Appendix 2

1 Determination of Harvest Levels

Calculation of gross harvest levels was complicated by numerous factors including reconciliation volume and an accelerated coniferous harvest that started part way through the first period and ended part way through the fifth period.

From May 1, 2004 (model reference date) to April 30, 2007, the harvest level for primary volume was assumed to be at that level generated by the 2006 DFMP submission (Appendix 6.5D) including quadrant reconciliation volumes. Reconciliation volumes would not be approved with un-even flow harvests. However, with three years of the first period already harvested, it was necessary to account for the reconciliation volumes reported in the DFMP when determining the new harvest levels. Therefore, it was assumed that all reconciliation volume had been balanced over the first 3 years of the first period (i.e., by May 1, 2007). Table 1–1 summarizes the proposed gross harvest levels, generated using the procedures outlined in this section.

Table 1–1 Proposed Gross Harvest Levels (m^3/yr)

FMU	Volume	May 1, 2007 – April 30, 2024	May 1, 2024 – April 30, 2025	May 1, 2025 – April 30, 2164
E1	Prim Con	142,011		65,989
	Prim Dec	26,025		
	Inc Dec	21,243	15,829	
	Inc Con	17,581		
E2	Prim Con	65,268		38,132
	Prim Dec	90,626		
	Inc Dec	10,010	9,456	
	Inc Con	38,208		
W5	Prim Con	23,685		22,168
	Prim Dec	42,594		
	Inc Dec	8,945	11,030	
	Inc Con	8,409		
W6	Prim Con	239,019		138,840
	Prim Dec	92,208		
	Inc Dec	76,157	62,830	
	Inc Con	22,026		
FMA	Prim Con	469,983		265,130
	Prim Dec	251,453		
	Inc Dec	116,354	99,145	
	Inc Con	86,224		

1.1 Primary Conifer

Primary conifer underwent an accelerated harvest for 18 years, effective May 1, 2007 (3 years into the first period) extending to the end of the first year of the fifth period (April 30, 2025). As such, calculation of the harvest level required periods 1 and 5 to be split into accelerated and non-accelerated harvest levels. The following process was used.

1. Determine the allocated primary conifer volume from period 1, without regard to reconciliation volume, from Appendix 6.5D of the November 2006 DFMP submission.
   - 373,615 m^3
2. Multiply by 0.6 to determine how much volume would have been harvested in the first 3 years of period 1, if harvesting at the DFMP allocated level.
   - 373,615 m^3 * 0.6 = 224,169 m^3
3. Add the reconciliation volume to determine how much volume would have to be harvested over the first 3 years to balance all reconciliation volume by May 1, 2007.
   - 224,269 m^3 + (-8,458 m^3) = 215,711 m^3
4. Determine the allocated primary conifer volume from period 1 of the PFMS.

- 505,772 m^3

5. Subtract the volume already harvested that balances the reconciliation volume (from point 3 above) to determine the portion of the PFMS allocated volume that is left to be harvested in the last 2 years of period 1 (i.e., during the accelerated primary conifer harvest period)
   - 505,772 m^3 – 215,711 m^3 = 290,061 m^3
6. Sum the allocated primary conifer harvest from periods 2-4, which are part of the accelerated primary conifer harvest period.
   - 697,625 m^3 + 707,983 m^3 + 717,253 m^3 = 2,122,861 m^3
7. Determine the post-surge average primary conifer harvest level (period 6-32). Period 5 includes part of the accelerated harvest period, so it is excluded from contributing to the average.
   - 329,945 m^3
8. Multiply the post-surge average from point 7 by 0.8 to determine how much would be harvested in the last 4 years of period 5.
   - 329,945 m^3 * 0.8 = 263,956 m^3
9. Subtract the value determined in point 8 from the PFMS allocated primary conifer harvest level from period 5 to determine how much of that volume remains to be harvested in the first year of period 5 (during the accelerated conifer harvest period).
   - 407,230 m^3 – 263,956 m^3 = 143,274 m^3
10. Add the harvest volumes determined in points 5, 6 and 9 together to determine how much volume is being harvested during the 18-year accelerated conifer harvest period.
    - 290,061 m^3 + 2,122,861 m^3 + 143,274 m^3 = 2,556,197 m^3
11. Divide the harvest volume determined in point 10 by 18 years (the accelerated harvest period) to determine the average annual **primary conifer harvest level, effective May 1, 2007 to April 30, 2025**.
    - 2,556,197 m^3 / 18 years = **142,011 m^3/yr**
12. The post-surge average primary conifer harvest determined in point 7, divided by 5 to convert to an annual harvest, is the long term post-surge average **primary conifer harvest level, effective May 1, 2025 to April 30, 2164** (end of the planning horizon)
    - 329,945 m^3/pd / 5 years/pd = **65,989 m^3/yr**

Table 1–2 Gross Primary Conifer Harvest Level Determination

		E1	E2	W5	W6
Period 1	DFMP Allocation	373,615	214,933	121,973	868,176
	3-yrs of DFMP (60%)	224,169	128,960	73,184	520,906
	plus DFMP recon vol	-8,456	-19,936	7,594	276,551
	Subtotal	215,711	109,024	80,778	797,457
	PFMS allocation	505,772	238,011	125,656	1,179,919
	less DFMP 3-yr	215,711	109,024	80,778	797,457
	= surge (2-yr) volume	290,061	128,987	44,878	382,462
Period 2-4	PFMS alloc (surge)	2,122,861	973,618	358,922	3,700,846
Period 5	Post-surge avg (6-32)	329,945	190,661	110,842	694,202
	4-yr alloc (80%)	263,956	152,529	88,674	555,361
	PFMS allocation	407,230	224,750	111,211	774,388
	less 4-yr post-surge	263,956	152,529	88,674	555,361
	= surge (1-yr) volume	143,274	72,221	22,537	219,027
Total surge volume (18-yr)		2,556,197	1,174,826	426,338	4,302,335
Average surge volume (m3/yr)		**142,011**	**65,268**	**23,685**	**239,019**
Period 6-32	PFMS allocation	8,908,526	5,147,858	2,992,739	18,743,441
	Time span (years)	135	135	135	135
Average post-surge volume (m3/yr)		**65,989**	**38,132**	**22,168**	**138,840**

1.2 Primary Deciduous

Primary deciduous does not undergo an accelerated harvest, thus the average harvest level across the planning horizon can be used to determine the proposed harvest levels, after balancing reconciliation volumes over the first 3 years of the first period. The following process was used.

1. Determine the allocated primary deciduous volume from period 1, without regard to reconciliation volume, from Appendix 6.5D of the November 2006 DFMP submission.
   - 135,897 m^3
2. Multiply by 0.6 to determine how much volume would have been harvested in the first 3 years of the period, if harvesting at the DFMP allocated level.
   - 135,897 m^3 * 0.6 = 81,538 m^3
3. Add the reconciliation volume to determine how much volume would have to be harvested over the first 3 years to balance all reconciliation volume by May 1, 2007.

- 81,538 m^3 + 78,772 m^3 = 160,310 m^3

4. Determine the allocated primary deciduous volume from period 1 of the PFMS.
   - 214,569 m^3
5. Subtract the volume already harvested that balances the reconciliation volume (from point 3 above) to determine the portion of the PFMS allocated volume that is left to be harvested in the last 2 years of period 1.
   - 214,569 m^3 – 160,310 m^3 = 54,259 m^3
6. Sum the allocated primary deciduous harvest from periods 2-32 and add it to the volume left to be harvested in the last 2 years of the first period (from point 5).
   - 4,031,612 m^3 + 54,259 m^3 = 4,085,871 m^3
7. Divide the total primary deciduous harvest determined in point 6 by the 157 years remaining in the planning horizon from May 1, 2007. This represents the **primary deciduous harvest level, effective May 1, 2007 to April 30, 2164** (end of the planning horizon).
   - 4,085,871 m^3 / 157 years = **26,025 m^3/yr**

Table 1–3 Gross Primary Deciduous Harvest Level Determination

		E1	E2	W5	W6
Period 1	DFMP Allocation	135,897	458,935	218,216	484,607
	3-yrs of DFMP (60%)	81,538	275,361	130,930	290,764
	plus DFMP recon vol	78,772	66,233	-8,066	293,972
	Subtotal	160,310	341,594	122,864	584,736
	PFMS allocation	214,569	538,175	212,211	777,174
	less DFMP 3-yr	160,310	341,594	122,864	584,736
	= 2-yr volume left	54,259	196,581	89,347	192,438
Period 2-32	PFMS allocation	4,031,612	14,031,714	6,597,949	14,284,149
Total Volume (post May 1, 2007)		4,085,871	14,228,296	6,687,296	14,476,587
Divided by # of years remaining		157	157	157	157
Average volume (m3/yr)		**26,025**	**90,626**	**42,594**	**92,208**

1.3 Incidental Deciduous

All models permitted 10% flow variation on incidental deciduous volumes from periods 1-4 to account for the increased incidental deciduous volumes associated with the accelerated primary conifer harvest. As such, incidental deciduous harvest level is calculated by averaging the harvest level from periods 1-4, thus being the effective **incidental deciduous harvest level from May 1, 2007 to April 30, 2024**. Although periods 1-4 do not perfectly overlap the accelerated conifer harvest time frame, it does allow enough flexibility in the model to manage for MPB without unnecessarily complicating the model formulation. There was no reconciliation volume to consider,

and it was assumed that harvest in the first 3 years of period 1 (May 1, 2004 to April 30, 2007) was consistent with the average.

The incidental deciduous harvest flows were also constrained to 10% variation from period 5 to 32 (end of planning horizon). Thus, the effective **incidental deciduous harvest level from May 1, 2024 to April 30, 2164** is the average from period 5 to 32, inclusive. Table 1–4 presents a summary of the calculations.

Table 1–4 Gross Incidental Deciduous Harvest Level Determination

		E1	E2	W5	W6
Period 1-4	PFMS Allocation	424,860	200,198	178,900	1,523,130
	Time span (years)	20	20	20	20
Average volume (m3/yr)		**21,243**	**10,010**	**8,945**	**76,157**
Period 5-32	PFMS Allocation	2,216,112	1,323,901	1,544,134	8,796,153
	Time Span (years)	140	140	140	140
Average volume (m3/yr)		**15,829**	**9,456**	**11,030**	**62,830**

1.4 Incidental Coniferous

FMUs E2 and W5 permit 10% flow variation on incidental coniferous volumes from periods 1-32. Due to preblocking from the first 3 years of period 1, there is an incidental conifer spike in FMUs E1 and W6 in period 1. As a result, incidental conifer volume is constrained to 10% flow variation from periods 2-32 instead, and 20% from period 1-2. Incidental coniferous harvest level is therefore calculated by averaging the harvest level from periods 1-32 for E2 and W5, and from periods 2-32 for E1 and W6. This assumes that the incidental conifer spike in period 1 in FMUs E1 and W6 is a factor only of the allocation of the first 3 years of the period. As a result, the **incidental coniferous harvest levels are from May 1, 2007 to April 30, 2164**. Table 1–5 presents a summary of the calculations.

Table 1–5 Gross Incidental Coniferous Harvest Level Determination

		E1	E2	W5	W6
Period 1*-32	PFMS Allocation	2,725,044	6,113,282	1,345,520	3,414,032
	Time span (years)	155	160	160	155
Average volume (m3/yr)		**17,581**	**38,208**	**8,409**	**22,026**

* FMU E1 and W6 use periods 2-32

1.5 Grazing

The final, aspatial Woodstock models that were used to develop the spatial harvest sequence and the PFMS of the November 2006 DFMP were used to determine the grazing disposition AAC levels. Two separate models were run; one with harvesting only occurring on the grazing disposition areas, the second with harvesting only on areas outside grazing dispositions. This was intended to determine the sustainable even flow harvest level inside the grazing area and to determine the impact on gross AAC of

requiring even flow within the grazing dispositions. These two scenarios were run for each FMU. Refer to the November 2006 DFMP submission for additional information on the formulation of the grazing models. The results of the grazing analysis are shown in Table 1–6.

Table 1–6 Gross Harvest Levels within Grazing and Non-Grazing Areas by FMU

	E1		E2		W5		W6	
	Conifer	Deciduous	Conifer	Deciduous	Conifer	Deciduous	Conifer	Deciduous
Primary								
Grazing Area AAC	44	45	2,873	12,575	3,495	12,614	1,002	3,194
Non-grazing Area AAC	74,839	28,466	40,357	83,223	20,444	28,816	157,401	93,484
Gross AAC	74,883	28,511	43,230	95,798	23,939	41,430	158,404	96,679
Incidental								
Grazing Area AAC	16	6	4,627	664	2,470	2,366	708	608
Non-grazing Area AAC	18,354	14,896	35,066	8,854	5,994	9,244	21,891	60,085
Gross AAC	18,370	14,903	39,693	9,518	8,464	11,609	22,599	60,693
Total *								
Grazing Area AAC	60	51	7,500	13,239	5,965	14,979	1,710	3,802
Non-grazing Area AAC	93,194	43,363	75,423	92,076	26,438	38,060	179,293	153,570
Gross AAC	93,253	43,414	82,923	105,316	32,403	53,039	181,003	157,372
% of AAC on Grazing								
Primary	0.1%	0.2%	6.6%	13.1%	14.6%	30.4%	0.6%	3.3%
Incidental	0.1%	0.0%	11.7%	7.0%	29.2%	20.4%	3.1%	1.0%
Total	0.1%	0.1%	9.0%	12.6%	18.4%	28.2%	0.9%	2.4%

* No direct comparison to PFMS can be made

The allocation of volume from grazing areas to Weyerhaeuser was generally in the same proportion as their allocation of FMA volume. For example, in FMU E1, Weyerhaeuser receives 95.3% of the primary conifer AAC. Therefore, Weyerhaeuser was similarly allocated 95.3% of the primary conifer AAC from the grazing areas. Where fixed volume allocations exist (E2, W5 and W6), the proportion of grazing versus non-grazing volume was assumed to match the proportions determined from the grazing analysis (i.e., if 15% of the primary deciduous AAC is from grazing areas, then 15% of the fixed primary deciduous volume allocation is assumed to be from the grazing areas).

In W6, 0.6% of the primary conifer AAC was from grazing areas. However, 0.6% of the non-Weyerhaeuser PFMS harvest level is greater than the available grazing AAC determined in Table 1–6. This would result in a negative primary conifer grazing AAC for Weyerhaeuser if the same process was applied as for deciduous volumes. Weyerhaeuser receives 24.7% of the primary conifer harvest level in W6 (as shown in Table 1 of Appendix 5), therefore Weyerhaeuser was allocated 24.7% of the primary conifer grazing AAC in W6. The calculations are shown in Table 1–7.

Table 1–7 Weyerhaeuser Non-FMA Quota Allocations

	Conifer	Deciduous	Conifer	Deciduous	Conifer	Deciduous	Conifer	Deciduous
Mean Gross AAC Grazing	60	51	7,500	13,239	5,965	14,979	1,710	3,802
Primary aac (1)	44	45	2,873	12,575	3,495	12,614	1,002	3,194
Incidental aac (2)	16	6	4,627	664	2,470	2,366	708	608
% allocation of aac to WY – Primary (3)	95.30%	100%	14.91%	100% – 13.1% of MTU	0	100% – 30.4% of MTU	24.7%	100%
% allocation of aac to WY – Incidental (4)	100%	100%	20%	100%	0	0	100%	100% – 1% of MTU
Gross Primary Volume allocations to WY (3X1)	42	45	428	12,357	0	11,261	248	3,194
Gross Incidental Volume allocations to WY (4X2)	16	6	925	664	0	0	708	412
Gross Grazing AAC to WY (Primary and Incidental)	58	51	1,354	13,021	0	11,261	955	3,606
Net Primary Volume allocations to WY	38	38	403	11,121	0	10,135	233	2,875
Net Incidental Volume allocations to WY	14	5	870	598	0	0	665	371
Net Total Grazing AAC to WY	51	43	1,273	11,718	0	10,135	898	3,246

The final proposed grazing harvest levels are summarized in Table 1–8. The calculated Weyerhaeuser grazing harvest levels were subtracted from the total Weyerhaeuser harvest levels to derive separate grazing and non-grazing harvest levels, as outlined in the timber allocation tables available in Appendix 5.

Table 1–8 Proposed Non-FMA Weyerhaeuser Dispositions

Disposition	Primary m3/yr	Incidental m3/yr	Total m3/yr	QAAC m3/period
Deciduous				
DTA E010002	38	5	43	217
DTA E020002	11,121	598	11,718	58,592
DTA W050003	10,135	0	10,135	50,673
DTA W060010	2,875	371	3,246	16,228
Coniferous				
CTQ E010006	38	14	51	257
CTQ E020003	403	870	1,273	6,363
CTQ W060013	233	665	898	4,490