Economic Parameters For Estimating the Delivered Wood Cost in the Deh Cho Planning Area

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A. Introduction

The Deh Cho Land Use Planning Committee is charged to put together a long-term land use plan that recognizes various resource use opportunities inherent with the existing land base. Forestry is one of the many land use options that are being considered in the modeling phase of the planning project. To assist with the modeling exercise, key economic parameters such as delivered wood costs and timber pricing are required to be estimated for the 20-year horizon. Meyers Norris Penny (MNP) has been commissioned by the Deh Cho Land Use Planning Committee to develop the projected delivered wood cost estimates.

The purpose of this report is to summarize the estimates.

B. Sawlog Harvesting Cost Estimate For The Deh Cho Territory

1.0 Forest Management Assumptions

The NWT does not have a large timber resource and, as a result, has not been "historically blessed" with a major forest industry. Depending on which report and which inventory you read and what utilization standard is applied, the AAC is probably less than 500,000 m^3. Also, given the distribution of the timber, lack of existing transportation infrastructure and the distance to major markets, the potential for a commodities-based major mill to be established in the area does not currently exist. These factors lend themselves perfectly to the development of locally based commodities and value-added forest products businesses to serve the northern markets with the possible eventual shipment of higher value products to southern markets. The major underlying assumption for this analysis is that, on a landscape-level, the focus will be on obtaining maximum value from the total forest resource.

2.0 Timber Management Assumptions

Based on the timber supply reports, various inventory information and the review of a sample of operational scale maps provided for the areas containing moderate to very high potential sawlog volumes, timber management will target White Spruce (Sw) and Trembling Aspen (A) as the two major commercial tree species.

Since all naturally occurring Sw stands are multi-aged, uneven-aged silvicultural strategies will apply at the landscape planning level. At the operational level, uneven-aged silvicultural systems will apply (e.g. individual tree selection, shelterwood, group selection, etc.) depending on the size of the harvesting unit. The larger the unit, the more uneven-aged the resulting stand will be. The smaller the unit (i.e. 1 to 2 ha), the more even-aged the resulting stand will appear. Harvesting systems used for the costing estimates reflect those required in operating the mixture of stands shown on the inventory maps provided.

The aspen stands appear to be primarily even-aged. Cull factors can be high (up to 30%) as per inventory reports supplied. For costing purposes, aspen harvest will be done for sawlog production. The objective will be to maximize value recovery (i.e. F1 and F2 grade logs according to the hardwood log grading system) from the aspen dominant stands. This will require selective harvesting of individual trees or, perhaps,

clones. Based on experience in other areas, it is unlikely that more than 12% of the aspen AAC will be suitable for sawlog production.

The current reforestation ratio of 65:35 (natural to artificial) is expected to increase to 90:10 for Sw using uneven-aged management strategies. Aspen reforestation should be 100% natural with minimal costs incurred for some site preparation and assessment work.

3.0 Operational Assumptions

The cost of harvesting and delivering timber to a mill depends on a number of operating variables. Productivity of each of the main harvesting phases is largely dependent on volume per tree and merchantable volume per hectare. The silvicultural system used will influence these factors as well as the reforestation costs. Total volume to be cut (AAC) will have a major effect on infrastructure construction and maintenance costs (e.g. roads). For the purpose of estimating delivered log costs to assist in the regional planning exercise, the following assumptions were made; these are based on the various timber supply reports and inventory information provided.

3.1 General Operating Conditions and Timber Profile

The general operating conditions are as follows:

- Silvicultrual system — White Spruce – uneven-aged Aspen – even-aged and uneven-aged (stand specific)
- Harvesting system — Selective – including individual tree, shelter-wood and group selection. Maximum removal in Sw stands – 15% - 20% of crown closure. Patch and selective in Aspen.
- Average volume per tree — Sw – directly tied to average DBH at rotation age (120 yr.) and 13 cm top in merchantable Sw dominant stands and incidental in Aspen stands. (1.71 m^3/tree).
  Aspen – based on average DBH at age 70 in merchantable Aspen stands and incidental in Sw stands (1.75 m^3).
- Average volume per hectare
  - For removal in Sw stands — Sw – 142.6 m^3; Aspen – 4.6 m^3
  - For removal in A stands — Sw – 0.8 m^3; A – 20.5m^3
- Average unmerchantable stems/ha. — Sw stands – 486; A stands – 664
- Understory protection to apply.
- Winter operations only – October to April
- Average weight to volume conversions — Sw – 850 kg/m^3; A – 960 kg/m^3

3.2 Harvest volumes:

Three areas have been identified as possible regions where sawlog harvest can take place based on the available softwood and hardwood timber inventory data – Fort Liard, Fort Smith and Enterprise. Based on the sample inventory maps, available stand and stock tables and the sawlog distributions identified for these three areas, the possible volumes of sawlogs available in these three regions are:

- Fort Liard –100,000 m^3/yr. (Based on the volume per hectare for both softwood and aspen indicated in Section 3.1 and 678 hectares per year of accessible harvest area.)
- Fort Simpson – 60,000 m^3/yr. (Based on the volume per hectare for both softwood and aspen indicated Section 3.1 and 408 hectares per year of accessible harvest area.)
- Enterprise – 12,000 m^3/yr. (Based on the volume per hectare for both softwood and aspen indicated in Section 3.1 and 82 hectare per year of accessible harvest area.)

Appendix A shows the geographical locations of these three regions.

4.0 Harvesting Cost Estimates

4.1 Felling

All felling will be done with chain saws with tree selection by the feller. The assumed average estimated productivity is 18.0 m^3/productive hour (Sw) and 9.4m^3 (Aw).

The estimated cost is \$2.50/m^3 (Sw) and \$4.79/m^3 (Aw). These rates will apply to all harvest areas.

4.2 Skidding

Skidding will be done using small to medium-sized line machines (rubber-tired or tracked) to maximize winching ability and minimize damage to understory and unmerchantable timber. Average estimated productivity is assumed at 12.6 m^3/ productive machine hour (Sw) and 11.7 m^3 (Aw). The estimated costs area: \$5.16/m^3 (Sw) and \$5.56/m^3 (Aw).

4.3 Processing

Some processing (i.e. topping) will be done at the stump by the faller to help minimize residual tree damage during skidding. The rest of the de-limbing and any bucking will be done mechanically at roadside or on the landing. Average estimated productivity is assumed at 43.6 m^3/productive machine hour for mechanical and 9.0 m^3/hour for chainsaw. The estimated cost is \$3.21/m^3 for mechanical (Sw primarily) and \$5.00/m^3 for chainsaw (Aw primarily).

4.4 Main Road Construction

The main haul roads to and through harvest areas will be considered permanent, but of lower class (Alberta Class 5), winter use only. Watercourse crossings will be snow-fill, ice bridge or culverts in some cases. Existing access will be improved and used where possible. Construction of a network will be progressive each year amortized over the volume removed during the year of construction. Haul points used for costing are:

- Fort Liard – timber from Lower Liard area
- Fort Simpson – timber from Upper Liard and Wrigley
- Enterprise – timber from the Cameron Hills
  (See spreadsheet for yearly estimates)

It should be emphasized that the 500,000 m^3 AAC volume mentioned above is not directly related to the operational volumes used for these cost estimates. The volumes used in the cost estimation are reasonable estimates based on the apparent inventory distribution and initial harvest volume expectations needed to produce acceptable unit (cubic meter) costs for the required fixed infrastructure for each region (e.g. road construction and maintenance, overhead, supervisory, planning needs). If uneven-aged management is to be practiced, as the cost estimates assume, the AAC calculations may need to be re-examined. The 172,000 m^3 volume will likely be within any new calculations and is a reasonable number to use for initial strategic planning.

4.5 Harvest Area Road and Landing Construction

These roads are Class 5 temporary and temporary workspace areas.

(See Appendix B for yearly cost estimates)

4.6 Road Maintenance

Includes equipment use and sanding requirements primarily during log haul. Costs vary depending on the required haul days for varying volumes per year. (See spreadsheet for yearly estimates).

4.7 Clean-up

Involves piling and burning debris accumulations, slashing, watercourse removal and erosion control. Costs will vary with area and volume logged. (See Appendix B for yearly estimates)

4.8 Equipment Moves

Low-bed costs are assumed for moving skidders and dozers. Costs vary with volume logged and equipment requirements. The spreadsheet shows the yearly estimates.

4.9 Loading & Hauling

Loading and hauling will be done using self-loading, 6-axle pole trailers. This equipment allows flexibility in hauling to small mills where large loaders may not be available or yard space is limited. Also, picking up small volumes at various decking sites necessary with selective harvesting will be more efficient. Average net weights should be about 29 tonnes and hourly rates in the $120 to $130 range. Costs will vary by year according to the estimated cycle times. (See Appendix B for a breakdown)

The cycle time estimates are for destinations within the NWT – specifically Enterprise, Fort Liard and Fort Simpson. It is assumed that all logs will be manufactured near those local communities - no timber will be exported.

4.10 Contractor Administration

This cost allowance covers crew transportation, camp costs, accounting, daily crew supervision and other overhead expenses. The estimated cost is $1.20/$m^3$.

4.11 Reforestation

Aspen reforestation activity is limited to scarification in low density stands to encourage natural suckering. Estimated costs also include those for regeneration surveys and mapping. The estimated cost is $2.60/$m^3$.

It is expected that selective harvesting activity in Sw stands will result in 90% of areas regenerating naturally. About 10 % of the area will be winter scarified and either naturally seeded or hand-seeded. Estimated costs include allowances for regeneration surveys and seed collection. The estimated cost is $5.20/$m^3$.

4.12 Forestry, Supervision and Administration

This cost includes a company's operational and long-range planning, layout, contract administration and scaling activities. Costs will vary with yearly volume requirements and reflect wages, salaries, transportation, office and other estimated administrative costs (See Appendix B for a yearly breakdown)

NOTE:

- **Costs do not include stumpage or other government charges.**
- **Additional estimated cost to load and haul from Enterprise to High Level 0 $14.01/$m^3$ – (6.9 hour cycle time with 7-axle @ $92/hour)**

5.0 Development Staging

Based on the estimated delivered wood costs, the area that should have a higher priority in term staging timber harvesting as part of the Deh Cho economic development agenda is Fort Liard because the region has the lowest delivered wood costs. Fort Smith and Enterprise would have lower priorities accordingly. However, it is noted that harvesting

activities are already present in the Enterprise region to meet the need of a local sawmill. This underscores the fact development staging is more so influenced by local community factors. For example, if a local community or a member of the community decides to pursue timber processing activities, these activities can take place so long certain basic economic and community development conditions – other than just profit maximization – are satisfied.

6.0 Estimated delivered wood costs over the planning horizon

Based on the assumptions presented above, the delivered wood costs for both conifer and aspen sawlogs over the 20 year planning horizon are presented in Appendix B.

The costs are estimated in 2005 dollar. They vary over time because different areas within the three regions will be accessed which entail new road construction and different hauling distances between the harvest areas and the processing centres.

The estimated delivered wood costs are presented in two formats in Appendix B. First, the 20-year planning horizon is divided into 2-year increments and the total costs are presented as lump sum figures. Second, the planning horizon is divided into 4-year increments and a breakdown of the delivered wood costs by component is presented.

C. Trend prices for coniferous and deciduous logs south of the NWT

Timber is sold in two ways in regions south the NWT (e.g., Alberta) – in log form on a delivered basis and standing timber (at the stump). In the following table, two types of transaction prices are shown together with the average delivered wood costs for both coniferous and deciduous timber in Alberta. The first type is the bid price established through auctions of short-term timber permits (Commercial Timber Permits or Deciduous Timber Permits) by the Alberta Government. The second is the transaction value for private timber. This data was collected through an annual survey.

It appears that the transaction values were trending downward between 1999 and 2002 which was consistent with the trend price of dimension lumber (e.g., 2x4) prices. During this period, the delivered price for softwood logs was as high as $40 per cubic metre using the timber permit bid rates as the reference point and $50 per cubic metre using the private timber transaction values as the reference point. For deciduous timber, the delivered price appeared to range from $24 per cubic metre to $28 per cubic metre for the same period.

It should be pointed out that due to higher lumber and OSB prices during the last quarter of 2003 and the first half of 2004, indications were that private timber transaction values did head up during this period. The impact appeared to be mostly on softwood logs as delivered prices were as high as $65-70 per cubic metre.

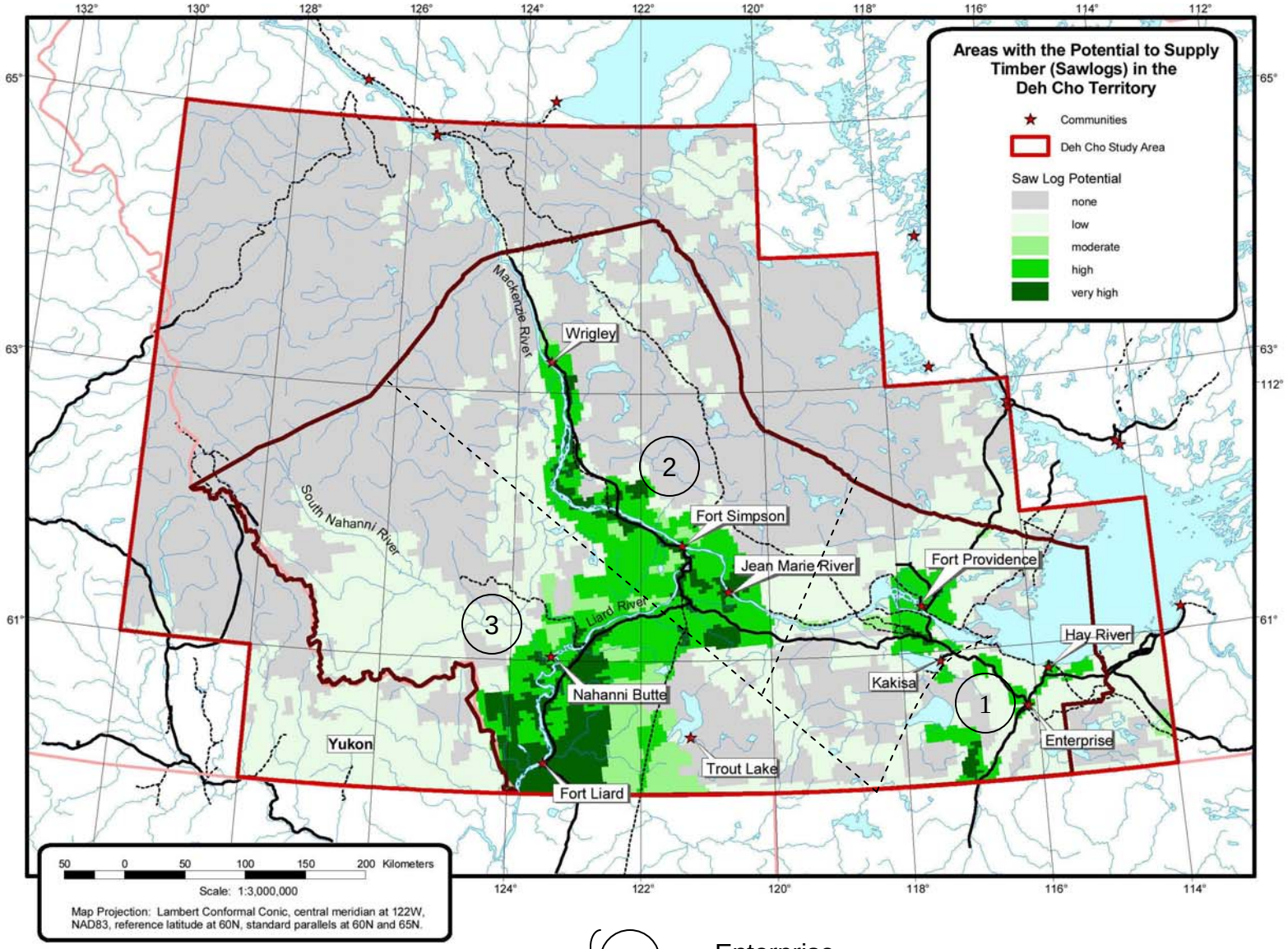
Timber transaction value in Alberta

	Timber Permit Bid Rates (bonus bid)		Standing timber values-private transactions		Average delivered wood cost	
Year	Coniferous	Deciduous	Coniferous	Deciduous	Coniferous	Deciduous
1999	$16.11	$1.86	$24.96	$3.70	$24.88	$22.78
2000	$11.07	$2.19	$21.52	$1.40	$28.81	$25.52
2001	$12.00	$2.02	$21.23	$1.83	$24.11	$22.75
2002	$9.61	$1.20	$16.43	$2.74	$26.43	$25.71
2003	$11.20	$1.43	$18.32	$2.90	$27.52	$25.80

A 20-year projection is provided below for the timber transaction value for both softwood and deciduous. The projection is based on the long-term projected prices for western spruce-pine-fir 2x4, standard and better and 7/16 OSB provided by Resource Information System Inc, as presented below.

Year	Coniferous	Deciduous
1999	$49.84	$26.48
2000	$50.33	$26.92
2001	$45.34	$24.58
2002	$42.86	$28.45
2003	$45.84	$28.70
2004	$51.92	$31.37
2005	$44.95	$24.31
2006	$45.03	$24.31
2007	$47.43	$29.10
2008	$49.04	$27.52
2009	$47.60	$24.35
2010	$45.43	$23.92
2011	$45.51	$24.89
2012	$48.40	$28.63
2013	$51.04	$27.88
2014	$50.64	$24.96
2015	$48.16	$24.85
2016	$48.88	$27.55
2017	$51.28	$29.86
2018	$53.12	$27.23
2019	$50.80	$25.07
2020	$51.96	$26.15
2021	$51.73	$27.38
2022	$51.02	$27.43
2023	$50.45	$26.91
2024	$51.21	$27.17
2025	$51.78	$27.14

Appendix A



Study Regions

1 Enterprise

2 Fort Simpson

3 Fort Laird

Appendix B

FORESTRY SCENARIOS - m^3 /YEAR /HARVEST AREA

Year	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	
Fort Liard	0	0	5000 ASPEN	5000 ASPEN	10000	10000	15000	15000	20000	20000	25000	25000	30000	30000	35000	35000	40000	40000	45000	45000	Start at 5,000m^3/yr in year 3 increasing every 2 years in increments of 5,000 m^3/yr to 45,000m^3/yr in year 20
Fort Simpson	5000 ASPEN	5000 ASPEN	10000	10000	15000	15000	20000	20000	25000	25000	30000	30000	35000	35000	40000	40000	45000	45000	50000	50000	Start at 5,000m^3/yr in year 1 increasing every 2 years in increments of 5,000 m^3/yr to 50,000m^3/yr in year 20
Enterprise	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	5000 SPRUCE	Existing Operation (Paterson Sawmill) to remain constant at 5000m^3/yr from year 1-20, with additional costs of haulage to High Level

Choice of species for "additional" increments in FT LIARD & FT SIMPSON should be based on what in you judgement would be most profitable over the next 20 years from your economic projections, costs and likely availability of timber.

ESTIMATED DELIVERED LOG COST - $/$m^3$/YEAR/HARVEST AREA

Fort Liard	$0/$m^3$	$0/$m^3$	Aw-$48.12	Aw-$42.17	Aw-$41.21	Aw-$43.36	Aw-$42.13	Aw-$41.66	Aw-$41.76	Aw-$42.02	Aw-$43.39									
			Sw-0$/$m^3$	Sw-$36.99	Sw-$35.80	Sw-$37.23	Sw-$36.51	Sw-$35.97	Sw-$36.27	Sw-$36.36	Sw-$38.21									
Fort Simpson	Aw - $46.04		Aw-$43.22	Aw-$41.23	Aw-$40.99	Aw-$40.67	Aw-$41.81	Aw-$41.49	Aw-$41.57	Aw-$42.48	Aw-$42.88									
	Sw - $0/$m^3$		Sw-$38.05	Sw-$36.87	Sw-$35.43	Sw-$35.80	Sw-$36.45	Sw-$36.18	Sw-$35.92	Sw-$36.58	Sw-$36.59									
Enterprise	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82	$50.82

Additional Estimated Loading and Hauling Cost to High Level - $14.04/$m^3$