697357	5.410596	-4.010160	0.000062
NET_DECID_CB_DECID_BONUS_SB	-18.004382	2.777129	-6.483091	0.000000
YEM2022	6.223703	4.045471	1.538437	0.124026
PC_20_100	-20.691642	6.344013	-3.261601	0.001118
DSC_HINGE200	-0.203422	0.024352	-8.353229	0.000000
CAMP_DIST	-1.435702	0.513503	-2.795897	0.005202

FINAL NUMBER OF BIDDERS

MODEL INFO:
Observations: 3784
Dependent Variable: LOG_NB
Type: OLS linear regression

MODEL FIT:
$F(9,3774) = 154.464222$, $p = 0.000000$
$R^2 = 0.269196$
Adj. $R^2 = 0.267454$

Standard errors: Robust, *type* = HC3

	Est.	S.E.	t val.	p
(Intercept)	-0.383890	0.047389	-8.100779	0.000000
RWB.ReH	0.012247	0.000426	28.746247	0.000000
CB_1_D_RG35	0.070222	0.035921	1.954888	0.050670
CB_D_RG35	0.097833	0.022048	4.437297	0.000009
PARCUT	-0.499960	0.124151	-4.027027	0.000058
SLOPE_15	-0.007468	0.000942	-7.927680	0.000000
DANB	0.264252	0.015903	16.616728	0.000000
HWY_TRAN	0.059551	0.023818	2.500197	0.012455
DQ1_DQ2	0.102522	0.017271	5.936121	0.000000
YEM2022	-0.634059	0.060070	-10.555306	0.000000