TIMBER SUPPLY ANALYSIS
INFORMATION PACKAGE

SELKIRK TREE FARM LICENCE 55 (TFL 55)
MANAGEMENT PLAN NO. 4

Prepared for:
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LP BUILDING PRODUCTS

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Reference: *TFL 55 MP No. 4 Information Package*

Enclosed please find the *Information Package* in support of the Management Plan No. 4 Timber Supply Analysis for Tree Farm Licence 55.

Please call if you have any questions or comments related to the document or any other aspect of the analysis. Thank you for your input during the preparation of the *Information Package*.

Yours truly,
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1.0 INTRODUCTION

This *Information Package* has been prepared on behalf of Louisiana Pacific Ltd. (LP) as part of the timber supply analysis for Management Plan No. 4 (MP No. 4) for Tree Farm Licence 55 (TFL 55). It provides a summary of the inputs and assumptions made in preparing the timber supply analysis data model.

Included are inventory and landbase summaries, growth and yield information, and management assumptions for timber and non-timber resources as they relate to timber supply. This *Information Package* follows the suggested format outlined in the *Guide for Tree Farm Licence Management Plans (20-month) and Calendar Year Reports* (BC MoFR, 2001).

The analysis involves modelling a Base Case which is intended to represent current management practices. In addition, a number of sensitivity analyses will also be conducted to test the impact of different assumptions on timber supply for TFL 55. All analysis simulations will be completed using CASH6, Timberline's proprietary forest estate model.

Upon acceptance by the British Columbia Ministry of Forests and Range (MoFR) Timber Supply Analyst, the assumptions and methodology provided in the *Information Package* will be used by LP to prepare and submit a timber supply analysis to the MoFR. All analysis results will be provided to the Chief Forester of British Columbia, or designate, for allowable cut determination.

Many of the inputs and assumptions included in the timber supply analysis will be based on information provided in the *Revelstoke Higher Level Plan Order* (BC MSRM 2005).

2.0 TIMBER SUPPLY ANALYSIS PROCESS

Multiple management options will be considered and modelled in this analysis. The main models considered are:

1. Base Case - current management practice; and
2. Sensitivity analyses.

2.1 Missing Data

At the time this information package was prepared the site indices from the JS Thrower & Associates Ltd. site index adjustment (SIA) project were not available.

Also missing is the wildlife tree patch (WTP) calculation (Table 10.4), which will be calculated following the procedure documented in the landscape unit planning guide.

3.0 TIMBER SUPPLY OPTIONS

This section provides an overview of the options that will be evaluated in the timber supply analysis.

3.1 Base Case

This option reflects current management performance at September 2005. The analysis will incorporate the following:

- Vegetation resource inventory (VRI) (complete Phase 1 and Phase 2);
- Revised operability;
- Ecosystem based analysis units;
- Improved managed stand productivity estimate through site index adjustment;
- Natural disturbance in the non -THLB;
- Spatial adjacency is in effect for 20 years in lieu of IRM requirements;
- Implementation of the *Revelstoke Higher Level Plan Order*; and
- Implementation of current genetic gains to managed stand yields.

3.2 Sensitivity Analysis

Sensitivity analysis is used to assess the uncertainty of assumptions made in the Base Case. A specific variable is adjusted and the magnitude of the timber supply impact reflects the degree of uncertainty surrounding that given variable. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect results.

Each scenario will be fully documented with respect to the data and assumptions employed. Table 3.1 summarizes the sensitivity issues to be addressed in the analysis.

Table 3.1 Sensitivity analyses

Issue	Sensitivity Levels to be Tested
Landbase	Timber harvesting landbase ±5%
	Old operability
Growth and yield	Natural stand yields ±10%
	Managed stand yields ±10%
	Natural stand minimum harvest ages ±10 years
	Managed stand minimum harvest ages ±10 years
	Regeneration delays ±5 years
	Turn off genetic gains
	No SIA
	Managed stand SI ±1 m
	No Inventory Adjustment
Resource management	Green-up heights ±1 meter
	Turn off adjacency and turn on IRM
	Caribou retention at 60%
	No caribou retention
Biodiversity	Landscape Level Biodiversity
	Turn of disturbances in non-THLB
Harvest rules	Relative oldest first
	Maximize existing volume
Alternative harvest levels	Maximum short term harvest
	Maximum non-declining harvest level

3.3 Alternative Harvest Flow

A number of different harvest flows will be explored, based on tradeoffs between short and mid-term harvest levels. Ultimately, forest cover requirements and biological capacity of the timber harvesting landbase (THLB) will dictate timber availability and harvest level options.

In all phases of the analysis, the choice(s) of harvest flow will reflect the following objectives:

- Maintain or increase the current harvest level for as long as possible;
- Limit changes in harvest level to less than 10% of the level prior to the reduction; and
- Achieve stability in the long-term harvest level and growing stock profiles.

3.4 Other Options

The *20-Year Spatial Feasibility Analysis* (documented under separate cover) is the only additional scenario identified for MP No. 4 at this time.

4.0 FOREST ESTATE MODEL

4.1 Model Description

Analysis simulations in support of MP No. 4 on TFL 55 will be carried out using CASH6 (Critical Analysis of Schedules for Harvesting) version 6.2l, a proprietary timber supply model developed by Timberline Forest Inventory Consultants Ltd. (Timberline, 2005).

A variable degree of spatial resolution is available depending on inventory formulation and resource emphasis area definitions. Forest stands in refuges such as environmentally sensitive and inoperable areas that do not contribute to the periodic harvest are nonetheless counted for their contribution to forest structure at both the stand and landscape levels.

In their current implementation, forest cover objectives require a control area over which to operate. The control area for a constraint set should correspond to a realistic element in the landscape. For example, the requirements associated with caribou objectives are designed to operate on the landbase identified as caribou habitat. Pseudo-geography may be employed to translate spatial constraints on harvesting into forest cover and static access constraints. The objective is to identify the "natural" constituency for forest cover constraints. Numerous levels of land aggregation are used to define both geographically separate areas and areas of similar management regime. CASH6 functionality also includes the capability to model height-based green-up.

4.2 Timber Supply Analysis

Timber supply analysis for the 250-year planning horizon will be carried out using CASH6 operating in aspatial mode. In the Base Case, a 400-year time frame will be modelled to ensure complete understanding of the factors influencing timber supply well into the long term.

4.3 20-Year Spatial Feasibility Analysis

Determination of a spatially feasible harvest schedule incorporating all integrated resource management considerations will be undertaken using CASH6 operating in spatial mode for the first 20 years of the planning horizon. Approved blocks from the current forest development plan (FDP) will be given the highest priority for harvest.

5.0 CURRENT FOREST COVER INVENTORY

This section describes base mapping, forest cover inventory, and other data used in the analysis.

5.1 Base Mapping

All spatial information is registered to the Terrain Resource Inventory Mapping (TRIM), North American Datum (NAD) 83 base. Inventory data has been prepared using the ARC/INFO™ geographic information system (GIS). Use of GIS ensures that spatial relationships between the various inventory attributes are maintained throughout the analysis process. For example, existing roads and streams have been buffered to provide specific area reductions from the THLB.

The current inventory consists of timber in several land classes. Timber on the operable but excluded landbase is not available for harvesting under the assumptions of the Base Case option. However, this land contributes to forest cover and seral stage requirements for non-timber resources.

5.2 Vegetation Resource Inventory

A comprehensive vegetation inventory commenced in 2002, based on a Chief Forester's recommendation. The Phase 1 VRI was completed in 2002 and the Phase 2 ground information was also collected in 2002 by Atticus Resource Consulting. The Phase 2 attribute adjustment has just recently been completed by Timberline using methods detailed in *VRI Procedures and Standards for Data Analysis, Attribute Adjustment and Implementation of Adjustment in the Corporate database* (MoFR, 2004). A detailed description of the VRI phase 2 adjustment procedure is documented in TFL 55 *Vegetation Resources Inventory Statistical Adjustment* (Timberline, 2005). A brief summary is provided in the following paragraphs.

In 2002 there were 80 Phase 2 VRI plot cluster established at randomly selected locations throughout the productive operable landbase of TFL 55. Using this information, the Phase 1 age, height and volume have been adjusted following VRI standard procedures in the *Fraser Protocol* BC MSRM, 2001b.

Table 5.1 shows the weighted ratios that have been used to adjust each of the strata. The adjustments have only been applied to stands over the age of 40 years.

Table 5.1 Phase 2 adjustment

Stratum	Height	Age	Volume
Balsam	1.03775	0.7919	1.0456
Cedar	0.9665	1.9918	1.3673
Hemlock	0.9057	1.1998	1.2636
Other (Fd)	0.9665	1.4871	1.3673
Spruce	0.9780	0.8080	1.0274

These adjustment factors affect the analysis as follows:

- Adjusted age and height are used to determine the inventory site index, which:
  - Are inputs to variable density yields program (VDYP) used for determining existing volumes used for the netdown (*i.e.* low site);
  - Are inputs to VDYP used for creating natural stand yield curves;
- Adjusted ages are updated and used as the starting age in the analysis; and
- Volume adjustment factors are a VDYP input that adjust the natural stand yield curves.

5.2.1 Updating the Inventory Information

For the present analysis the inventory has been updated for disturbances to the present, September 1, 2005. The update procedure was an informal process designed only to capture recent disturbances for the purpose of this analysis. The VRI has been updated to 2003. The spatial location of the recent disturbances since 2003, have been included using a harvest coverage provided by LP. For the analysis, recently harvested blocks have been given an age 0 and put on the appropriate managed stand yield curve.

The inventory has been projected to January 1, 2005.

5.3 Data Sources

Many sources of data were compiled to provide input to the timber supply analysis for TFL 55 MP No. 4. These are documented in Table 5.2. Data was used for three general purposes:

- Landbase summary – classification of the landbase into non-productive, productive non-THLB, and THLB;
- TUMs, which are treatment units (blocks) for use in the analysis; and
- Resultant, which is the final analysis database used to create the analysis files.

The three rightmost columns of Table 5.2 indicate which of the above mentioned processes the data were used.

Table 5.2 Data sources

DESCRIPTION	TFIC COVERAGE NAME	SOURCE	Date Received	NETDOWN	BLOCKING	RESULTANT
BEC Zones	bgc	LP Pre-2005	20-Jun-05	N	Y	Y
Biodiversity Emphasis	bio_emph	LP Pre-2005	20-Jun-05	N	Y	Y
FDP September 13, 2005	blk13sep05	LP	13-Sep-05	Y	Y	Y
Caribou Habitat	caribou	LP Pre-2005	20-Jun-05	N	Y	Y
Contours	contour	LP Pre-2005	20-Jun-05	N	N	N
Mapsheet index	index	Timberline generated	1-Jul-05	N	N	N
Landscape units	lu	LP Pre-2005	20-Jun-05	N	Y	Y
OGMA, draft	ogma	LP	15-Sep-05	N	N	Y
2005 operability layer	op_2005	LP/Timberline	15-Sep-05	Y	Y	Y
1994 operability layer	oper_94	LP/Timberline	15-Sep-05	N	Y	Y
Riparian buffers	rip_buffers	Timberline generated	15-Sep-05	Y	Y	Y
Road buffers	road_buf	Timberline generated	15-Sep-05	Y	Y	Y
Slope breaks	slope	Timberline generated	20-Jun-05	N	Y	Y
Terrain	terrain	LP Pre-2005	20-Jun-05	Y	Y	Y
TFL boundary	tfl55_bdy	LP Pre-2005	20-Jun-05	Y	Y	Y
Forest cover non-productive code	tfl_npd	LP Pre-2005	20-Jun-05	N	N	N
Ownership	tfl_own	LP Pre-2005	20-Jun-05	Y	Y	Y
PEM	tfl_pem	Timberline generated	1-Sep-05	N	Y	Y
Spatial wildlife tree patches	tfl_wtp	LP	15-Sep-05	Y	Y	Y
VRI	vri	Phase 2 completed Sept 2005	20-Jun-05	Y	Y	Y
Phase 2 sample plots	sample_plots	Atticus	20-Jun-05	N	N	N
TFL 55 chart	tfl55_chart	LP/Timberline	15-Sep-05	N	N	Y

6.0 LANDBASE DESCRIPTION

This section describes the TFL 55 landbase and the methodology used to determine the way in which land contributes to the analysis. Some portions of the productive landbase, while not contributing to harvest, may be available to meet other resource needs.

6.1 Timber Harvesting Landbase Determination

Table 6.1 presents the results of the landbase classification process to identify the productive landbase and the THLB. The productive column shows the total amount of productive landbase in the TFL that fits the description of the specific net down. The total productive area is generally larger than the area removed because of the overlap with other netdowns. The order of the entries in Table 6.1 corresponds to the sequence in which the landbase classifications were applied.

Table 6.1 Base Case THLB determination

Landbase Classification	MP 3 Area (ha)	MP4 Area (ha)	Productive Area (ha)	Volume (m^3)
Total Landbase	**92,700**	**92,744**	**-**	**-**
Ownership	-	38	-	3,917
Total TFL	**92,700**	**92,706**	**92,706**	**16,429,377**
Non-productive, Non-forest	47,300	36,801	-	139
Roads	858	802	-	167,111
Productive Landbase	**44,542**	**55,103**	**55,103**	**16,262,127**
Non-commercial	5	-	-	-
Alpine Tundra	40	-	-	-
Inoperable	22,551	30,244	30,244	7,569,920
Operable Landbase	**21,946**	**24,859**	**-**	**8,692,208**
Terrain	551	698	18,223	286,455
Riparian Reserves	433	810	3,335	353,215
Low Site	121	127	16,423	11,926
Deciduous	164	85	307	17,746
Non-merchantable	508	421	5,391	203,938
NSR	555	87	103	447
Wildlife Tree Patches	386	290	431	147,674
Present Timber Harvesting Landbase	**19,228**	**22,341**	**-**	**7,670,808**
Future Additions:				
NSR	555	87	103	447
Future Reductions:				
Future roads, trails and landings	1,154	1,340	-	460,248
Future Timber Harvesting Landbase	**18,629**	**21,087**	**-**	**7,211,006**

There are three significant changes to the landbase since MP 3; specifically:

1. Using the VRI the definition of productive forest is any stand that has a crown closure over 10%, which tends to include more area than what the forest cover called productive; and
2. The productive landbase shown in the MP 3 summary table was 858 hectares larger than that shown in Table 6.1 because MP3 included the existing roads, trails and landings.
3. The operability coverage has been updated.

The differences from the MP 3 productive landbase are mostly because of the changes to the productive definition, whereas the differences to the THLB are mostly due to the changes to the operability.

6.1.1 Distribution of Area by Leading Age and Leading Species

Table 6.2 summarizes the distribution of area and coniferous volume by 10-year age class for both the productive and THLB.

Table 6.2 Age class distribution

Age Class	MoFR Age Class	Productive Area (ha)	Productive Volume (1000s m^3)	THLB Area (ha)	THLB Volume (1000s m^3)
0(1)	1	441	0	283	0
1		2,971	0	2,802	0
2		3,360	100	2,694	22
3	2	952	5.353	351	238
4		433	12,057	13	398
5	3	433	12.245	17	1.366
6		1,121	127,116	155	40,531
7	4	423	55.513	120	28.975
8		1,740	178,118	162	40,241
9	5	974	191.845	313	88.067
10		3,576	910,665	1,093	418,736
11	6	296	99.583	131	54.839
12		1,299	298,773	317	132,681
13	7	1.070	240.834	165	73.821
14		889	243,907	343	111,784
15	8	3,642	736.632	750	263.684
16		247	58,334	31	9,583
17		24	6,410	9	3,033
18		1,372	385,388	386	151,886
19		4	945	0	0
20		5,748	1,686,448	1,144	515,859
21		41	12,645	15	5,648
22		2,564	864,868	785	322,075
23		1,793	691,498	598	249,394

Age Class	MoFR Age Class	Productive Area (ha)	Productive Volume (1000s m^3)	THLB Area (ha)	THLB Volume (1000s m^3)
24		2,096	852,330	856	384,362
25		6,493	2,831,983	2,539	1,318,108
26+	9	11,100	5,758,332	6,268	3,455,453
Total		55,103	16,261,922	22,339	7,670,782

(1) Includes NSR

Figure 6.1summarizes the area of the TFL by 10-year age classes.

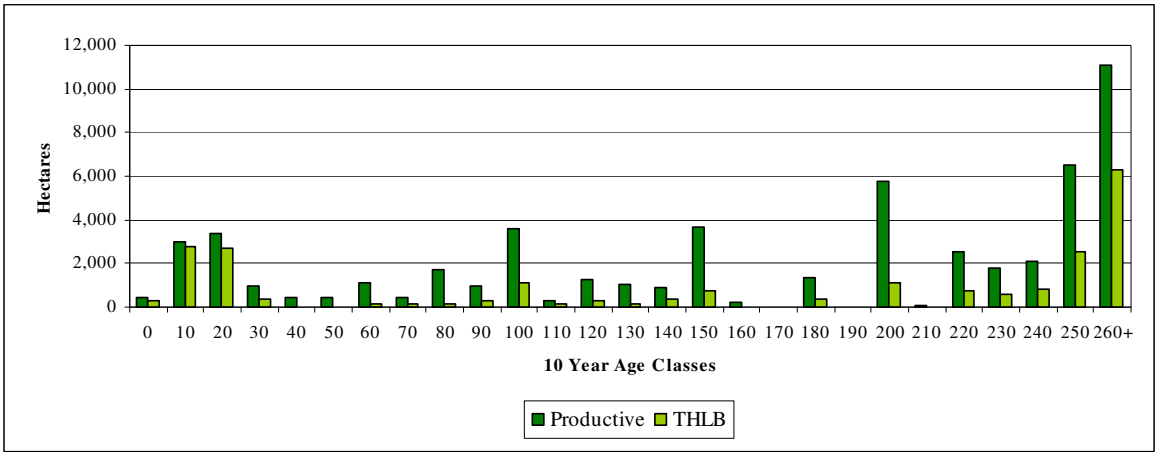

Figure 6.1 Age class distribution

Table 6.3 summarizes the distribution of area by leading species for both the productive and THLB. Stands with leading species AC and ACT are included only if there is a previous harvest history- in the absence of this stands would be netted out.

Table 6.3 Leading species distribution

Leading Species		Productive Area (ha)	Net THLB (ha)
Name	**Code**		
No leading species		466	307
Cottonwood	AC	217	91
Cottonwood	ACT	22	16
Aspen	AT	72	0
Balsam	BL	15,637	1,592
Cedar	CW	5,960	3,899
Birch	EP	54	0
Douglas-fir	FD	642	440
Douglas-fir	FDI	2,458	1,192
Hemlock	H	318	71

Hemlock	HM	1,834	265
Hemlock	HW	6,527	3,445
Pine	PA	13	0
Lodgepole pine	PL	49	23
Lodgepole pine	PLI	8	8
Spruce	SE	15,877	6,280
Spruce	SW	14	3
Spruce	SX	4,936	4,707
Total		**55,103**	**22,339**

6.2 Total Area

The total area of TFL 55 is 92,706 hectares.

6.3 Non-productive non-forest

There are 36,801 hectares of non-productive non-forest land within the TFL. The VRI does not explicitly attribute non-productive land so this area was identified by selecting where crown closure is less than 10% and age is greater than 30 years old from the VRI attributes. In addition, BC land classification level 1 non-treed was taken out as non-productive non-forest, unless the stand has a harvest history.

6.4 Non-commercial

There are no non-commercial stands identified in the new VRI.

6.5 Roads, Trails and Landings

Existing roads were identified by Louisiana Pacific and buffered 8.5 meters either side giving a total of 17 meters. This buffer distance was used to be consistent with the Revelstoke TSR. In total 802 hectares of roads were identified and removed from the productive landbase as shown in Table 6.4. Future roads were accounted for by applying a 6 % reduction to the THLB as can be seen in Table 6.1.

Table 6.4 Roads, trails, and landings

Description	Gross (ha)	Productive (ha)	Area Removed (ha)
Existing Roads	910	0	802

6.6 Inoperable

The operability layer was updated by Louisiana Pacific to better reflect current harvesting. In total 2,100 hectares of land was added to the existing operable layer. The non-operable landbase was selected by removing all polygons classified as I, M, N as shown in Table 6.5 where I is

inoperable, M is marginal and N is the classification for miscellaneous factors such as the presence of a lodge or mining site.

Table 6.5 Operable landbase summary

Description	Gross (ha)	Productive (ha)	Area Removed (ha)
I	64,965	29,697	64,965
M	641	547	641
N	38	0	38
Total	**65,645**	**30,244**	**65,645**

A summary of newly classified operable land is shown by species and age group in Table 6.6 below and Figure 6.2.

Table 6.6 Operable area added in 2005 by Species and Age

Age (years)	Area added by species (ha)							
	Balsam	Cedar	Deciduous	Douglas-fir	Hemlock	Pine	Spruce	Total
0 - 80	3	5	13	4	28	0	36	91
81 - 120	1	5	2	36	5	22	185	257
121 +	197	519	0	325	242	0	466	1,753
Total	201	530	15	365	275	22	687	2,100

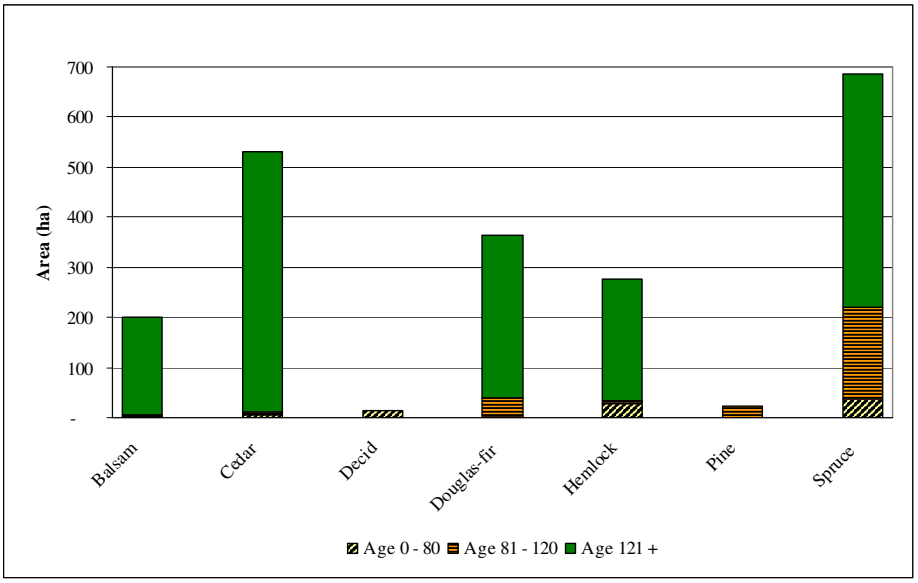

Figure 6.2 Operable area added in 2005 by Species and Age

6.7 Terrain Stability

Using the terrain inventory, potentially-unstable and unstable land has been partially removed from the timber harvestable landbase based upon percentages determined during the last management plan. LP revisited the netdown percentages against recently harvested blocks and found the reductions to be reasonable. A total of 698 hectares were removed from the landbase for terrain as shown in Table 6.7.

Table 6.7 Terrain stability

Description	Gross(ha)	Productive(ha)	Netdown %	Area Removed (ha)
Potentially-unstable	16,169	13,300	10%	412
Unstable	6,905	4,923	50%	286
Total	**23,073**	**18,223**		**698**

The areas shown as gross and productive hectares are the total areas defined as potentially-unstable or unstable. Since other netdown steps preceded the terrain stability netdown, a portion of this potentially-unstable or unstable terrain was already removed. The netdown % is the percentage of that landbase not yet netted out that was removed resulting in the area removed.

6.8 Riparian Reserve and Management Zones

Classified lakes, wetlands, and streams were available for TFL 55 and were buffered to reflect Forest Practice Code guidelines as laid out in the *Riparian Area Management Guidebook.* Reserve zones were buffered as per guidebook specifications.

Management zones were buffered with an average retention level to allow them to be applied spatially. An average retention level of 25% was applied to all riparian management zones, irrespective of riparian classification, in determining the area to be removed from the net harvesting landbase. For the purposes of timber supply modelling, the management zone width as defined in the *Riparian Area Management Guidebook* was reduced by the management zone retention percentage and added to the reserve zone width to arrive at a composite buffer width, as shown in the table below.

GIS buffering techniques were then used to construct an effective riparian reserve zone inside of which harvesting activity was fully excluded. Note that the composite buffer width was applied to each side of stream features, and to the terrestrial side of wetland or lake features.

Table 6.8 Riparian management buffer widths

Riparian Class	Length (km)	Reserve Zone Width m	Manag. Zone Width m	Manag. Zone Reten. %	Tot Buff Width (m)	Gross Area (ha)	Productive Area (ha)	Area Removed (ha)
Lakes								
L1	11	10	0	25	10	30	30	-
L3	17	0	30	25	7.5	31	31	-
Wetlands								

Riparian Class	Length (km)	Reserve Zone Width m	Manag. Zone Width m	Manag. Zone Reten. %	Tot Buff Width (m)	Gross Area (ha)	Productive Area (ha)	Area Removed (ha)
W1	211	10	40	25	20	528	525	47
W3	49	0	30	25	7.5	73	73	29
Streams								
S1	90	50	20	25	55	846	551	350
S2	76	30	20	25	35	411	397	127
S3	3	20	20	25	25	15	15	11
S4	22	0	30	25	7.5	32	31	8
S5	138	0	30	25	7.5	197	197	45
S6	1617	0	20	25	5	1,486	1,484	192
					Total	**3,649**	**3,335**	**810**

6.9 Low Site Productivity

Sites that are unable to achieve a minimum acceptable volume by the age 140 have been excluded from the THLB as low sites. Cedar and hemlock stands were removed if they did not achieve a volume of 200 m^3/ha by the age 140. All other stands were removed if they did not achieve 150 m^3/ha. This age and volume criteria was sourced through LP and reflects current practice. Stands that are currently over the age 140 were assessed using the existing stand volumes. Any stand with a logging history remained in the THLB. A total of 141 hectares has been removed as shown in Table 6.8.

Table 6.9 Low site productivity reductions

Description	Species	Volume at 140 years (m^3/ha)	Age	Gross (ha)	Productive (ha)	Area Removed (ha)
Low Site 1	Cedar, Hemlock	200	> 30	765	759	26
Low Site 2	All others	150	> 30	15,666	15,664	101
			Total	**16,431**	**16,423**	**127**

6.10 Deciduous

All deciduous leading stands were removed from the harvestable landbase except where the stands had a harvest history as shown in Table 6.10.

Table 6.10 Deciduous stand reduction

Inventory Type Group	Gross (ha)	Productive (ha)	Area Removed (ha)
35 to 42	308	307	85
Total	**308**	**307**	**85**

6.11 Non-merchantable Forest Types

Non-merchantable stands are those that exceed low site criteria, yet are not currently utilized. As requested in the previous determination, through consultation with LP the non-merchantable definition has been modified to better reflect current practice. Non-merchantable stands were defined as stands that are greater than 80% hemlock or balsam and are greater than 140 years of age as shown in Table 6.11. Non-merchantable stands previously used the criteria from the 1998 Revelstoke TSA Analysis and were defined as all stands older than 140 years and consisting of pure hemlock, pure balsam or predominantly balsam with no spruce component.

Table 6.11 Non-merchantable reduction

Description	Gross (ha)	Productive (ha)	Area Removed (ha)
Non-merchantable	5,391	5,391	421
Total	**5,391**	**5,391**	**421**

6.12 Not Satisfactorily Restocked (NSR)

NSR stands were identified using LP's forest development plan (FDP) and areas are summarized in Table 6.12.

Table 6.12 NSR

Description	Gross (ha)	Productive (ha)	Area Removed (ha)
NSR	103	103	87
Total	**103**	**103**	**87**

NSR areas regenerate to contribute to the analysis.

6.13 Stand-level Biodiversity (Wildlife Tree Patches)

Existing wildlife tree patches (WTPs) on TFL 55 have been explicitly mapped, and are incorporated into the spatial database for this analysis. As shown in Table 6.13, a total of 290 hectares of existing WTPs have been removed from the THLB, but are retained in the modelling data set so that they may contribute to non-timber resource objectives.

Table 6.13 Wildlife tree patches

Description	Gross (ha)	Productive (ha)	Area Removed (ha)
WTP	431	431	290
Total	**431**	**431**	**290**

7.0 INVENTORY AGGREGATION

In order to reduce the complexity of the forest description for the purpose of timber supply analysis, aggregation of individual forest stands is necessary.

7.1 Revelstoke Higher Level Plan Order

In March 2005 the *Revelstoke Higher Level Plan Order* was implemented as legislated in Section 3 of the Forest Practices code of British Columbia Act. The Order established resource management zones and objectives. On TFL 55 the only RMZ having a potential impact on TFL 55 are caribou. The higher level plan order also provides objectives for the mature and old seral requirements for TFL 55.

7.2 Resource Management Zones

The resource emphasis areas defined for this analysis are listed in Table 7.1

Table 7.1 Resource Management Zones (RMZs)

Resource Management Zones	Area (ha)		
	Productive	Productive non-THLB	THLB
Caribou in ESSF zone above car line	5,542	5,258	285
Caribou in ICH zone above car line	2,533	1,615	918
Caribou in ESSF zone below car line	5,561	360	5,201
Caribou in ICH zone below car line	7,955	356	7,599
Total	21,591	7,588	14,003

7.3 Ecosystem Types

Figure 7.1 shows the area in each BEC variant on TFL 55. Note that the sum of productive non-THLB and THLB area is total productive area.

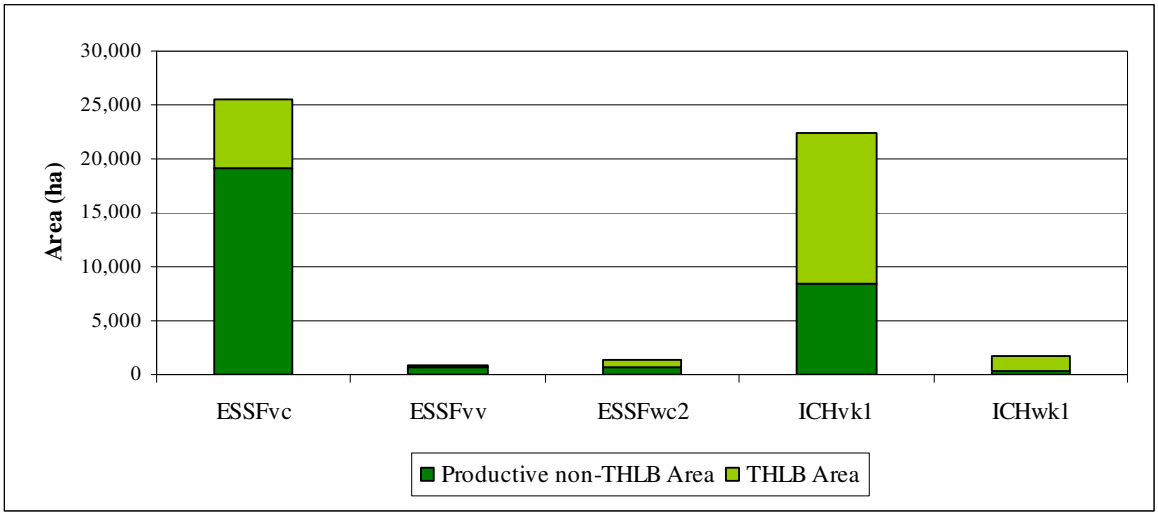

Figure 7.1 BEC Variants for productive landbase in TFL 55

7.4 Landscape Units

Table 7.2 shows the areas in the two dominant landscape units on TFL 55.

Table 7.2 Landscape units on TFL 55

Landscape Unit	Gross Area	Productive Area	THLB Area
r5	58,281	29,602	8,834
r17	34,268	25,499	13,506

7.5 Seral Zones

Table 7.3 summarizes the distribution of LU-BEC variants on TFL 55, and also shows the biodiversity emphasis option (BEO) assigned to each LU-BEC combination.

Table 7.3 Landscape units, ecosystem types, and biodiversity emphasis

Landscape Unit	NDT	BEC variant	BEO	Area (ha)		
				Gross	Productive	THLB
r17	1	ESSFvc	Intermediate	238	231	227
r17	1	ESSFvc	Low	11,839	10,105	4,257
r17	1	ESSFvcp	Low	4,168	1,305	0
r17	1	ESSFvv	Low	1,236	894	152
r17	1	ESSFvvp	Low	1,792	333	1
r17	1	ESSFwc2	Low	1,796	1,380	621
r17	1	ICHvk1	Intermediate	3,971	3,632	2,817

r17	1	ICHvk1	Low	8,481	7,550	5,392
r17	1	ICHwk1	Intermediate	56	46	38
r5	1	ESSFvc	Intermediate	847	329	4
r5	1	ESSFvc	Low	22,318	14,840	1,842
r5	1	ESSFvcp	Intermediate	10	0	0
r5	1	ESSFvcp	Low	11,983	1,583	0
r5	1	ICHvk1	Intermediate	3,974	3,200	1,840
r5	1	ICHvk1	Low	10,308	7,956	3,865
r5	1	ICHwk1	Intermediate	1,282	996	800
r5	1	ICHwk1	Low	740	684	479
Totals				**85,038**	**55,063**	**22,336**

Note that the discrepancies between gross area in Table 7.2 and Table 7.3 are caused by the use of two different coverages that encompass different areas; it does not affect the analysis.

7.6 Analysis Units

Stands are grouped into analysis units to reduce modelling complexity. In previous management plans, analysis units were formed based on similar species mix, productivity, and age group. For this analysis, an ecologically-based system for grouping stands into analysis units was implemented. This approach was selected because it integrates more closely with ecologically-based productivity estimates. Additionally, many management and silviculture treatment decisions are determined based on the ecological classification of the stand being treated.

Stands were grouped using the BEC system (PEM) at the site series level and leading species. Site series/species combinations that only represent a small proportion of the landbase have been aggregated with a similar analysis unit. There are 25 natural stand analysis units and a corresponding 25 existing managed stand analysis units. There is a third set of analysis units for the future managed stands, which will include genetic gains.

Table 7.4 shows the analysis unit definitions and the area in each analysis unit.

Table 7.4 Analysis unit definitions

Analysis Unit	Analysis Unit Definition			THLB Area (hectares)		
	BEC Variant	Site Series	Species	Natural	Managed	Total
1	ICHwk1	9,7,6	Spruce	156	70	227
2	ICHwk1	5	Spruce	96	17	113
3	ICHwk1	4	Hemlock-Cedar	102	4	106
4	ICHwk1	4	Douglas_fir	225	30	255
5	ICHwk1	4	Spruce	55	86	140
6	ICHwk1	1	Cedar	98	2	100
7	ICHwk1	1	Hemlock	109	38	147
8	ICHwk1	1	Spruce-Douglas_fir	25	200	225
9	ICHvk1	5	Spruce-Balsam	535	75	610
10	ICHvk1	5	Cedar-Hemlock	256	88	344
11	ICHvk1	4	Spruce-Balsam-Pine	645	701	1,346
12	ICHvk1	4,3	Cedar-Douglas_fir-Pine	1,549	174	1,723

8.0 GROWTH AND YIELD

8.1 Site Index Assignments to Inventory Polygons

The growth potential of modelled stands is quantified using site index. Site index is defined as the potential height of a site tree at breast height age 50 grown on the site.

8.1.1 VRI Site Index

VRI site index values are developed using the age and height attributes for each stand in the inventory which is at least 30 years old.

8.1.2 SIA Productivity Estimates

The site index adjustment productivity estimates were not available at time of release of this document. In December of 2005 the SIA project was completed and documented in TFL 55 Site Index Adjustment Final Report (Thrower, 2005). This section has been updated to provide a synopsis of the SIA process and its application to the MP4 timber supply analysis.

8.2 Site Index Assignment for Yield Tables

The inventory site indices have been shown in the information package because the adjusted site indices are not available. Once available the adjusted site indices will be used for the managed stand yield curves. Table 8.2 on the next page includes the inventory site indices for each analysis unit.

8.3 Utilization Levels

The utilization levels modelled are listed in Table 8.1. They reflect current standards and performance. There is no pine leading regeneration.

Table 8.1 Utilization levels

Leading Species	Minimum DBH (cm)	Stump Height (cm)	Minimum Top DIB (cm)
All species	17.5	30.0	10.0

Note: DBH = diameter breast height, DIB = diameter inside bark

8.4 Decay, Waste, and Breakage for Natural Unmanaged Stands

Decay waste and breakage (DWB) has been included in this analysis via VDYP, which is set for each forest inventory zone (FIZ) and public sustained yield units (PSYU). These values have been indirectly adjusted through the Phase 2 inventory adjustment, because VDYP net volume projections have been adjusted to reflect actual ground-truthed volumes, which include the net volume adjustment factors.

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8.5 Volume Reductions

Standing inventory volumes reported in this document are reduced for any deciduous component. Similarly, for the purposes of modelling, all yield tables are reduced by a percentage reflecting the deciduous component of the stand.

Yield tables will also be reduced to account for wildlife tree patches. These reductions are discussed further in Section 10.3.2. The deciduous component of natural stands can contribute to the wildlife tree patch percentage.

8.6 VDYP Natural Stand Yield Tables

Natural stand yield tables (NSYTs) were developed using the batch version of VDYP (Version 6.6d). Deciduous areas are kept as an input into VDYP and are then dealt with by applying an appropriate reduction OAF by analysis unit further into the analysis.

Table 8.2 Average natural stand attributes by analysis unit

AU	THLB	CC	SI	Species Composition									
1	156	55	24.0	SX	70	CW	12	HW	8				
2	96	59	17.3	SX	40	CW	30	HW	23	AT	4		
3	102	68	12.8	HW	42	CW	27	SX	15	FD	13		
4	225	73	15.4	FD	49	HW	16	SX	13	CW	12	EP	6
5	55	76	25.2	SX	59	FD	23	CW	8	HW	7	BL	1
6	98	66	15.7	CW	55	HW	29	SX	11	FD	2		
7	109	66	11.8	HW	55	CW	28	FD	10	SX	5		
8	25	71	16.2	FD	32	HW	26	CW	23	SX	15		
9	535	44	20.3	SX	77	BL	8	CW	6	HW	5	AT	1
10	256	49	16.9	CW	65	HW	19	SX	13				
11	645	58	17.5	SX	59	BL	16	HW	11	CW	6	FD	4
12	1,549	64	15.5	CW	43	HW	20	FD	19	SX	14		
13	346	71	15.3	FD	49	SX	16	HW	15	CW	12	EP	3
14	1,135	63	11.7	HW	57	CW	27	SX	10	FD	3		
15	1,509	49	16.8	SX	61	BL	20	HW	8	CW	6	FD	1
16	1,863	56	16.3	CW	63	HW	25	SX	10				
17	1,605	59	12.2	HW	60	CW	25	SX	11	FD	1		
18	411	52	16.2	BL	48	SX	47	CW	3				
19	190	55	15.7	SX	46	BL	45	CW	5	HW	2		
20	855	53	13.7	BL	61	SX	33	HW	4				
21	92	54	15.4	CW	55	SX	23	HW	20	BL	1		
22	418	56	10.5	HW	60	SX	22	BL	10	CW	7		
23	2,492	53	14.6	SX	67	BL	26	HW	5	CW	1		
24	122	51	12.9	SX	55	BL	31	HW	12				
25	780	54	13.3	SX	54	BL	28	HW	8	FD	4	CW	2

Note: AU = analysis unit, CC = crown closure, SI = site index.

8.6.1 Existing Timber Volume Check

Table 8.3 shows the inventory volume on the THLB compared to the yield curve volume. The THLB volume shown in the netdown table (7,767,808) has been reduced by 3% (5,440.659) to account for the volume adjustments applied to the yield curves in lieu of WTPs.

Table 8.3 Timber volume check

Polygon Volume	Yield Curve Volume	% Concurrent (polygon / yield curve)
7,440,659	7,355,689	98.9%

8.7 Genetic Gains (Tree Improvement)

This section summarizes the characteristics of seed improvement for TFL 55, which is consistent with the procedures recommended by the Forest genetic council (BC Forest Genetics Council 2001).

All seed data was supplied by LP. In all cases the seed class is "A", the species is spruce, the seed planning zone was NE and the type was G10. Table 8.4 shows the data for BEC zone ICH. The average genetic gain is the sum of the potential trees over the potential trees times gain and is therefore a weighted average. Genetic gains are applied only to future managed stands.

Table 8.4 Seed Improvement Data for Spruce in ICH

Seed Lot	Location	Lat.	Long.	Elev.	Collection Date	Owner	Germ. %	Potential Trees	Potential Trees Times Gain
06374	G+02	51 06	119 20	1160	1987-07-	MULTIPLE 20	86		
06700	G+02	51 08	119 15	770	1989-09-	MULTIPLE 00	94		
06861	G+02	49 49	118 00	1065	1990-08-	MULTIPLE 00	92		
06914	G+02	51 03	119 18	1270	1990-09-	MULTIPLE 00	91		
06591	G+02	49 43	117 54	960	1992-08-	MULTIPLE 00	80		
06024	G+02	51 05	119 18	1156	1993-08-	MULTIPLE 00	81		
06580	G+02	49 44	118 09	875	1993-09-	MULTIPLE 00	90	941	1,881
06581	G+02	49 45	117 59	1080	1993-09-	MULTIPLE 00	82		
60433	G+05	51 10	119 20	980	1996-09-	MOFR 20	89		
62014	G+04	51 00	119 20	1250	1996-09-	TOLKO 00	93		
60713	G+05	51 00	118 00	1050	1999-09-	MULTIPLE 20	92	15	75
60291	G+05	49 45	118 00	1100	1999-09-	MOFR 20	92	28	140
60430	G+06	49 47	118 06	1066	2002-08-	MOFR 20	94	2,409	14,455
60743	G+10	51 00	118 00	1149	2002-09-	MULTIPLE 00	90	6,842	68,416
60752	G+12	51 00	118 00	1174	2003-08-	MULTIPLE 00	92	14	168
60762	G+14	51 06	119 26	1120	2004-08-	MULTIPLE 20	90	2,241	31,378
	Sum of potential trees or potential trees times gain							12,490	116,513
							Average Genetic Gain		**9.33**

Table 8.5 shows data for BEC zone ESSF.

Table 8.5 Seed Improvement Data for Spruce in ESSF

Seed lot	Location	Lat.	Long.	Elev.	Collection date	Owner	Germ. %	Potential trees	Potential trees times gain
61096	G+04	50 40	116 20	1450	1996-09-	MOFR 20	90	2,164	8,655
62013	G+04	50 40	116 20	1450	1996-09-	TOLKO 00	87		
60424	G+05	49 43	117 56	1549	2002-08-	MOFR 20	98	433	2,163
60242	G+02	49 51	117 20	1550	1996-09-	MULTIPLE 00	92		
06582	G+02	49 51	117 20	1555	1993-08-	MULTIPLE 00	91		
60440	G+04	49 49	117 44	1571	2003-08-	MOFR 20	93	456	1,826
60763	G+12	51 10	119 29	1625	2004-09-	MULTIPLE 20	88	4,175	50,102
60279	G+02	51 18	119 34	1629	1995-08-	MULTIPLE 20	85		
60744	G+07	51 00	118 00	1654	2002-08-	MOFR 20	89	4,847	33,931
	Sum of potential trees or potential trees times gain							12,075	96,677
							Average Genetic Gain		**8.01**

8.8 Polygon Size Distribution in the THLB

Figure 8.1 shows the size distribution of the polygons used in this analysis. The resultant polygons (stands) are the smallest unit recognized in the modelling. Blocks are the harvest units which are aggregates of stands.

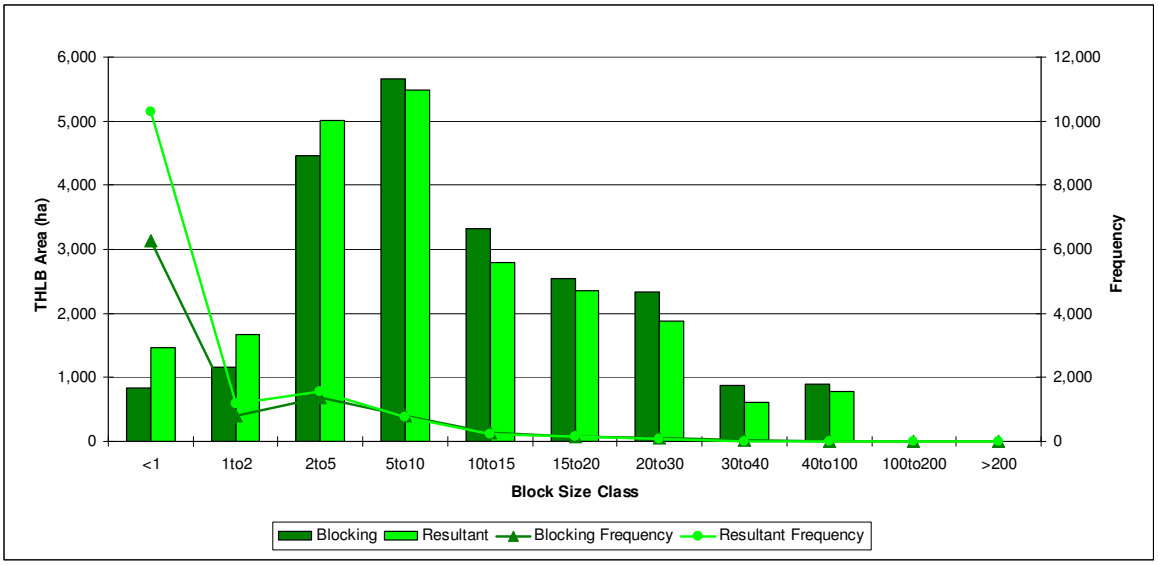

Figure 8.1 Polygon size distribution for TFL 55

8.9 Silviculture Management Regimes

This section describes how each stand is regenerated after harvesting. In the management of TFL 55, everything is planted to an average of 1,450 stems/ha.

8.10 Regeneration Delay

Regeneration delay is the time elapsed between harvesting and the establishment of a new stand of trees. The end of the regeneration delay is time zero for a yield table; it is the point in time when stand growth begins. Regeneration delay is two years for all species and has been modelled using the regeneration delay in CASH6.

8.11 TIPSY Managed Stand Yield Tables

There are two sets of analysis units for managed stands specifically:

- 101 through 125 are future managed stands that include genetic gain; and
- 201 through 225 are existing managed stands that do not include genetic gain.

Managed stand yield tables (MSYTs) were modelled using *Batch*TIPSY (Version 3.0a). Table 8.6 presents the managed stand analysis units, species and site index values that were input to TIPSY during yield curve preparation. The SIA site indices indicated on Table 8.6 are used for the MP4 Base Case and the VRI site indices are provided for a comparison. The species compositions are based on current management practices on TFL 55. All managed stands were planted, genetic gains to spruce were either 8 or 9 as shown in Table 8.6, initial density of 1450stems/ha, OAFs used of 15% and 5% and utilization level of 17.5.

Table 8.6 Managed stand analysis unit descriptions (TIPSY Inputs)

AU	Description	SIA SI	VRI SI	Species Composition						Genetic Gain to Spruce
101	ICHwk1-9,7,6-S	23.8	24.0	Sx	54	Cw	46			9
102	ICHwk1-5-S	27.0	17.3	Sx	55	Cw	40	Fdi	5	9
103	ICHwk1-4-H-C	24.9	12.8	Fdi	49	Sx	36	Cw	15	9
104	ICHwk1-4-Fd	23.5	15.4	Fdi	49	Sx	36	Cw	15	9
105	ICHwk1-4-S	24.8	25.2	Fdi	49	Sx	36	Cw	15	9
106	ICHwk1-1-C	26.4	15.7	Sx	50	Fdi	30	Cw	20	9
107	ICHwk1-1-H	26.2	11.8	Sx	50	Fdi	30	Cw	20	9
108	ICHwk1-1-S-Fd	25.9	16.9	Sx	50	Fdi	30	Cw	20	9
109	ICHvk1-5-S-B	21.5	20.3	Sx	65	Cw	30	Fdi	5	9
110	ICHvk1-5-C-H	23.5	16.7	Sx	65	Cw	30	Fdi	5	9
111	ICHvk1-4-S-B-P	22.1	17.7	Sx	53	Cw	27	Fdi	20	9
112	ICHvk1-4,3-C-Fd-P	22.1	15.5	Sx	53	Cw	27	Fdi	20	9
113	ICHvk1-4-Fd	22.2	15.4	Sx	53	Cw	27	Fdi	20	9
114	ICHvk1-4-H	23.3	11.7	Sx	53	Cw	27	Fdi	20	9
115	ICHvk1-3,1-S-B-H	22.5	16.9	Sx	62	Cw	31	Fdi	7	9

AU	Description	SIA SI	VRI SI	Species Composition						Genetic Gain to Spruce
116	ICHvk1-1-C	23.8	16.3	Sx	62	Cw	31	Fdi	7	9
117	ICHvk1-1-H-Fd-P	23.0	12.2	Sx	62	Cw	31	Fdi	7	9
118	ESSFwcw, ESSFwc2-4,3-S-B	19.0	16.3	Sx	65	Bl	22	Hw	13	8
119	ESSFwcw, ESSFwc2-1-S	16.4	15.7	Sx	69	Bl	24	Hw	7	8
120	ESSFvc-1-B	16.0	13.8	Sx	69	Bl	24	Hw	7	8
121	ESSFvc-1-C	19.2	15.2	Sx	69	Bl	24	Hw	7	8
122	ESSFvc-1-H	17.8	10.5	Sx	69	Bl	24	Hw	7	8
123	ESSFvc-1-S	17.8	14.6	Sx	69	Bl	24	Hw	7	8
124	ESSFvc-6,4-S	13.2	12.9	Sx	67	Bl	22	Hw	11	8
125	ESSFvc-3-All	15.9	13.0	Sx	60	Bl	24	Hw	16	8
201	ICHwk1-9,7,6-S	25.0	22.1	Sx	54	Cw	46			0
202	ICHwk1-5-S	27.0	13.6	Sx	55	Cw	40	Fdi	5	0
203	ICHwk1-4-H-C	25.1	21.0	Fdi	49	Sx	36	Cw	15	0
204	ICHwk1-4-S	23.4	17.1	Fdi	49	Sx	36	Cw	15	0
205	ICHwk1-4-S	24.1	15.9	Fdi	49	Sx	36	Cw	15	0
206	ICHwk1-1-C	26.6	15.7	Sx	50	Fdi	30	Cw	20	0
207	ICHwk1-1-H	26.3	18.0	Sx	50	Fdi	30	Cw	20	0
208	ICHwk1-1-S-Fd	26.8	19.7	Sx	50	Fdi	30	Cw	20	0
209	ICHvk1-5-S-B	23.8	20.3	Sx	65	Cw	30	Fdi	5	0
210	ICHvk1-5-C-H	24.2	21.1	Sx	65	Cw	30	Fdi	5	0
211	ICHvk1-4-S-B-P	23.8	15.2	Sx	53	Cw	27	Fdi	20	0
212	ICHvk1-4,3-C-Fd-P	23.5	13.6	Sx	53	Cw	27	Fdi	20	0
213	ICHvk1-4-Df	23.6	19.6	Sx	53	Cw	27	Fdi	20	0
214	ICHvk1-4-H	24.2	9.1	Sx	53	Cw	27	Fdi	20	0
215	ICHvk1-3,1-S-B-H	23.7	17.1	Sx	62	Cw	31	Fdi	7	0
216	ICHvk1-1-C	24.8	10.4	Sx	62	Cw	31	Fdi	7	0
217	ICHvk1-1-H-Fd-P	23.8	22.1	Sx	62	Cw	31	Fdi	7	0
218	ESSFwcw, ESSFwc2-4,3-S-B	20.9	18.9	Sx	65	Bl	22	Hw	13	0
219	ESSFwcw, ESSFwc2-1-S	21.0	15.7	Sx	69	Bl	24	Hw	7	0
220	ESSFvc-1-B	19.8	13.7	Sx	69	Bl	24	Hw	7	0
221	ESSFvc-1-C	19.4	15.2	Sx	69	Bl	24	Hw	7	0
222	ESSFvc-1-H	18.0	17.7	Sx	69	Bl	24	Hw	7	0
223	ESSFvc-1-S	19.6	14.0	Sx	69	Bl	24	Hw	7	0
224	ESSFvc-6,4-S	13.2	12.9	Sx	67	Bl	22	Hw	11	0
225	ESSFvc-3-All	17.7	12.7	Sx	60	Bl	24	Hw	16	0

8.12 Silviculture History

8.12.1 Immature Managed Stands

Table 8.7 summarizes the immature inventory on the TFL by leading species and 5-year age class.

Table 8.7 Immature inventory by leading species and 5-year age class

Species	0-4	5-9	10-14	15-19	20-24	25-29	THLB
Balsam	0	69	73	98	176	122	**537**
Cedar	0	235	109	88	99	79	**609**
Fir	0	66	92	177	65	32	**432**
Hemlock	0	61	41	73	49	40	**264**
Pine	0	39	4	1			**43**
Spruce	0	547	860	1,169	722	435	**3,734**
Decid.	0	1	2	18	43	7	**72**
Totals	**0**	**1,017**	**1,180**	**1,624**	**1,155**	**715**	**5,692**

Stands that are currently less than four years of age have not been updated in the inventory so there is no leading species indicated. These stands have been assigned to analysis units using the leading species from the natural stands. In case where no species is available they have been defaulted to spruce.

8.12.2 Not Satisfactorily Restocked Areas

Not satisfactorily restocked (NSR) areas can be current NSR or backlog NSR. Backlog NSR areas are those that were harvested before 1987 and that LP has no legal obligation to manage. Backlog NSR accounts for an area of 103 ha which has been identified in a spatial coverage provided by LP. These areas are currently stocked at an average of approximately 450 stems/ha.

To assess the volume implications of the backlog NSR TIPSY was run with a range of leading species and site index combinations. Changes were made to the initial stocking and regeneration method to compare 450 stems/ha natural regeneration versus 1450 stems/ha planted. It was found that there was a 45% average reduction in volume at the minimum harvest age when comparing backlog NSR stands with present management. This trend was strong across all species tested and site indexes.

Figure 8.2 below is an example of a typical volume curve.

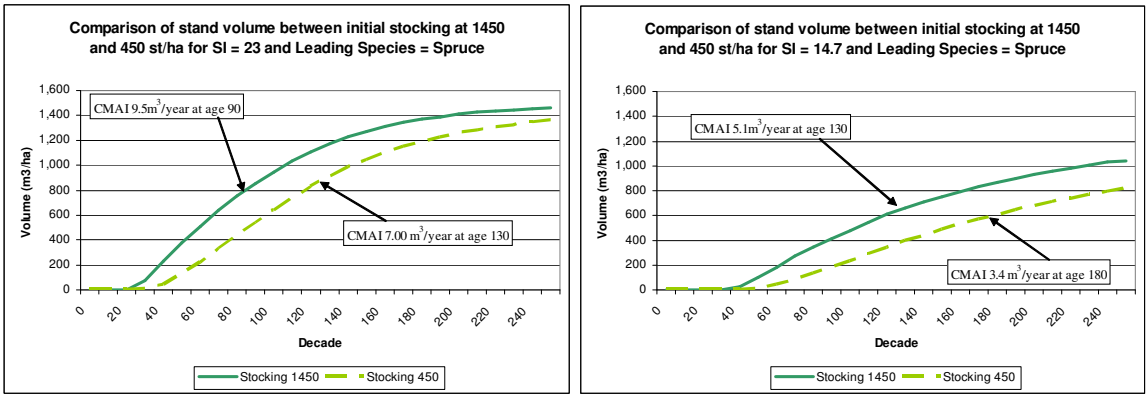

Figure 8.2 Comparing managed stand yield curves for NSR Stands

In order to capture this in the modelling environment the age of the backlog NSR stands will be reduced by 30 years. Given that the area in question is rather insignificant this should adequately reduce the available volume from the NSR areas.

9.0 PROTECTION

Damage to timber caused by fire, wind, insects, diseases and other pests contribute to loss in harvestable volumes. This volume loss is difficult to quantify, although losses to insects and disease that normally occupy stands (endemic losses) are accounted for in empirical yield table estimates. The unsalvaged losses have been estimated using:

Fire losses - based on unsalvaged fire data between 1955 and 2004 for the TFL (THLB only);

Insect losses – Estimated using the Forest Insect and Disease Survey (FIDS) information, local knowledge and professional judgment;

Avalanche and windthrow – Estimated based on review of losses over the last 15 years and professional judgment.

The annual unsalvaged losses are summarized in Table 9.1.

Table 9.1 Unsalvaged losses

Source of Loss	Losses		
	Hectares/year	Volume(m^3/ha)*	Unsalvaged (m^3/year)
Fire			
Wild	1.2	414	497
Prescribed	0.5	414	207
Total Fire	1.7	414	704
Insects			
Hemlock looper	0.5	414	207
Spruce bark beetle	0.5	414	207
Douglas-fir bark beetle	0.1	414	41
Total Insects	1.1		315
Windthrow	0.7	414	290
Avalanche	0.1	414	41
Total	3.6		1,490

*The volume is the average volume per hectare on TFL 55

The unsalvaged losses have increased 50 % over the MP3 unsalvaged losses of 990 m^3/year.

10.0 INTEGRATED RESOURCE MANAGEMENT

This section provides details on how the modelling methodology addresses non-timber resource requirements.

10.1 Forest Resource Inventories

The status of the various resource inventories covering TFL 55 was provided earlier in Section 5.

10.2 Forest Cover Objectives – Rationale

A summary of forest cover constraints that will be assigned to the RMZs in the timber supply analysis is provided in Table 10.1. Note that ungulate winter range (UWR) is no longer required on TFL 55.

10.2.1 Visual Quality Objectives

There are no visuals in the TFL 55 management area.

10.2.2 Caribou

The aim of the Caribou RMZ is to retain Caribou seasonal habitats. The *Revelstoke Higher Level Plan Order* classifies Caribou habitat requirements by location and BEC zone. The "location" referred to is defined as either being above or below the Operability Line in effect during 1994 (BC MSRM, 2005). The applicable RMZs have been listed below in Table 10.1 along with their minimum forest retention % and corresponding required age class. These requirements are applied to the forested landbase (excluding Provincial Parks, Protected Areas, Ecological Reserves and Federal Parks) with slopes less than 80%.

Table 10.1 Caribou Habitat requirements – Base Case

Analysis ID	Resource Management Zones	Min forest retention (%) by age class
1	Caribou in ESSF zone above car line	>= 70%, >= 8
2	Caribou in ICH zone above car line	>= 70%, >= 8
3 and 5	Caribou in ESSF zone below car line	>= 40%, >= 8 and >= 10%, 9
4 and 6	Caribou in ICH zone below car line	>= 40%, >= 8 and >= 10%, 9

10.2.3 Integrated Resource Management

The IRM zone has not been specifically modelled in this analysis because it does not reflect any operational reality for LP's management of the TFL. Instead spatial adjacency has been modelled for the initial 20 years. The impact of turning on the IRM disturbance requirement allowing no more than 25% below the height of 2 meters will be tested as sensitivity.

10.3 Biodiversity

10.3.1 Landscape-level Biodiversity

The management of landscape level biodiversity is legislated in the *Revelstoke Higher Level Plan Order*. Seral zones are defined by LU, BEC and biodiversity emphasis (BEO). There are no mature seral requirements for low BEO.

Table 10.2 shows the NDT, and definition of mature and old age for each of the seral zones in TFL 55. All seral zones are in natural disturbance type (NDT) 1.

Table 10.2 Old and mature seral definitions

NDT	LU and BEC	Mature (yrs)	Old (yrs)
1	ESSF	> 120	> 250
1	ICH	> 100	> 250

Table 10.3 shows the forest cover retention requirements for each of the seral zones in TFL 55. in the *Revelstoke Higher Level Plan Order* it is required that these seral requirements outlined in Table 10.3 must be met independently above and below the operability line for each LU/BEC combination. This equates to requiring that each seral constraint must be met both in and out of the operability area separately. Since operability loosely approximates THLB and only THLB seral constraints are applicable in the timber supply analysis, seral requirements need only be modelled below the operability line and therefore no one-third draw down rule has been applied.

Table 10.3 *Revelstoke Higher Level Plan Order* old and mature growth retention targets

Analysis ID	Landscape Unit	BEC Variant	BEO	Seral Requirements - Area (%) > Given Age	
				Mature	Old
1	r17	ESSFvc	Intermediate	36% >120	19% >250
2	r17	ESSFvc	Low	n/a	19% >250
3	r17	ESSFvv	Low	n/a	19% >250
4	r17	ESSFwc2	Low	n/a	19% >250
5	r17	ICHvk1	Intermediate	34% >100	13% >250
6	r17	ICHvk1	Low	n/a	13% >250
7	r17	ICHwk1	Intermediate	34% >100	13% >250
8	r5	ESSFvc	Low	n/a	19% >250
9	r5	ICHvk1	Intermediate	34% >100	13% >250
10	r5	ICHvk1	Low	n/a	13% >250
11	r5	ICHwk1	Low	n/a	13% >250
12	r5	ICHwk1	Intermediate	34% >100	13% >250

10.3.2 Stand-level Biodiversity

Stand level biodiversity is addressed in the analysis by reserving wildlife tree patches (WTP). A portion of the WTPs can come from areas already removed from the THLB, and the remainder is removed at the time of harvest.

The landscape unit planning guide describes the methods for calculating the additional area required for WTPs. In order to identify the net harvestable area requiring WTP reserves all areas removed from the productive forest landbase were identified. These included areas specifically identified as wildlife tree patches in Louisiana Pacific's forest development plan and stands with veteran layers which are assumed to not contribute to harvest. All of these forest components were then given a 250-metre buffer to reflect half of the maximum acceptable distance between wildlife tree patches according to Forest Practices Code (FPC) *Biodiversity Guidebook*. Harvestable areas not included within these buffers were deemed to require additional retention of WTP reserves. Table 10.4 summarizes percentage reservations calculated based on Table 20(a) of the *Biodiversity Guidebook*. Veteran layers do not contribute to volume estimates used in timber supply analysis; however they do provide old growth characteristics valuable for stand level biodiversity. The assumption that stands with veteran layers contribute to the WTP is based on the assumption that operations will leave the veterans standing, probably in the context of WTPs or snag recruitment.

Table 10.4 Wildlife tree retention requirements

1	2	3	4	5	6	7	8	9	10	11
					5/4	4/3		8/4		10*9
Landscape Unit	**Bec Zone / Subzone**	**Productive (ha)**	**Net (ha)**	**Net Logged (ha)**	**% of Net Logged**	**% of Productive that is Net**	**Net > 250m (ha)**	**Ratio Net 250/Net**	**WTP % Gross**	**WTP % Net**
Goldstream Creek		5	3	-	-	57	0	0.00	-	-
Goldstream Creek	ATun	9	-	-	-	-	-	-	-	-
Goldstream Creek	ESSFvc	15,169	1,846	435	24	12	394	0.21	1	0.21
Goldstream Creek	ESSFvcp	1,583	0	0	93	0	-	-	-	-
Goldstream Creek	ICHvk1	11,156	5,705	1,407	25	51	760	0.13	5	0.67
Goldstream Creek	ICHwk1	1,680	1,279	380	30	76	336	0.26	7	1.83
Mica Creek	ATun	0	-	-	-	-	-	-	-	-
Mica Creek	ESSFvc	10,336	4,484	1,050	23	43	1,547	0.34	5	1.72
Mica Creek	ESSFvcp	1,305	0	-	-	0	-	-	-	-
Mica Creek	ESSFvv	894	152	-	-	17	7	0.05	-	-
Mica Creek	ESSFvvp	333	1	-	-	0	-	-	-	-
Mica Creek	ESSFwc2	1,380	621	174	28	45	193	0.31	5	1.56
Mica Creek	ICHvk1	11,205	8,209	2,761	34	73	2,688	0.33	7	2.29
Mica Creek	ICHwk1	46	38	0	-	83	10	0.25	7	1.77
									Productive Area Weighted Average	**1.53**

10.4 Timber Harvesting

10.4.1 Minimum Harvest Age

The minimum harvest ages have been set at age at which 95% of CMAI is achieved providing that it has achieved a minimum volume and minimum DBH. The minimum volume is 200m^3/ha for cedar and hemlock and 150m^3/ha for other species. The minimum DBH limit for all species is 25cm DBH.

Table 10.5 summarizes the minimum harvest age (MHA) attributes for the natural stand yield tables.

Table 10.5 Minimum harvest age attributes for natural stands

AU	Name	THLB (ha)	Min. Harvest Age (years)	Diameter (cm)	Volume (m^3/ha)	MAI (m3/ha/yr)
1	ICHwk1-9,7,6-S	156	70	27.9	260	3.68
2	ICHwk1-5-S	96	80	27.2	256	3.14
3	ICHwk1-4-H-C	102	100	27.5	265	2.57
4	ICHwk1-4-S	225	100	27.6	278	2.71
5	ICHwk1-4-S	55	70	27.4	308	4.31
6	ICHwk1-1-C	98	80	26.6	272	3.26
7	ICHwk1-1-H	109	110	28.1	260	2.34
8	ICHwk1-1-S-Fd	25	90	26.7	296	3.22
9	ICHvk1-5-S-B	535	80	28.9	253	3.07
10	ICHvk1-5-C-H	256	80	29	282	3.39
11	ICHvk1-4-S-B-P	645	90	28.4	257	2.75
12	ICHvk1-4,3-C-Fd-P	1,549	80	26.3	246	3.00
13	ICHvk1-4-Fd	346	100	27.2	280	2.74
14	ICHvk1-4-H	1,135	120	29.2	273	2.25
15	ICHvk1-3,1-S-B-H	1,509	90	28.3	231	2.49
16	ICHvk1-1-C	1,863	80	28	283	3.38
17	ICHvk1-1-H-Fd-P	1,605	110	28.4	271	2.42
18	ESSFwcw, ESSFwc2-4,3-S-B	411	80	26.6	181	2.26
19	ESSFwcw, ESSFwc2-1-S	190	90	27.7	217	2.33
20	ESSFvc-1-B	855	90	26.3	167	1.81
21	ESSFvc-1-C	92	80	26.9	242	2.92
22	ESSFvc-1-H	418	130	30	292	2.23
23	ESSFvc-1-S	2,492	100	27.7	208	2.03
24	ESSFvc-6,4-S	122	110	27.9	196	1.76
25	ESSFvc-3-All	780	110	27.9	208	1.85

Table 10.6 summarizes the attributes for 95% CMAI for the TIPSY yield tables representing future managed stands and Table 10.7 summarizes for existing managed stands.

Table 10.6 Minimum harvest age attributes for future managed stands

Analysis Unit	Name	THLB (ha)	Min. Harvest Age (years)	Diameter (cm)	Volume (m^3/ha)	MAI (m3/ha/yr)
101	ICHwk1-9,7,6-S	0	70	27.9	491	6.73
102	ICHwk1-5-S	0	90	24.7	359	3.87
103	ICHwk1-4-H-C	0	120	21.2	215	1.75
104	ICHwk1-4-S	0	90	21.3	224	2.49
105	ICHwk1-4-S	0	60	25.1	374	6.16
106	ICHwk1-1-C	0	90	22.4	263	2.89
107	ICHwk1-1-H	0	130	21.9	237	1.76
108	ICHwk1-1-S-Fd	0	90	23.5	307	3.26
109	ICHvk1-5-S-B	0	70	24.4	346	4.90
110	ICHvk1-5-C-H	0	90	24.3	337	3.64
111	ICHvk1-4-S-B-P	0	90	24.5	350	3.73
112	ICHvk1-4,3-C-Fd-P	0	100	23.7	316	3.03
113	ICHvk1-4-Fd	0	100	23.6	313	3.00
114	ICHvk1-4-H	0	130	22.6	264	1.97
115	ICHvk1-3,1-S-B-H	0	90	24.4	343	3.68
116	ICHvk1-1-C	0	90	23.8	320	3.47
117	ICHvk1-1-H-Fd-P	0	120	22.8	271	2.25
118	ESSFwcw, ESSFwc2-4,3-S-B	0	90	23.9	320	3.54
119	ESSFwcw, ESSFwc2-1-S	0	100	24.6	345	3.34
120	ESSFvc-1-B	0	110	23.8	310	2.78
121	ESSFvc-1-C	0	100	24.1	324	3.19
122	ESSFvc-1-H	0	140	22.9	267	1.90
123	ESSFvc-1-S	0	110	24.6	344	3.02
124	ESSFvc-6,4-S	0	120	23.8	311	2.52
125	ESSFvc-3-All	0	120	23.8	312	2.54

Table 10.7 Minimum Harvest Age Attributes for Existing Managed Stands

AU	Name	THLB (ha)	Min. Harvest Age (years)	Diameter (cm)	Volume (m^3/ha)	MAI (m3/ha/yr)
201	ICHwk1-9,7,6-S	70	70	25.6	407	5.75
202	ICHwk1-5-S	17	110	23	282	2.54
203	ICHwk1-4-H-C	4	80	24.9	363	4.36
204	ICHwk1-4-S	30	90	22.6	272	2.94
205	ICHwk1-4-S	86	100	22.5	267	2.57
206	ICHwk1-1-C	2	100	23.1	290	2.80
207	ICHwk1-1-H	38	90	24.1	331	3.52
208	ICHwk1-1-S-Fd	200	80	24.3	341	4.14
209	ICHvk1-5-S-B	75	80	25.6	397	4.75
210	ICHvk1-5-C-H	88	80	26.3	424	5.04
211	ICHvk1-4-S-B-P	701	100	23.1	290	2.84
212	ICHvk1-4,3-C-Fd-P	174	110	22.5	267	2.41
213	ICHvk1-4-Fd	316	80	24.3	346	4.26
214	ICHvk1-4-H	23	170	21.7	224	1.28
215	ICHvk1-3,1-S-B-H	2,601	90	24.1	330	3.62
216	ICHvk1-1-C	256	150	22.6	258	1.68
217	ICHvk1-1-H-Fd-P	244	70	25.3	387	5.40
218	ESSFwcw, ESSFwc2-4,3-S-B	149	80	24.4	344	4.26
219	ESSFwcw, ESSFwc2-1-S	24	100	24.2	328	3.23
220	ESSFvc-1-B	83	120	24.3	330	2.67
221	ESSFvc-1-C	37	110	24.8	353	3.09
222	ESSFvc-1-H	30	90	24.8	355	3.81
223	ESSFvc-1-S	1,198	110	23.6	304	2.74
224	ESSFvc-6,4-S	25	120	23.5	296	2.46
225	ESSFvc-3-All	199	130	24	322	2.39

Table 10.7 shows the MHA using 95% of CMAI only. The full MHA criteria will be used once the adjusted site indices are available

Table 10.8 shows the LRSY estimates for TFL 55.

Table 10.8 LRSY estimates for natural and managed stands

THLB Area (ha)	Natural		Managed	
	Average CMAI	LRSY (m^3/yr)	Average CMAI	LRSY (m^3/yr)
22,339	2.67	59,745	3.34	74,633

10.4.2 Silviculture Systems

The purpose of this section is to document the silviculture management regimes that are applied on the TFL and how these regimes are reflected in the analysis. The analysis assumes that a clear cut or patch cut silviculture system is carried out in every case throughout the TFL. There has been no reduction for shading applied to managed stand yields in areas that are harvested using a patch cut silviculture system.

10.4.3 Initial Harvest Rate

The current AAC for TFL 55 is 90,000 m^3/yr, including allocation to the British Columbia Timber Sales Program (BCTS). In addition, an allowance must be made for non-recoverable losses. As the timber supply analysis is based on the net harvest plus NRLs, the initial gross harvest level for the Base Case analysis will be set to 91,490m^3/yr, providing a starting point for the analysis.

10.4.4 Harvest Rule

Harvest rules are used by the simulation model to rank stands for harvest. The harvest rule "oldest first" is used in this analysis. Another common rule is "relative-oldest first". With this rule, the difference between stand age and minimum harvest age is calculated. Stands with the greatest difference between these ages are given the highest priority for harvest. Harvest rules interact with forest cover constraints to determine the actual order of harvesting within the model. If a higher ranked stand is in a constrained zone and cannot be harvested then the model will choose the next highest ranked stand that can be harvested.

10.4.5 Harvest Flow Objectives

In all phases of the analysis, the harvest flow will reflect a balance of the following objectives:

- Maintain or increase the current harvest level for as long as possible;
- Limit changes in harvest level to less than 10% of the level prior to the reduction; and
- Achieve a maximum stable long-term harvest level and while having a stable growing stock profiles.

Forest cover requirements and biological capacity of the THLB will ultimately dictate the harvest level determined in the analysis.

10.4.6 Disturbing the Non-THLB

When modelling, the entire productive landbase is available to fulfill various landbase requirements (i.e. caribou and seral requirements). Traditionally, the only form of disturbance modelled is timber harvesting in the THLB. This is a concern because eventually in the model all the non-THLB becomes old and can lead to the non-THLB fulfilling an unrealistic portion of forest cover requirements, thereby reducing the impact on the THLB. In reality, there will be some level of natural disturbance within the non-THLB.

This section describes the theoretical process of disturbing the non-THLB used in the modeling of this analysis. The intentions are to achieve the early, mature and old seral percentages for each BEC variant in accordance with the natural range of variation (NROV) defined in the *Biodiversity Guidebook*.

The method used for this analysis is to: impose a seral requirement on the non-THLB of each BEC variant, which will force the non-THLB to achieve a seral zone distribution similar to the NROV from the *Biodiversity Guidebook*. From the non-THLB, the model will recruit the oldest stands first in order to achieve seral requirements as soon as possible. Then, the model forces an annual harvest disturbance to the non-THLB of each BEC zone using the oldest first harvest rule. The size of the disturbance will be determined from the disturbance frequency in the *Biodiversity Guidebook*

This process has been carried out by:

1. Determining the BEC zones and their area breakdown in TFL 55;
2. Using the *Biodiversity Guidebook* to determine the NDT, disturbance interval, mature and old age for each BEC zone;
3. Estimate the seral stage distribution following the *Biodiversity Guidebook* procedure (Appendix 4);
4. Determine the appropriate seral requirement (mature and old) for each BEC zone; and
5. Determine the annual disturbance for each BEC zone.

Table 10.9 provides the summary information for the BEC zones in TFL 55. All BEC variants shown are NDT 1.

Table 10.9 Summary information for BEC Zones

BEC Variant	Disturbance Interval	Mature Age	Old Age	Productive Area	THLB Area
ESSFvc	350	120	250	25,506	6,330
ESSFvv	350	120	250	894	152
ESSFwc2	350	120	250	1,380	621
ICHvk1	250	100	250	22,360	13,914
ICHwk1	250	100	250	1,726	1,317

The seral stage distribution is estimated using the negative exponential equation from Appendix 4 of the *Biodiversity Guidebook*. The negative exponential equation uses disturbance interval and gives the percent older than the input age:

Percent older than specified age = exp (-age/return interval)

Table 10.10 shows the seral stage distribution for the two fire return intervals that occur in TFL 55 (250 years and 350 years).

Table 10.10 Seral stage distribution for fire return intervals of 250 years and 350 years

Age	250		350	
	Greater than	Less than	Greater than	Less than
20	92%	8%	94%	6%
40	85%	15%	89%	11%
60	79%	21%	84%	16%
80	73%	27%	80%	20%
100	67%	33%	75%	25%
120	62%	38%	71%	29%
140	57%	43%	67%	33%
160	53%	47%	63%	37%
180	49%	51%	60%	40%
200	45%	55%	56%	44%
220	41%	59%	53%	47%
240	38%	62%	50%	50%
250	37%	63%	49%	51%

Table 10.11 shows the area that will be disturbed each year in each BEC zone and also shows the seral zone requirements that will be placed on the BEC zones in order to achieve the desired NROV.

Table 10.11 Disturbance levels and mature and retention requirements in non-THLB

BEC Zone	Disturbance Interval (yrs)	Annual Disturb (%)	Annual Dist (area in ha)	Seral requirements	
				Mature	Old
ESSFvc	350	0.29%	74	71% > 120	49% > 250
ESSFvv	350	0.29%	3	71% > 120	49% > 250
ESSFwc2	350	0.29%	4	71% > 120	49% > 250
ICHvk1	250	0.40%	89	67% > 100	37% > 250
ICHwk1	250	0.40%	7	67% > 100	37% > 250

11.0 SENSITIVITY ANALYSES

This section briefly describes the sensitivity analyses that will be performed on the Base Case. The sensitivities reflect the stability of the Base Case in the face of uncertainty surrounding specific analysis assumptions. They also reflect the impact of alternative management or potential changes in forest practices.

11.1 Landbase Definition

11.1.1 Timber Harvesting Landbase ±5%

Area will be shifted between the noncontributing and net landbase components to simulate changes in the operable landbase definition.

11.2 Growth and Yield Assumptions

11.2.1 Natural Stand Yields ±10%

All VDYP yield curves will be adjusted to measure the timber supply impact.

11.2.2 Managed Stand Yields ±10%

All TIPSY yield curves will be adjusted to measure the timber supply impact.

11.2.3 Natural Stand Minimum Harvest Ages ±10 Years

Natural stand minimum harvest ages will be altered to measure timber supply impact.

11.2.4 Managed Stand Minimum Harvest Ages ±10 Years

Managed stand minimum harvest ages will be altered to measure timber supply impact.

11.2.5 Regeneration Delay +5 years

Regeneration delay will be altered to measure the timber supply impact.

11.2.6 Managed Stand Site Index ±1 m

Managed stand site index will be altered to measure the timber supply impact.

11.2.7 Genetic Gains Removed

Genetic gains will be removed from future managed stands.

11.3 Resource Management Zone Assumptions

11.3.1 Green-up Heights ±1 Meter

Green-up heights used in spatial adjacency will be altered to measure the timber supply impact.

11.3.2 Turn off Adjacency and Turn on IRM

Disturbance constraints allowing more than 25% below two meters will be applied to the THLB to measure the timber supply impact.

11.4 Biodiversity Assumptions

11.4.1 Caribou Constraints

This will investigate the impact of reduced caribou constraints.

- Caribou retention at 60% below the caribou line (at clients request); and
- No caribou retention.

11.4.2 Landscape Level Biodiversity

Allow seral requirements to be fulfilled from inoperable as well as operable.

11.4.3 Turn off Disturbances in the Non-THLB

This will allow the non-THLB to age continuously and is similar to previous timber supply analyses on TFL 55.

11.5 Alternative Harvest Rules

The basecase harvest rule is the oldest first harvest rule. This sensitivity will evaluate the impact of modelling alternative harvest rules, including:

- Relative oldest first;
- Maximum existing volume; and
- Prioritizing harvest for fir and cedar stands first.

11.6 Alternative Harvest Levels

This sensitivity will test various options for harvest levels, including:

- Maximum harvest level for 10 years while maintaining a midterm harvest level above the natural stand LRSY; and
- Maximum non-declining harvest level.

12.0 REFERENCES

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