

# Management Plan No. 3 Terrace Community Forest

## Community Forest Agreement



### K1X

Date of Submission:

May 2020

Prepared by: Kim Haworth RPF

I confirm that the Management Plan submitted is consistent with the Community Forest Agreement dated Aug. 20, 2020, all relevant forestry legislation, any applicable Higher Level plans under the *Forest and Range Practices Act* and any commitments agreed to by both parties to this agreement.

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| <b>RPF signature</b>  | <b>Company representative signature</b>   |
| Kim Haworth   | Kim Haworth, General Manager  |
| <b>Printed Name of RPF</b>  | <b>Printed name of Company representative</b>   |

# Table of Contents

|  |           |
|--|-----------|
| <b>Introduction</b>  | <b>1</b>  |
| <b>Part A: Linking Community Values to the Management of the Community Forest</b>              | <b>2</b>  |
| <b>1. TCF Mission Statement and Guiding Principles</b>   | <b>2</b>  |
| Mission Statement:   | 2         |
| Guiding Principles:  | 2         |
| <b>2. Linkage of Community Forest Program Goals to TCF Management Goals</b>                    | <b>3</b>  |
| <b>3. Timber Production and Annual Allowable Cut</b>   | <b>7</b>  |
| <b>4. Consultation with other Forest Users</b>   | <b>9</b>  |
| <b>5. Protection and Conservation of Non-Timber Values and Resources</b>                       | <b>10</b> |
| Soils  | 10        |
| Visual Quality   | 11        |
| Range Land   | 11        |
| Water  | 11        |
| Wildlife and Fish and Fish Habitat Resource Features   | 11        |
| Biodiversity   | 12        |
| Recreation Resources   | 12        |
| Cultural Heritage Resources  | 12        |
| <b>6. Reporting</b>  | <b>13</b> |
| <b>Literature Cited</b>  | <b>14</b> |
| <b>Appendix A: Terrace Proposed Community Forest Sustainable Harvest Level Review</b>          | <b>15</b> |
| <b>Appendix B: Articles of Terrace Community Forest Limited</b>                                | <b>16</b> |
| <b>Appendix C: Maps of Operating Areas and Agreement Area for the Terrace Community Forest</b> | <b>17</b> |
| <b>Part B: Establishing the Annual Allowable Cut</b>   | <b>18</b> |
| <b>1. Proposed Allowable Annual Cut</b>  | <b>18</b> |
| <b>2. Allowable Annual Cut Rationale</b>   | <b>18</b> |
| <b>3. Timber Supply Review</b>   | <b>18</b> |
| <b>4. RPF Declaration</b>  | <b>18</b> |

## **Introduction**

The City of Terrace was granted a Probationary Community Forest license on June 21, 2005 with an allowable annual cut of 30,000 m<sup>3</sup>/year. The Terrace Community Forest Limited Partnership (TCF) is now requesting an increase in the allowable annual cut from 30,000 m<sup>3</sup>/year to 57,160 m<sup>3</sup>/year. This amendment to the Management Plan provides an update on the strategic direction of the Terrace Community Forest and includes the rationale for the increase in the allowable annual cut as a result of the timber supply review work carried out by Ecora.

This Management Plan amendment has been prepared for the Ministry of Forests, Lands, Natural Resource Operations and Rural Development and the City of Terrace, and it is consistent with the requirements stated in the Community Forest Agreement, the current forestry legislation, and higher-level plans (Kalum SRMP) under the Forest and Range Practices Act.

## **Part A: Linking Community Values to the Management of the Community Forest**

### **1. TCF Mission Statement and Guiding Principles**

#### **Mission Statement:**

*To provide long-term jobs while improving timber, wildlife and biodiversity values.*

#### **Guiding Principles:**

Terrace Community Forest Limited Partnership supports the following guiding principles as high-level direction to the governance and management of the community forest. These guiding principles inform and shape decision-making and assist in the attainment of the vision, mission, goals and objectives. The TCF will strive to promote their application by all those who work in and on community forest governance and operations.

1. provide long-term opportunities for achieving a range of community objectives, values and priorities
2. diversify the use of and benefits derived from the community forest agreement area
3. provide social and economic benefits to British Columbia
4. undertake community forestry consistent with sound principles of environmental stewardship that reflect a broad spectrum of values
5. promote community involvement and participation
6. promote communication and strengthen relationships between Aboriginal and non-Aboriginal community members
7. foster innovation
8. advocate forest worker safety
9. ensure that development is economically viable and will provide a positive return on investment to the local community
10. management of the community forest will provide employment opportunities to local residents and businesses

## 2. Linkage of Community Forest Program Goals to TCF Management Goals

The social, economic and broad resource management goals of the Terrace Community Forest are summarized in the following table:

| Goals   | Objectives   | Potential Strategies  | Linkage to Associated Provincial CFA Goals   |
|---|--|---|--|
| <p>Management of the community forest will provide long term benefits to the local community.</p> <p>TCF is managed for the local community and its values.</p> | <ul style="list-style-type: none"> <li>• Ensure that all operations are economically viable while maintaining or enhancing the other resource values which support our local community.</li> <li>• Forest management decisions of the community forest are pro-active and not responsive.</li> <li>• Management decisions of the community forest accurately reflect the needs of the community.</li> <li>• Forest management promotes community involvement and participation.</li> <li>• Maintain accurate and updated inventories to assist planning.</li> </ul>        | <ul style="list-style-type: none"> <li>• Manage the community forest under the guidance of the Community Forest Agreement and the Development Plan.</li> <li>• Management of the community forest will ensure that only operations with a positive return to the community will move forward.</li> <li>• TCF invested an VRI update from 2014 to 2016 and a site index adjustment project in 2018. Inventories for all resource values will be continually updated as funding becomes available.</li> <li>• Arrange meetings periodically to ensure adequate and sufficient communication between the community and the TCF General Manager.</li> <li>• Worker safety is of the highest priority and harvesting systems, which ensure safe working conditions, will be implemented.</li> <li>• Create local jobs but also requires high value stands or ideal market conditions to become viable</li> </ul> | <ul style="list-style-type: none"> <li>• provide long-term opportunities for achieving a range of community objectives, values and priorities</li> <li>• provide social and economic benefits to British Columbia</li> <li>• undertake community forestry consistent with sound principles of environmental stewardship that reflect a broad spectrum of values</li> <li>• promote community involvement and participation</li> <li>• advocate forest worker safety</li> </ul> |
| <p>Management of the community forest will provide long term jobs while improving timber, wildlife and biodiversity values.</p>                                 | <ul style="list-style-type: none"> <li>• Management the community forest will provide employment opportunities to local residents and businesses.</li> <li>• Management of the forest protects water quantity and quality of the community.</li> <li>• Management of the community forest will mitigate the impacts of harvesting on other forest values and their benefits.</li> <li>• Management the community forest will promote visual, archaeological, fish and fish habitat, wildlife, terrain and recreation inventories exist for the operating areas.</li> </ul> | <ul style="list-style-type: none"> <li>• Terrace has a very experienced and quality local workforce capable of carrying out all phases of the forestry activities necessary to meet the Community Forest development objectives.</li> <li>• Long term contracts will be entered into where practical and beneficial to both TCF and the consultant/contractor.</li> <li>• The avoidance of large openings in harvest planning.</li> <li>• Implement adequate silviculture systems (example: commercial thinning, shelterwood, single tree, patch cut or retention systems) to provide high water quality for the Deep Creek Fish Hatchery.</li> </ul>   | <ul style="list-style-type: none"> <li>• provide long-term opportunities for achieving a range of community objectives, values and priorities</li> <li>• diversify the use of and benefits derived from the community forest agreement area</li> <li>• provide social and economic benefits to British Columbia</li> <li>• undertake community forestry consistent with sound principles of environmental stewardship that reflect a broad spectrum of values</li> </ul>       |

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| <p>Management of the community forest will diversify the use of, and benefits derived from the community forest agreement area</p>       | <ul style="list-style-type: none"> <li>• Management of the Community Forest can expect to produce a wide variety of wood products.</li> <li>• Forest management will take advantage of local opportunities.</li> </ul>  | <ul style="list-style-type: none"> <li>• Deciduous species are managed for biodiversity and aesthetic reasons where operationally feasible and safe to do so.</li> <li>• Small millers and local entrepreneurs within the Community Forest are developing business plans, which will allow them to take advantage of the opportunity of the access to an expanding Asian market for the entire North Coast provided by the completion of the Prince Rupert container port, and the potential it gives to a value added industry.</li> <li>• Corporate with Bio-energy company to produce torrefied (black) pellet, which is in high demand within the European markets and utilizes any part of the tree and is not species specific, to further allow TCF to provide for a larger percent of deciduous species within the operating areas, while offsetting operating costs.</li> </ul> | <ul style="list-style-type: none"> <li>• diversify the use of and benefits derived from the community forest agreement area</li> <li>• foster innovation</li> </ul>  |
| <p>Forest management will promote communication and strengthen relationships between Aboriginal and non-Aboriginal community members</p> | <ul style="list-style-type: none"> <li>• Forest management will protect First Nations cultural values</li> <li>• Partner with First Nations in not only an economic venture but in educating the community at large.</li> <li>• A proactive one and solutions will be sought to minimize conflict and maintain healthy relationship with First Nations people when dealing with cultural values.</li> </ul> | <ul style="list-style-type: none"> <li>• Maintain culturally modified trees (CMT's) can be maintained and where possible promoted through education and research opportunities.</li> <li>• Employ First Nations people who have a great understanding of the medicinal properties within a wide range of our local botanical plant species in our silviculture program.</li> <li>• Traditional use study maps will, where possible, be obtained by the Community Forest and used during the planning process to ensure that traditional uses are identified and discussed with First Nations prior to any development.</li> <li>• An annual open house meeting will be held for the local First Nations. The General Manager will host the annual open house meeting at the TCF office. The specifics for the open house meeting will be advertised in the local paper.</li> </ul>       | <ul style="list-style-type: none"> <li>• promote communication and strengthen relationships between Aboriginal and non-Aboriginal communities and persons</li> </ul> |

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| <p>Responsibly manage and conserve all resources of the CF area based on the principles of environmental stewardship</p> <p>Resources include soils, timber, recreation, visual quality, water, fish and fish habitat, wildlife and wildlife habitat, water and riparian areas, forage and plant communities including invasive plants</p> | <ul style="list-style-type: none"> <li>• Emphasis on the improvement of the site productivity and various growth and yield information primarily in the managed stands.</li> <li>• The second growth volume is truly the future of TCF. The highly productive sites, roaded access and managed stand characteristics will make the second growth stands highly valuable as stem piece sizes increase over time.</li> <li>• Ensure proper surface grading, maintenance of ditches, cleaning of culverts, and flood and storm drainage repairs.</li> <li>• Implement proactive silviculture practice to allow for a greater number of rotations over the long term, minimizes brush competition problems and allows for harvest of adjacent stands sooner rather than later</li> <li>• Responsibly manage for visual sensitivity, old growth management areas, recreation and tourism potential, opportunities for research and education wildlife habitat values and a healthy environment</li> <li>• Forest health is paramount and will ensure a sustainable flow of timber products over time.</li> <li>• A Forest Stewardship Plan (FSP) was prepared for Terrace Community Forest Ltd Partnership prior to December 31, 2006 and is consistent with the Forest and Range Practices Act (January 31, 2004) its associated regulations and the Kalum Sustainable Resource Management Plan (April 2006).</li> </ul> | <ul style="list-style-type: none"> <li>• Manage second growth forest using alternate harvest systems (e.g. commercial thinning, shelterwood, single tree, patch cut or retention systems) to create an uneven aged management.</li> <li>• Harvesting will occur initially within the old growth component of the TCF operating areas to help the landbase transition to more-productive second growth faster.</li> <li>• When economical opportunities arise, harvesting will be focused on areas previously developed by BCTS in the Deep Creek watershed. Large amounts of capital investment and professional analysis has already taken place in this operating area therefore timber development can carry forward as soon as markets develop.</li> <li>• Incremental silviculture investments will be implemented throughout the community forest operating areas to improve overall stand condition and reduce age class gaps where identified.</li> <li>• A proactive approach to silviculture will be implemented to ensure stands are reforested promptly with appropriate species and mixes to ensure green-up is achieved quickly and forest health issues are mitigated.</li> <li>• A variety of wildlife that depends on the form of habitat within the community forest will be maintained.</li> <li>• Recreation and tourism will benefit from visual quality.</li> <li>• environmental health will be a beneficiary of the silviculture systems.</li> <li>• Management second growth stands for forest health and safety issues using these alternate harvesting systems and potentially create an uneven aged forest.</li> <li>• Visual quality objectives have restricted access to timber as much of the eastern portion of the Deep Creek operating area is in a retention polygon, thus restricting development on the steeper western facing slopes.</li> </ul> | <ul style="list-style-type: none"> <li>• provide long-term opportunities for achieving a range of community objectives, values and priorities</li> <li>• diversify the use of and benefits derived from the community forest agreement area</li> <li>• undertake community forestry consistent with sound principles of environmental stewardship that reflect a broad spectrum of values</li> <li>• foster innovation</li> </ul> |
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| <p>Forest health is paramount and will ensure a sustainable flow of timber products over time.</p> | <ul style="list-style-type: none"> <li>• Mixed species management following harvesting activities will be required to mitigate forest health problems.</li> <li>• Silviculture surveys following harvest will be required to monitor the regeneration. Forest health incidence data will be collected at time of surveys, and noted damaging agents and/or pests will be forwarded to the TCF general manager and dealt with accordingly.</li> <li>• Prescribed burning of debris piles and for site preparation is permitted during periods of low risk.</li> </ul> | <ul style="list-style-type: none"> <li>• White pine weevil damage will be minimized by limiting the amount of spruce to be reforested on site following harvest to less than 20 percent.</li> <li>• Hemlock dwarf mistletoe will be controlled by ensuring infected stems within clear-cuts are slashed, where feasible, unless infected stems are located in wildlife tree patches, patches of advanced regeneration, riparian management zones or are non-merchantable defect trees being recruited as snags and wildlife trees.</li> <li>• Planting alternative species adjacent to infected stems will minimize hemlock mistletoe forest health issues.</li> <li>• Windthrow potential will be field assessed to mitigate future timber losses or damage to wind events.</li> <li>• Windthrow damaged timber rapidly loses economic value within the first two years of an event. Where economically and biologically possible salvage should occur within this two year window.</li> <li>• Fire assessments following harvesting activities will determine requirements and must be approved by the general manager of the TCF prior to treatment.</li> </ul> | <ul style="list-style-type: none"> <li>• provide long-term opportunities for achieving a range of community objectives, values and priorities</li> <li>• advocate forest worker safety</li> <li>• undertake community forestry consistent with sound principles of environmental stewardship that reflect a broad spectrum of values</li> <li>• provide social and economic benefits to British Columbia</li> </ul> |
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### 3. Timber Production and Annual Allowable Cut

#### Timber Harvest Specifications

Timber harvesting specifications will be consistent with the standards as defined within the Community Forest Agreement. Deciduous species will be maintained for biodiversity and aesthetic reasons where operationally feasible and safe to do so.

#### Silvicultural Activities

The TCF is taking a proactive approach to silviculture activities within the tenure area. These activities include:

- prompt planting of ecologically suitable seedlings, including weevil resistant spruce seedlings. This ensures the harvested lands are reforested and stocked immediately following harvest. This proactive silviculture activity allows for a greater number of rotations over the long term, minimizes brush competition problems and allows for harvest of adjacent stands sooner rather than later.
- juvenile spacing of approximately 400 hectares in the last 5 years. Juvenile spacing is a priority for the TCF as this mitigates future fall down and ensures the stands maintain their volume growth over the short term and are set up for a commercial thinning entry.
- Due to the juvenile spacing work completed in the 1990's the TCF has been able to implement a very successful commercial thinning program. To date the TCF has spaced approximately 700 hectares

The quick reforestation, juvenile spacing of suitable stands and commercial thinning treatment activities reduce rotation length and maximize volume growth for timber production.

In addition to this, the TCF establishes permanent sample plots (PSP) in all of their commercial thinning blocks. The purpose of the PSPs is to monitor diameter growth and volume production over time. They are also monitoring natural regeneration and brush species development.

#### Forest Health

Potential forest health factors include defoliators (western hemlock looper), woody tissue feeders (white pine weevil), forest diseases (hemlock dwarf mistletoe), root diseases (*tomentosus* root rot and *annosus* root disease), mammal damage (snowshoe hare, vole, moose, deer and porcupine) and abiotic injuries (sun scald, frost, and windthrow).

With exception to the white pine weevil, hemlock dwarf mistletoe and porcupine, damage generally tends to be localized. White pine weevil damage will be minimized by limiting the amount of spruce to be reforested on site following harvest to less than 20 percent. Hemlock dwarf mistletoe will be controlled by ensuring infected stems within clear-cuts are slashed, where feasible, unless infected stems are located in wildlife tree patches, patches of advanced regeneration, riparian management zones or are non-merchantable defect trees being recruited as snags and wildlife trees. Planting alternative species adjacent to infected stems will also minimize hemlock mistletoe forest health issues. Porcupine feed on western hemlock, spruce, pine and balsam trees. Spacing stands with greater than 2% current porcupine damage is not recommended.

Windthrow potential will be field assessed to mitigate future timber losses or damage to wind events. Windthrow damaged timber rapidly loses economic value within the first two years of an event. Where economically feasible, salvage should occur within two years of a windthrow event.

Mixed species management following harvesting activities will be required to mitigate forest health problems. Silviculture surveys following harvest will be required to monitor the regeneration. Forest health incidence data will be collected at time of surveys, and noted damaging agents and/or pests will be forwarded to the TCF general manager and dealt with accordingly.

### **Permanent Roads**

The old growth forest makes up approximately 21% of the total operating area while second growth forests represent approximately 27%. The remaining operating area includes streams, environmentally sensitive areas, roads, landings, alpine, rock and other inoperable features. Although 21% of the operable land base is in old growth age classes only a small percentage of this is currently economical because of the high pulp component and/or development costs. The anticipated impact of the reductions to the productive portion of the agreement area due to permanent roads, landings, pits and trails will be very minimal. Current commercial thinning operations are using existing built roads, landings, pits and trails. Future harvesting of old growth stands is expected to be minimal in the near future due to economic reasons, which will minimize the amount new permanent access created.

### **Other Impacts on Annual Allowable Cut**

Since the TCF is an area based licence, there are no other impacts on the annual allowable cut expected. The exception would be if the Government enacted new regulations or changes to regulations that the TCF is not aware of or if the Government placed a non-forestry related project within its tenure area that causes denudation of productive forest lands.

#### 4. Consultation with other Forest Users

| User                 | Measures to Identify  | Measures to Consult  |
|----------------------|---|--|
| Trappers             | The TCF has a list with contact information for each of the licensed trappers within and directly adjacent to the community forest of Terrace.  | Licensed trappers within and directly adjacent to the community forest will be informed of the proposed management plans as per the legislation. An annual open house meeting will be held for the trappers. The General Manager will host the annual open house meeting at the TCF office. The specifics for the open house meeting will be advertised in the local paper.  |
| Guide Outfitters     | The TCF has a list with contact information for each of the licensed guide outfitters within and directly adjacent to the community forest of Terrace.  | Licensed guide outfitters within and directly adjacent to the community forest will be informed of the proposed management plans as per the legislation. An annual open house meeting will be held for the guide outfitters. The General Manager will host the annual open house meeting at the TCF office. The specifics for the open house meeting will be advertised in the local paper.  |
| Range Tenure Holders | No range licenses exist within the community forests and none are expected. If a range license is applied for at future date, the issue will be dealt with at that time.  | Not applicable   |
| First Nations        | <p>It is TCF 's intention to continue to maintain good working relationship with the Kitsumkalum, Kitselas, Lax-Kw'alaams, Haisla and Metlakatla First Nations.</p> <p>The Community Forest will continue to work with First Nations people not just on cultural values but in capacity building.</p> | <p>Information package including maps of the Terrace Community Forest operating areas and First Nations traditional territories and Management Plan are sent to the following First Nations via email for their review and comments:</p> <ul style="list-style-type: none"> <li>Coast Tsimshian Resources (Lax Kw'alaams)</li> <li>Kitselas Band Council</li> <li>Kitimat Village Council</li> <li>Kalum Ventures (Kitsumklum)</li> <li>Metlakatla Band</li> <li>Allied Tsimshian Tribes Association</li> </ul> <p>Traditional use study maps will, where possible, be obtained by the Community Forest and used during the planning process to ensure that traditional uses are identified and discussed with First Nations prior to any development.</p> <p>First Nations comments are responded to in writing.</p> <p>An annual open house meeting will be held for the local First Nations. The General Manager will host the annual open house meeting at the TCF office. The specifics for the open house meeting will be advertised in the local paper.</p> |

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| Community Members   | Board members of Directors of Terrace Community Forest Ltd will be comprised of industry related members (from forestry, logging, sawmilling, value added or small sawmilling), stakeholders (from such groups as the First Nations, Steelhead Society, Shames Mountain Ski Corporations, Terrace-Kitimat Cross Country Ski Club), a financial person and at-large community members. | In addition to having the members of the community sit on the board of directors, annual public meetings, advertising in local newspapers and the City of Terrace website will provide a means for the member of the community and local governments to get involved.  |
| Local Government    | To ensure community involvement and control, the City of Terrace Council and staff members have been excluded from holding a director position.   | Each year, the Board of Directors of Terrace Community Forest Ltd. will make recommendations to the City of Terrace Council for appointments to the seven members Board for a one year period.<br>Terrace Community Forest Ltd. will conduct business as per the Province of British Columbia Business Corporations Act. Further governance detail can be found in Appendix B. |
| Government Agencies | Ministry of Forest Range and Natural Resource Operations (FLNRO)  | Staff at the TCF are in regular contact with FLNRO as they apply for new licenses and permits and discuss higher level issues.   |

## 5. Protection and Conservation of Non-Timber Values and Resources

A Forest Stewardship Plan (FSP) was prepared for Terrace Community Forest Ltd Partnership (2016-2021) titled *Forest Stewardship Plan for FL A16836 and CFA KIX – September 2016* and is consistent with the *Forest and Range Practices Act* (January 31, 2004) (FRPA), its associated regulations and the Kalum Sustainable Resource Management Plan (April 2006). The FSP addresses objectives set by government, which include: soils, visual quality, timber, forage and associated plant communities, water, fish, wildlife, biodiversity, recreation resources, resource features and cultural heritage resources. Strategies on how to carry out management activities and results to be achieved are also described in the FSP. The following is a summary of the community management objectives for the Terrace Community Forest and which are incorporated into the FSP.

### Soils

To minimize impact to soils, harvesting and road building activities will be assessed at the site level and recommendations made, if required, to mitigate impacts. Roads will also be placed to avoid terrain hazard-prone areas, or constructed to minimize impacts. Qualified professionals will be consulted where unstable road or block indicators are encountered. Also, operations will focus on minimizing the amount of road per hectare of harvest. In general, harvest of second growth forest utilizes existing roads. The TCF recently installed a bridge across Lean-to Creek. A qualified professional was retained to develop environmental Monitoring Plan to mitigate the sedimentation into the creek from the newly exposed soils including the use up sediment traps and grass seeding of native species.

## **Visual Quality**

Visual quality objectives are very important not only from a tourism perspective, but for the community at large. Maintaining visual resources is fundamentally important to ensure public expectations for the Community Forest are achieved, given the adjacency of the forest to the community and the highway travel corridors. The general management intent is to maintain the aesthetic quality of the visual resources within the community. Locally established visual quality objectives from the established view points along the different highway corridors will be followed to maintain these aesthetic values. Blocks will be consistent with established Visual Quality Objectives.

## **Range Land**

The operational areas identified in the TCF are currently not suitable for range management. No range licenses exist within the community forests and none are expected. If a range license is applied for at a future date, it will be managed accordingly at that time.

## **Water**

Within the three operational areas (Amesbury/Shames, Deep Creek, and Kitimat Valley), the operating area of highest concern with regards to water quality is Deep Creek. Deep Creek is the Terrace Community Watershed, which is used as a backup water supply system for the City of Terrace. Although the main water supply comes from pumped ground water, the Deep Creek Community Watershed is still utilized during periods of high consumption and, due to its gravity flow system, is the City's only source of water during power failures. Deep Creek is also the main water supply system for the Deep Creek fish hatchery, which has been in operation since 1983. The hatchery is owned by Fisheries and Oceans Canada and is operated by the Terrace Salmonid Enhancement Society. Water resources in all three operating areas will be managed according to FRPA and the FSP.

## **Wildlife and Fish and Fish Habitat Resource Features**

Conservation of wildlife and fish habitat is a priority. Reserve areas and management criteria are identified within the Forest Stewardship Plan. Qualified professionals will assess for these values at the landscape and stand level, and make appropriate management recommendations, where applicable, to mitigate impacts to wildlife and fish habitat. Mapping of riparian areas is occurring on an incremental basis by block and road project.

The TCF has installed bat boxes and raptor nesting sites in the commercially thinned areas and are monitoring these sites. The TCF has also completed instream riparian work in Spring Creek and removed culverts in the Kitimat area to restore fish access and fish habitat. The TCF will continue to develop and support wildlife inventories within the operating areas.

## **Biodiversity**

Biodiversity will be managed throughout the land base (coarse filtered approach) through the establishment of old growth management areas (OGMA's), seral stage distribution, wildlife tree retention, species composition, spatial distribution of cut blocks, connectivity and using the fine filtered approach through the establishment of wildlife habitat areas (WHA's) and ungulate winter ranges (UWR's). At the stand level coarse woody debris retention and riparian management will also be primary focuses of the community forest. Additionally, commercial thinning treatments of second growth stands will contribute to shrub and herb development in the understory by reducing crown closure and allowing more light to penetrate to the forest floor.

## **Recreation Resources**

Within TCF operating areas there are good opportunities for recreation and tourism. To aid in the diversification of the local economy, recreation and tourism should be seriously considered for added revenue and job creation. Currently the majority of the recreational opportunities have been provided by Ministry of Forest funds and through volunteers. The operational areas have the capacity to provide high quality recreational opportunities for snowmobiling, cross country & downhill skiing, snowboarding, backcountry hiking, camping, fishing, hunting, mountain biking, and canoeing/kayaking. Many community members would like to see existing facilities such as the Shames Mountain Ski Resort and the Onion Lake ski trails expanded or improved. Most of the campsites and trails established by the Ministry of Forests are small and continued funding to maintain or upgrade the existing facilities is questionable. There are no major tenure holders or industrial partners to assist in funding future or existing recreational facilities within our operating areas. The Terrace Community Forest could use revenues from its products to formalize the development and maintenance of trails and facilities as well as possibly collect user fees to sustain the planning and management of existing and proposed opportunities. Management of harvesting activities within the Terrace Community Forest will recognize recreation resources to minimize impacts to these values and their potential. Access management will include and recognize the potential need of all recreational opportunities.

In 2017, the TCF cleared a new trail at the cross country ski trails so that the users no longer had to walk down the Wedeene FSR to access the Dog Trail. The new trail is now accessed immediately South of the parking lot. It also connects the West and East Dog Trail as a loop trail. In addition to this, the TCF also cleared some more area for parking in 2018 and has day lighted many of the ski trails.

## **Cultural Heritage Resources**

First Nations cultural features are present within all three operating areas. These features and their significance can be used to educate local community members and students, plus local government agencies. The TCF will work closely with the local First Nations to ensure that traditional use areas are clearly identified and incorporated into the planning process. Review and updating of existing Archaeological Overview Assessments will help aid in operational planning. Areas and features of cultural significance will be avoided where operationally feasible and safe to do so, and where possible promoted through education and research opportunities.

In 2005 the TCF updated the Archaeological Overview mapping in the Kitimat operating area. The TCF also had a Chance Find Procedures document developed to bring more awareness to field and operational crews and to ensure there was a procedure in place if an archaeological feature were found.

Joint ventures with First Nations forest management companies will be pursued where mutually beneficial to both parties. The TCF currently has an existing partnership agreement in place with the Kitselas First Nations.

## 6. Reporting

Terrace Community Forest Limited Partnership has a full time General Manager to oversee all aspects of the corporation. The General Manager is responsible for:

- All administrative aspects of the corporation and its activities
- Short and long term planning
- Planning and implementing community initiatives in the Community Forest
- Monitoring harvest operations
- Public and First Nations consultation
- Accountable for all financial transactions and pursue outside funding sources where available to the corporation
- Reporting to the board and the community
- Reporting will be completed annually as per the request to do so from Kitselas First Nation. Annual reporting will touch on the aspects of the Community Forest Program outlined in Part A (2) above and detail TCF's progress on each item. Information will be summarized in a brief report, and presented in an open house setting as detailed below.

Public involvement is an important role for the General Manager and TCF. The General Manager will meet with council in camera annually to discuss operations and accomplishments. Accomplishments will include jobs created, financial status, projects funded, future direction and other issues significant to the community. An annual open house meeting discussing the accomplishments above will be held for the general public and user groups (trappers, guide outfitters, local first nations). The General Manager will host the annual open house meeting at the TCF office. The specifics for the open house meeting will be advertised in the local paper.

TCF is managed for the local community and its values. It is important that management decisions are made that reflect the needs of the community. TCF management decisions and results are to be reported to the community so that the needs of the community are accurately reflected in the decisions of management. This is a primary goal of the TCF General Manager.

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## **Appendix A: Terrace Proposed Community Forest Sustainable Harvest Level Review**



# Terrace Community Forest Timber Supply Analysis: Analysis Report

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**Dated:** April 30, 2020

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## Limitations of Report

This report and its contents are intended for the sole use of the Terrace Community Forest and their agents. Ecora Engineering & Resource Group Ltd. does not accept any responsibility for the accuracy of any data, analyses, or recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Terrace Community Forest. Any such unauthorized use of this report is at the sole risk of the user.

# Executive Summary

Terrace Community Forest (TCF) has recently improved the data available for the landbase for both timber and non-timber objectives by completing a Vegetation Resource Inventory (VRI) in 2014, a silviculture update in 2016, a geographic information systems (GIS) road classification exercise in 2016, a stream classification exercise in 2016, and a site index adjustment (SIA) project in 2018. These projects contribute to reducing uncertainty and improving the accuracy of the data that will be used for timber supply analysis.

The TCF initiated a timber supply analysis project to assist in determining a new AAC using the improved inventory data. Ecora Engineering & Resource Group Ltd. (Ecora) has been retained by TCF to prepare the information for the timber supply analysis and AAC determination. This document describes the results of the recently completed timber supply analysis and should be viewed in conjunction with the detailed description of the data and assumptions provided in the *Terrace Community Forest Timber Supply Analysis Data Package* (Ecora, 2020).

Through a landbase classification process, the area is systematically removed from the gross landbase area to establish both the Crown Forested Landbase (CFLB) and timber harvesting landbase (THLB). The THLB for the analysis is calculated at 10,127 ha.

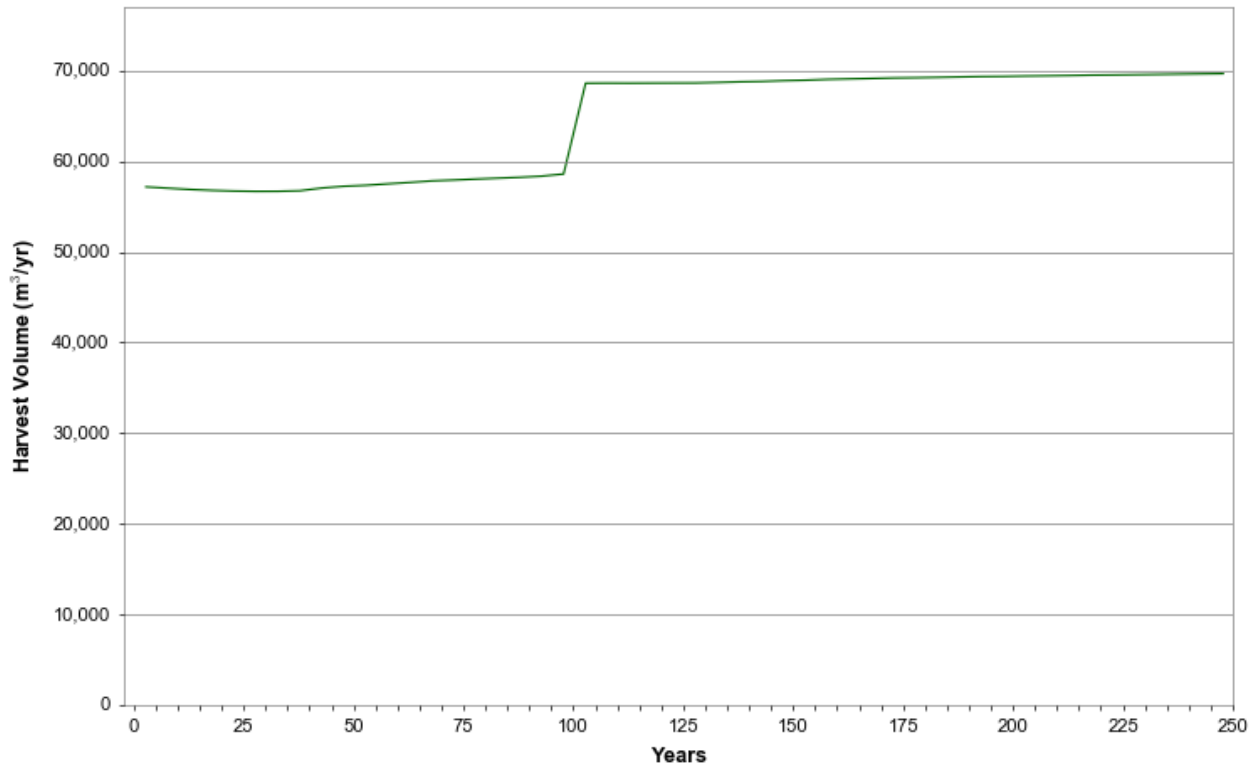
The base case analysis includes:

- A minimum harvestable volume of 250 m<sup>3</sup>/ha for conventional harvest systems;
- Landbase constraints including VQO, RMZ, WHA, Deep creek community watershed and landscape-level old forest retention targets;
- 100 years access constraint for identified marginal REHAB candidate stands to mimic delayed availability;
- A step-up harvest level starts from 57,000 m<sup>3</sup>/yr, stepping up to 69,000 m<sup>3</sup>/yr; and
- A sustainable long-term growing stock.

Pre-commercial thinning, commercial thinning and stand rehabilitation treatments have been assessed in the silviculture strategy analysis, they are defined as:

- **Pre-commercial thinning:** The pre-commercial thinning (PCT) treatment applies a thinning treatment to juvenile stands that removes very young stems to create desired stand conditions. PCT treatment has a cost of about \$2,200 per hectare depending on the stand conditions. There is no commercial product from PCT treatment because the stems removed are typically too small to be sold as a commercial crop. In the base case analysis, PCT treatment is only available for balsam and hemlock leading stands that are younger than 25 in age.
- **Commercial Thinning:** The commercial thinning (CT) treatment is to apply a thinning treatment to stands that have been pre-commercially thinned later in life and remove stems large enough to be sold as commercial products. There is no treatment cost related to CT as the value of the product recovered covers the cost of the treatment. Thinned volume is added into the annual harvest volume in the model and tracked separately. In the base case analysis, CT treatment is only available for balsam and hemlock leading stands aged 35 to 55.
- **Stand Rehabilitation:** The stand rehabilitation (REHAB) treatment is applied as a treatment to stands that have passed the age for juvenile spacing (PCT) and will have limited commercial return as stems removed have marginal merchantability and are small-diameter wood. In the base case analysis, REHAB treatment is only available for candidate stands that are older than 50 years for the first rotation.

The base case harvest forecast includes pre-commercial and commercial thinning treatments and is shown in Figure i. There are not REHAB treatments applied in the base case. The harvest level of the base case starts at approximately 57,000 m<sup>3</sup>/yr for 100 years and increased to around 69,000 m<sup>3</sup>/yr for the remainder of the planning horizon. The increase in harvest volume at around year 100 is caused by the delayed availability in marginal forest stands as well as the transition of natural stands to more-productive managed stands.



**Figure i: Base Case Scenario – Harvest Forecast**

Sensitivity analyses provide information on the degree to which uncertainty in the base case data and assumptions might affect the proposed harvest level for the landbase. A summary of the sensitivity analysis results and their variation from the base case are shown in Table i.

In general, the sensitivities and the base case show that the removal of pre-commercial thinning and commercial thinning treatments have the largest impact on the harvest flow with the removal of SIA having the next largest impact. Individual sensitivities are discussed in detail in Section 0.

**Table i: Average Harvest Level – All Scenarios**

| Sensitivity                      | Harvest Volume (1000's of m <sup>3</sup> /yr) |         |          |           |            | % Change from the Base Case |         |          |           |            |
|----------------------------------|---|---------|----------|-----------|------------|-----------------------------|---------|----------|-----------|------------|
|                                  | 1 to 5  | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                      | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                  | 57.16   | 57.02   | 57.21    | 58.32     | 69.13      | -                           | -       | -        | -         | -          |
| Even-flow Alternative (s35)      | 59.30   | 59.23   | 59.37    | 59.86     | 59.99      | 4%                          | 4%      | 4%       | 3%        | -13%       |
| Early Step-up Alternative (s36b) | 57.31   | 57.17   | 57.92    | 66.34     | 67.14      | 0%                          | 0%      | 1%       | 14%       | -3%        |
| Removal of SIA (s47)             | 47.22   | 47.12   | 47.21    | 48.14     | 55.91      | -17%                        | -17%    | -17%     | -17%      | -19%       |
| Block < 5 ha constraint (s40a)   | 55.38   | 55.24   | 55.78    | 57.43     | 68.60      | -3%                         | -3%     | -2%      | -2%       | -1%        |
| NSYT + 10% (s41)                 | 58.35   | 58.18   | 58.41    | 59.73     | 69.77      | 2%                          | 2%      | 2%       | 2%        | 1%         |
| NSYT - 10% (s43)                 | 54.25   | 54.02   | 54.32    | 55.79     | 68.80      | -5%                         | -5%     | -5%      | -4%       | 0%         |
| MSYT + 10% (s42)                 | 60.18   | 59.98   | 60.45    | 61.92     | 76.88      | 5%                          | 5%      | 6%       | 6%        | 11%        |
| MSYT - 10% (s44)                 | 51.34   | 51.22   | 51.32    | 52.26     | 62.99      | -10%                        | -10%    | -10%     | -10%      | -9%        |
| REHAB without Return (s38a)      | 58.18   | 57.91   | 58.39    | 60.08     | 69.29      | 2%                          | 2%      | 2%       | 3%        | 0%         |
| Rehab with Return (s38b)         | 59.70   | 59.45   | 59.68    | 61.02     | 69.22      | 4%                          | 4%      | 4%       | 5%        | 0%         |
| Limited budget PCT (s45)         | 54.38   | 54.24   | 54.14    | 55.43     | 67.89      | -5%                         | -5%     | -5%      | -5%       | -2%        |
| No Future Treatments (s37)       | 48.29   | 48.21   | 47.91    | 48.39     | 69.32      | -16%                        | -15%    | -16%     | -17%      | 0%         |
| No Silviculture Treatments (s46) | 35.49   | 35.33   | 35.71    | 64.55     | 69.49      | -38%                        | -38%    | -37%     | 11%       | 1%         |





# Table of Contents

|  |    |
|--|----|
| Executive Summary .....                                      | i  |
| 1. Introduction .....  | 1  |
| 2. Landbase Description.....                                 | 5  |
| 2.1 Location .....   | 5  |
| 2.2 Landbase Classification.....                             | 5  |
| 2.3 Leading Species .....                                    | 6  |
| 2.4 Logging History.....                                     | 7  |
| 2.5 Initial Age Class Distribution.....                      | 8  |
| 2.6 Site Index.....  | 9  |
| 2.7 Biogeoclimatic Ecosystem Classification .....            | 12 |
| 2.8 Volume Classes.....                                      | 13 |
| 3. Base Case Timber Supply Analysis.....                     | 15 |
| 3.1 Harvest Forecast .....                                   | 15 |
| 3.2 Base Case Harvest Characteristics.....                   | 17 |
| 3.3 Age Class Distribution .....                             | 22 |
| 3.4 Alternative Harvest Flow.....                            | 24 |
| 3.4.1 Even-flow Harvest Alternative.....                     | 24 |
| 3.4.2 Early Step-up Harvest Alternative.....                 | 25 |
| 4. Sensitivity Analysis.....                                 | 26 |
| 4.1 Removal of SIA Scenario .....                            | 26 |
| 4.2 Cutblock Size Limit .....                                | 29 |
| 4.3 Yield Assumptions .....                                  | 30 |
| 4.3.1 Natural Stand Yield Tables .....                       | 30 |
| 4.3.2 Managed Stand Yield Tables.....                        | 31 |
| 4.4 Silviculture Scenarios .....                             | 33 |
| 4.4.1 REHAB Treatment.....                                   | 33 |
| 4.4.1.1 REHAB Treatment without Volume Return.....           | 34 |
| 4.4.1.2 REHAB Treatment with 65% volume return .....         | 35 |
| 4.4.2 Limited Budget PCT Treatment Sensitivity .....         | 37 |
| 4.4.3 No PCT Treatment Sensitivity .....                     | 38 |
| 4.4.4 No Incremental Silviculture Treatment Sensitivity..... | 39 |

|       |  |    |
|-------|--|----|
| 5.    | Discussion.....  | 42 |
| 5.1   | Recommendations and Next Steps.....                        | 43 |
| 5.1.1 | Quality Assessment of Different Managed Stand Regimes..... | 44 |
| 5.1.2 | Monitor Treatment Stands for Future Improvements.....      | 44 |
|       | References.....  | 45 |

## List of Figures in Text

|              |  |    |
|--------------|--|----|
| Figure 1-1:  | Trial Treatment Implementation (Photo by Jason Bennett)                          | 2  |
| Figure 1-2:  | Commercial Thinning within TCF (Photo by Jason Bennett)                          | 3  |
| Figure 1-3:  | TCF Treatment Site in Winter (Photo by Jason Bennett)                            | 3  |
| Figure 2-1:  | Leading Species Summary  | 6  |
| Figure 2-2:  | Harvest Decade Distribution  | 7  |
| Figure 2-3:  | Initial Age Class Distribution   | 8  |
| Figure 2-4:  | Inventory Site Index Distribution  | 9  |
| Figure 2-5:  | Site Productivity Layer Distribution by THLB and Non-THLB                        | 10 |
| Figure 2-6:  | Site Index Adjustment Distribution by THLB and Non-THLB                          | 11 |
| Figure 2-7:  | BEC Subzones   | 12 |
| Figure 2-8:  | Volume Class Distribution  | 14 |
| Figure 3-1:  | Base Case Harvest Volume by Treatment Type                                       | 16 |
| Figure 3-2:  | Total Growing Stock  | 17 |
| Figure 3-3:  | Harvest Volume by Current Stand Types  | 18 |
| Figure 3-4:  | Harvest Volume by Natural and Managed Stands                                     | 19 |
| Figure 3-5:  | Average Harvest Age  | 20 |
| Figure 3-6:  | Average Harvested Volume Per Hectare   | 21 |
| Figure 3-7:  | Harvest by Leading Species   | 22 |
| Figure 3-8:  | Age Class Distribution   | 23 |
| Figure 3-9:  | Even-flow Alternative versus Base Case Harvest Flow                              | 24 |
| Figure 3-10: | Early Step-up Alternative versus Base Case Harvest Flow                          | 25 |
| Figure 4-1:  | No SIA Sensitivity versus Base Case Harvest Flow                                 | 27 |
| Figure 4-2:  | No SIA Sensitivity versus Base Case Growing Stock                                | 28 |
| Figure 4-3:  | Cutblock Size Restriction Sensitivity versus Base Case Harvest Flow              | 29 |
| Figure 4-4:  | NSYT Sensitivities versus Base Case Harvest Flow                                 | 30 |
| Figure 4-5:  | MSYT Sensitivities versus Base Case Harvest Flow                                 | 32 |
| Figure 4-6:  | REHAB Treatment without Return Sensitivity versus Base Case Harvest Flow         | 34 |
| Figure 4-7:  | REHAB Treatment without Return Sensitivity Harvest Volume by Current Stand Types | 35 |
| Figure 4-8:  | REHAB Treatment with 65% Return Sensitivity versus Base Case Harvest Flow        | 36 |
| Figure 4-9:  | Limited Budget PCT Treatment Sensitivity versus Base Case Harvest Flow           | 37 |
| Figure 4-10: | No Future Treatment Sensitivity versus Base Case Harvest Flow                    | 39 |
| Figure 4-11: | No Silviculture Treatment Sensitivity versus Base Case Harvest Flow              | 40 |
| Figure 4-12: | No Silviculture Treatment Scenario Harvest Volume by Current Stand Types         | 41 |

## List of Tables in Text

|             |   |    |
|-------------|---|----|
| Table 2-1:  | Landbase Classification.....  | 5  |
| Table 3-1:  | Base Case Average Annual Harvest Levels.....  | 16 |
| Table 3-2:  | Current Stand Conditions .....  | 17 |
| Table 3-3:  | Even-flow Alternative versus Base Case Annual Harvest Levels .....                                      | 24 |
| Table 3-4:  | Early Step-up Alternative versus Base Case Annual Harvest Levels .....                                  | 25 |
| Table 4-1:  | Sensitivity Analysis Scenarios .....  | 26 |
| Table 4-2:  | No SIA Sensitivity versus Base Case Annual Harvest Levels .....   | 27 |
| Table 4-3:  | Cutblock Sizes Restriction Sensitivity versus Base Case Harvest Flow .....                              | 29 |
| Table 4-4:  | NSYT versus Base Case Harvest Volume and Percent Difference .....                                       | 31 |
| Table 4-5:  | MSYT versus Base Case Harvest Volume and Percent Difference .....                                       | 32 |
| Table 4-6:  | Silviculture Treatment Sensitivity Analysis Scenarios .....   | 33 |
| Table 4-7:  | REHAB Treatment without Return Sensitivity versus Base Case Harvest Volume and Percent Difference ..... | 34 |
| Table 4-8:  | REHAB Treatment with 65% Return Sensitivity versus Base Case Harvest Volume and Percent Difference..... | 36 |
| Table 4-9:  | Limited Budget PCT Treatment Sensitivity versus Base Case Harvest Volume and Percent Difference .....   | 38 |
| Table 4-10: | No Future Treatment Sensitivity versus Base Case Harvest Volume and Percent Difference .....            | 39 |
| Table 4-11: | No Silviculture Treatments Sensitivity versus Base Case Harvest Volume and Percent Difference .....     | 40 |
| Table 5-1:  | Summary of Analysis Results.....  | 42 |

## Acronyms and Abbreviations

|        |   |         |  |
|--------|---|---------|--|
| AAC    | Allowable Annual Cut  | NSYT    | Natural Stand Yield Tables                                     |
| AC     | Poplar  | OGMA    | Old Growth Management Areas                                    |
| ACT    | Black Cottonwood  | PCT     | Pre-commercial Thinning  |
| BA     | Amabilis Fir  | PFLB    | Productive Forest Landbase                                     |
| BC     | British Columbia  | PL      | Lodgepole Pine   |
| BEC    | Biogeoclimatic Ecosystem Classification                                     | PSPL    | Provincial Site Productivity Layer                             |
| CC     | Clear-cut   | REHAB   | Rehabilitation   |
| CF     | Community Forest  | RESULTS | Reporting Silviculture Updates and Land Status Tracking System |
| CFA    | Community Forest Agreement  | RMZ     | Resource Management Zone                                       |
| CFLB   | Crown Forested Landbase   | SIA     | Site Index Adjustment  |
| CT     | Commercial Thinning   | SIBEC   | Site Index Estimates by BEC Site Series                        |
| CW     | Western Red Cedar   | SPH     | Stems per Hectare  |
| DR     | Red Alder   | SX      | Spruce Hybrid  |
| EP     | Paper Birch   | TASS    | Tree and Stand Simulator                                       |
| FAIB   | Forest Analysis Inventory Branch  | TCF     | Terrace Community Forest                                       |
| FESBC  | Forest Enhancement Society of British Columbia                              | THLB    | Timber Harvesting Landbase                                     |
| GIS    | Geographic Information Systems  | TIPSY   | Table Interpolation Program for Stand Yields                   |
| Ha     | Hectares  | TSA     | Timber Supply Area   |
| HM     | Mountain Hemlock  | TSR     | Timber Supply Review   |
| HW     | Western Hemlock   | UWR     | Ungulate Winter Range  |
| IRM    | Integrated Resource Management  | VDYP    | Variable Density Yield Prediction Growth and Yield Model       |
| LRMP   | Land and Resource Management Plan   | VQO     | Visual Quality Objectives                                      |
| MFLNRO | Ministry of Forest, Lands, Natural Resource Operation and Rural Development | VRI     | Vegetation Resources Inventory                                 |
| MOF    | Ministry of Forests   | WHA     | Wildlife Habitat Area  |
| MSYT   | Managed Stand Yield Tables  |         |  |
| NRL    | Non-Recoverable Losses  |         |  |

# 1. Introduction

The community of Terrace holds a long-term Community Forest Agreement (CFA) with exclusive rights to harvest timber and manage the forest values within the area. The Terrace Community Forest (TCF) covers 25,163 hectares (ha) located within the Coast Mountains Resource District and Kalum Timber Supply Area (TSA). It is divided into three parcels situated north (Deep Creek), west (Shames) and south (Kitimat) of the community of Terrace. TCF has an allowable annual cut (AAC) of 30,000 m<sup>3</sup> per year currently.

The community forest area was heavily harvested prior to the 1980s. The forest regeneration procedures of the time resulted in those stands being naturally regenerated as very high-density stands. This resulted in a high mortality rate that restricts the understory vegetation, restricts wildlife access, and reduces the diameter growth of the crop trees. These stands are therefore identified through a review process and are labelled as REHAB candidate stands described in the *Terrace Community Forest Timber Supply Analysis Data Package* (the data package) (Ecora, 2020). Without silviculture intervention, these stands are unavailable for harvest for 100 years. However, with pre-commercial thinning and commercial thinning treatments as modelled in this analysis report in Section 0, these stands will become economically viable sooner.

This analysis report describes the results of the recently completed timber supply analysis for TCF. TCF has an estimated timber harvesting landbase (THLB) of 10,127 ha. The Terrace Community Forest has undertaken various projects over the past two years to significantly improve the quality of information for the landbase. This includes:

- A comprehensive vegetation resource inventory (VRI) (2014);
- A VRI silviculture update (2015-2016);
- A roads and trails inventory (2016);
- A stream classification project (2016); and
- A site index adjustment project (2018).

This information supports better planning and resource management decision-making while significantly reduces the uncertainty associated with estimating the effect of the timber supply analysis for this community forest.

TCF initiated a timber supply analysis project to assist in determining a new AAC. Ecora Engineering & Resource Group Ltd. (Ecora) has been retained by TCF to prepare the information for the timber supply analysis and AAC determination.

TCF and its manager have participated in and lead a number of silviculture treatment trials in TCF and hold extensive regional expertise in the implementation of silviculture treatments. The TCF manager implemented the Onion Lake Flats Pruning Density Trial in 1993, which included 171 ha of CWH ws1 Biogeoclimatic subzone. This area was harvested in 1972 - 73 and regenerated naturally with western hemlock and amabilis fir. The trial consisted of 17 different treatment units including one control. The 16 treatments and one control were randomly assigned to the units. Spacing and pruning began in the summer of 1993, and all treatments were completed by the spring of 1995. All units, except the control, were thinned to six target density levels (300, 450, 600, 800, 1000, and 1200 SPH). Each thinning density had three regimes:

1. Not pruned;
2. 100% pruned; and

3. Every 2<sup>nd</sup> tree pruned (50% pruned), except for the 300 and 450 stems per hectare (SPH) densities which did not include a 50% prune regime.

A second lift prune (~6.0 m) was completed between the fall of 2001 and 2004.

The first commercial thinning that took place in the TCF was in 2014/2015 in cutting permit 8 block 1. Cutting permit 8 block 1 is located within the Coastal Western Hemlock (CWH) biogeoclimatic zone and consists of four openings that were logged between 1971 and 1974. A portion of the block (opening 103 I 037–007) was broadcast burnt in 1972 and planted shortly thereafter. The remainder of the block was naturally regenerated with hemlock and balsam. The block was juvenile spaced between 1990 and 1997 to approximately 1,200 SPH. This study was established as a baseline for future measurements in order to compare and contrast the growth patterns of trees that remain after commercial thinning harvest entries.

In 2018, the trial areas were commercially thinned to a target density of 400 SPH. The average commercial thinning treatment area is 130 ha per year. The average volume taken with a commercial thinning entry is about 225 m<sup>3</sup>/ha, resulting in a return of approximately 29,250 m<sup>3</sup> per year.

Figure 1-1 shows the previous thinning trials being developed. Figure 1-2 shows a site that had previous pre-commercial thinning in the process of being commercially thinned (right side of the photo). Figure 1-3 shows a treatment site in winter.



Figure 1-1: Trial Treatment Implementation (Photo by Jason Bennett)





Figure 1-2: Commercial Thinning within TCF (Photo by Jason Bennett)



Figure 1-3: TCF Treatment Site in Winter (Photo by Jason Bennett)

The purpose of this analysis report is to document the results of modelled scenarios in support of the new AAC determination. This analysis report should be viewed in conjunction with the recently completed *Terrace Community Forest Timber Supply Analysis Data Package* (the Data Package; Ecora, 2020) which describes the input data and assumptions used in this analysis.

## 2. Landbase Description

### 2.1 Location

The Terrace Community Forest is divided into three parcels situated north (Deep Creek), west (Shames) and south (Kitimat) of the community of Terrace (i.e., Kitimat, Shames, and Deep Creek). See Figure 1-1 in the data package for the community forest's geographic location.

### 2.2 Landbase Classification

The landbase classification process begins with the total area of the TCF and removes the area in a stepwise fashion according to the classification criteria detailed in *the Data Package* (Ecora, 2020). Through this process, the area is systematically removed to establish both the crown forested landbase (CFLB) and the timber harvesting landbase (THLB). A complete description of the data and assumptions used in the netdown is documented and the final THLB is 10,127 ha. Table 2-1 shows the detailed landbase classification type and their removed area.

**Table 2-1: Landbase Classification**

| Landbase Classification                  | Gross Area (ha) | Removed Area (ha) |
|--|-----------------|-------------------|
| <b>Total area</b>                        | 22,043          | 22,043            |
| Non-forest                               | 6,312           | 5,916             |
| Non-commercial                           | 3,493           | 14                |
| Road                                     | 479             | 460               |
| Trail                                    | 37              | 14                |
| <b>Crown forested landbase (CFLB)</b>    |                 | <b>15,288</b>     |
| Wetland                                  | 74              | 28                |
| Lake                                     | 119             | 2                 |
| Stream                                   | 484             | 366               |
| Ungulate winter range (UWR)              | 2,177           | 1,266             |
| Wildlife habitat area (WHA)              | 39              | 0.1               |
| Deciduous                                | 332             | 82                |
| Low Crown Closure Areas                  | 2,687           | 786               |
| Low Volume Areas                         | 3,502           | 658               |
| OGMA                                     | 1,282           | 881               |
| Inoperable                               | 2,876           | 707               |
| Unstable                                 | 1,260           | 334               |
| Future roads                             | 49              | 49                |
| <b>Timber harvesting landbase (THLB)</b> |                 | <b>10,127</b>     |

## 2.3 Leading Species

The CFLB includes both the THLB and the productive non-timber harvesting landbase (non-THLB). Figure 2-1 shows the leading species within the CFLB divided into THLB and non-THLB. Most of the stands within the non-THLB are mountain hemlock leading (HM) while most of the stands within the THLB are western hemlock leading (HW). Western hemlock leading stands represent 73% of the THLB followed by mountain hemlock (Hm) at 11%, balsam (subalpine-fir and amabilis fir) at 9%, pine (PL) at 3%, and spruce (SX) at 3%. The remaining 2% of the THLB is composed of a variety of other minor species (i.e. deciduous, and cedar). The other deciduous species include poplar, birch and alder (AC, ACT, EP and DR). The leading species 'none' indicates area without a leading species.

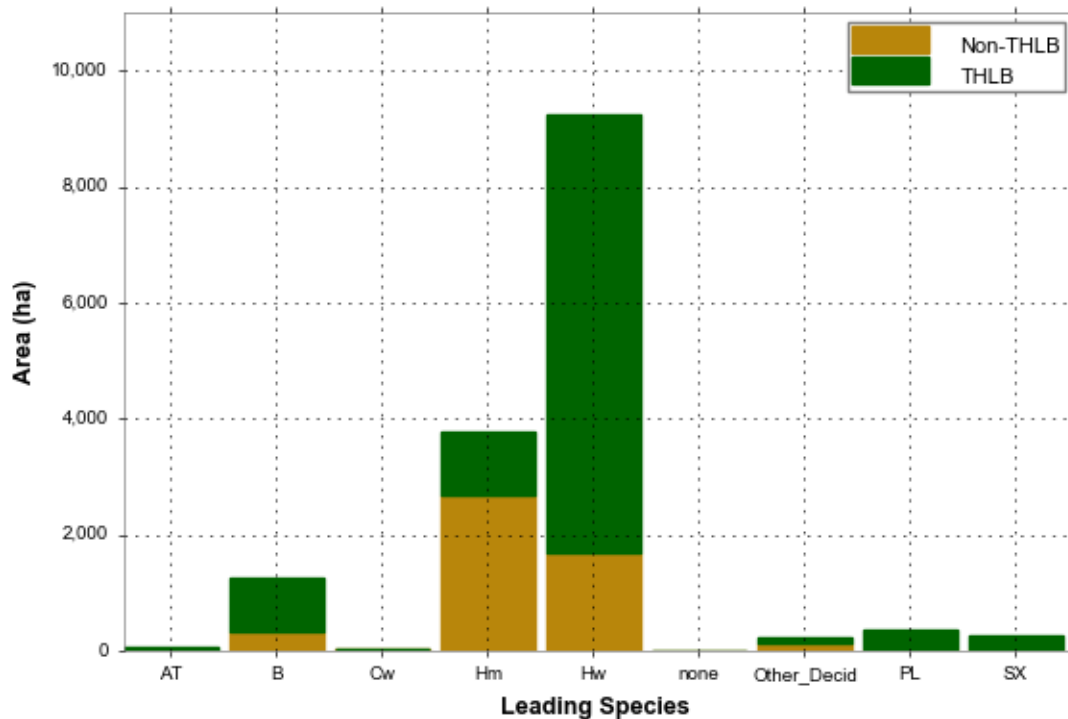


Figure 2-1: Leading Species Summary

## 2.4 Logging History

Logging history has been compiled from the MFLNRO and TCF corporation records including:

- Reporting Silviculture Updates and Land Status Tracking System (RESULTS);
- Consolidated cutblocks; and
- TCF cutblocks.

Figure 2-2 summarizes the THLB and non-THLB by the decade of harvesting activities, logging history is traced back to before the 1960s. There was 16% of the THLB harvested in the decade of the 1960s and 20% in the 1970s. Harvest drops in the 1980s down to 8% of the THLB, 2% in the 1990s and 1% in the 2000s. The TCF has been implementing silviculture treatments since 1993 and has developed a three-path harvest system that applies PCT treatment at age 20, CT treatment at age 40 and clear-cut after age 80.

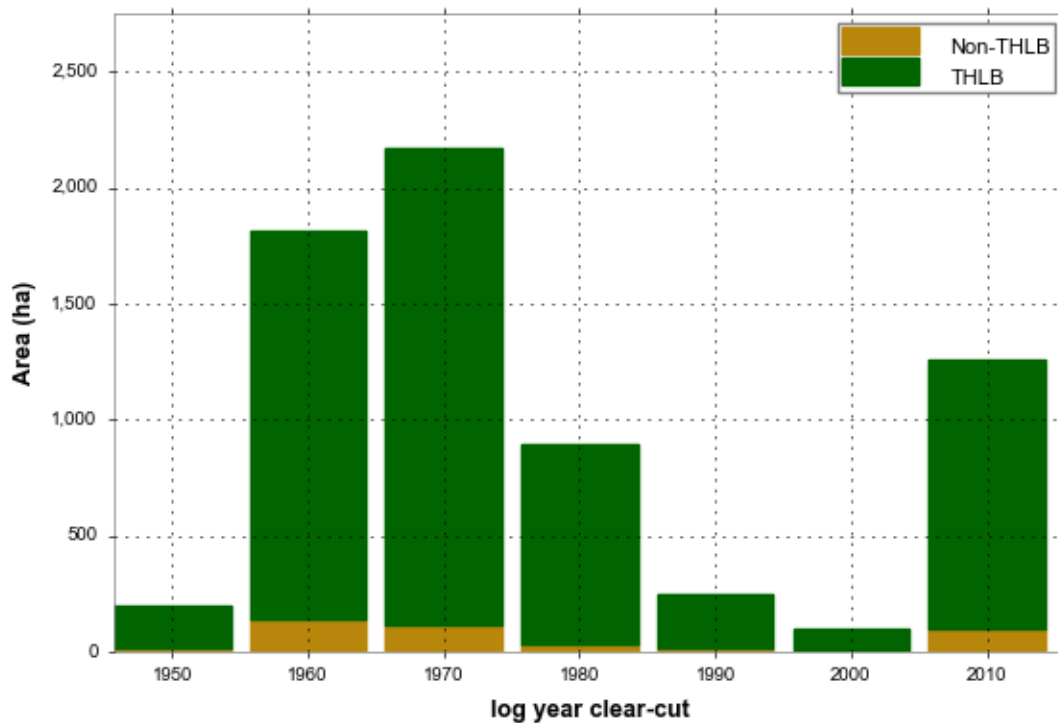


Figure 2-2: Harvest Decade Distribution

## 2.5 Initial Age Class Distribution

This analysis uses stand ages updated to January 1<sup>st</sup>, 2019 and has been updated according to VRI reference year and logging activities completed by December 31<sup>st</sup>, 2018. Figure 2-3 shows the current age class distribution. Age class one includes ages 0-20, age class two includes ages 21-40, age class three includes ages 41-60, age class four includes ages 61-80, age class five includes ages 81-100, age class six includes ages 101-120, age class seven includes ages 121-140, age class eight includes ages 141-250, and age class nine is described by forest older than 250 years. The age-class distribution of the forest is largely influenced by harvest history, placing approximately 62% of the THLB are in age classes 1, 2 and 3 where 39% of the THLB area is in age class 3. The remaining 38% of the THLB is composed of 1% of age class 4, 5% of age class 5, 5% of class 6, 2% of age class 7, 10% of age class 8, and 15% of age class 9. The graph also shows that natural disturbances do not frequently occur on this landbase because most of the forest is concentrated in age class 8 and 9.

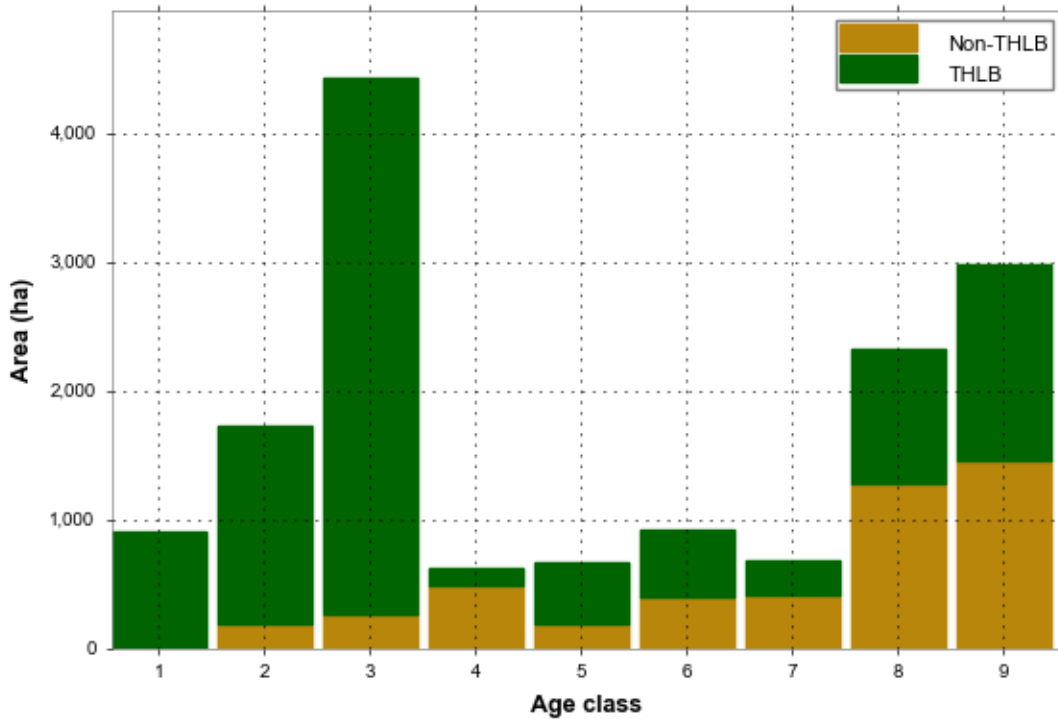


Figure 2-3: Initial Age Class Distribution

## 2.6 Site Index

Site index is the measure of site productivity and is defined as ‘the average height that free-growing undamaged top height trees of a given species can achieve in 50 years of growth above breast height (Ministry of Forests (MOF), 1999). Inventory site index values are used to estimate the productivity of natural stands, while site index values from the adjusted Provincial Site Productivity Layer (PSPL) site index values are used for managed stands.

In this analysis, inventory site index values are primarily used to generate natural yield curves. Figure 2-4 shows the inventory site index distribution for TCF with the majority of the THLB between 12 and 24 meters.

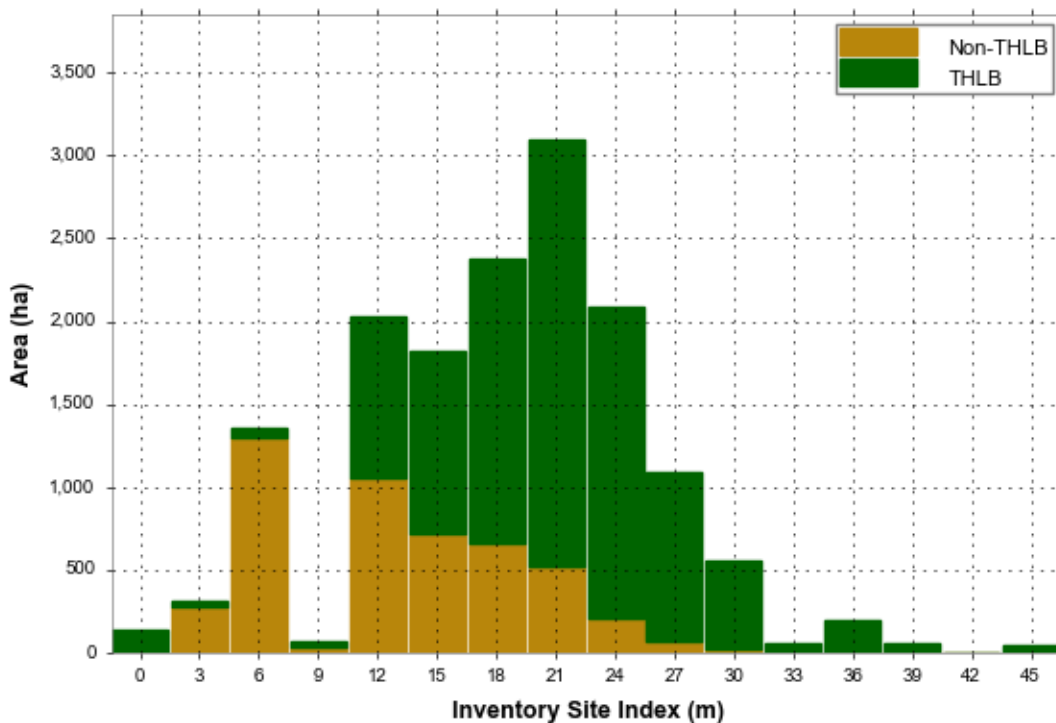


Figure 2-4: Inventory Site Index Distribution

It is commonly believed that inventory site index estimates from photo-interpreted height and age of Vegetation Resources Inventory (VRI) under-estimates the site index of managed stands. When these under-estimated site index values are applied to future managed stands in timber supply modelling, the predicted yield and sustainable harvest level can be significantly understated. According to the *Kalum VRI Strategic Inventory Plan* (LM Forest Resource Solution, 2004), site productivity was an identified forest management issue in the Kalum TSA as it relates to VRI (LM Forest Resource Solution, 2004). In the *Kalum TSA Timber Supply Analysis Technical Report* (Forest Analysis Inventory Branch (FAIB), 2010), the base case included a site index adjustment for western hemlock (HW), based on the findings of Nigh and Love (1997). The report also includes a sensitivity analysis with site index adjustments on the other tree species based on the same study and found that the harvest level over the latter half of the planning horizon increased (FAIB, 2010).

Based on these findings, TCF and Ecora completed a site index adjustment (SIA) project. The process was approved by MFLNRO. The objective of the SIA project was to conduct unbiased field sampling to validate the existing site index values from the PSPL, which estimates the managed stand site index of commercial species

across BC. This is accomplished through the application of PSPL and SIA data in areas with existing ecosystem maps and developing gap-filling biophysical models. The SIA project findings (Ecora, 2018) were applied as adjustment ratios to the PSPL site index values. SIA site index values are used to estimate existing and future managed stand productivity and the VRI site index is used to estimate natural stand productivity. For additional information on the site index adjustment project see *Terrace Community Forest Site Index Adjustment Project – Final Report* (Ecora, 2018).

Figure 2-5 shows the distribution of PSPL values across the CFLB. Most of the site productivity layer values are concentrated between 21 and 24 meters, which is 81% of the THLB area.

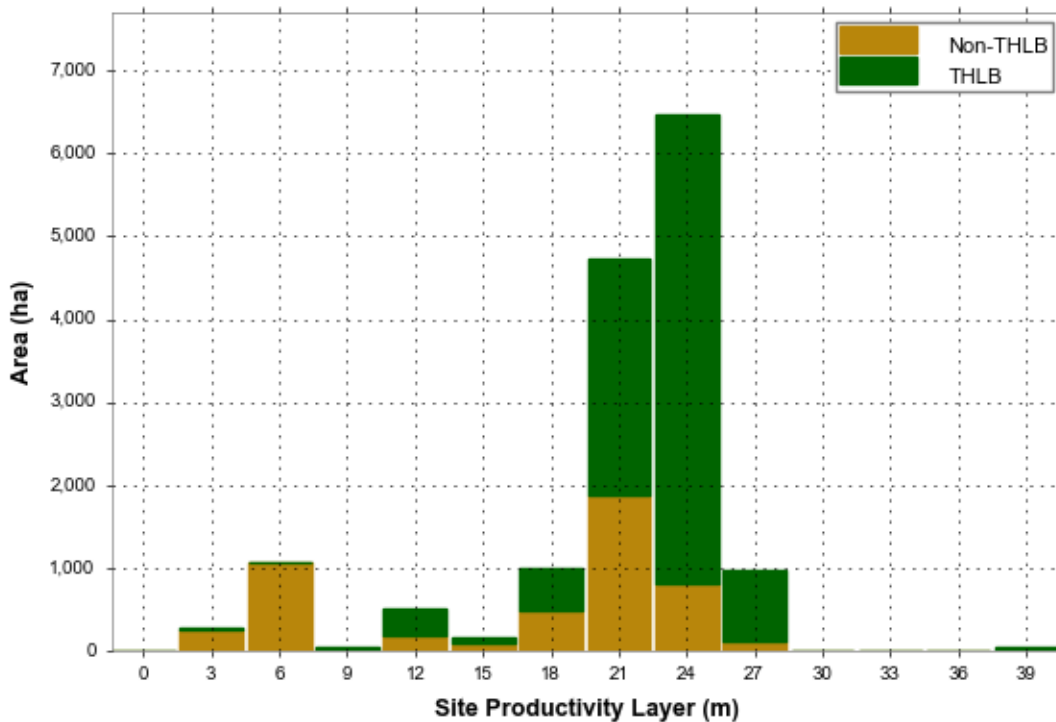


Figure 2-5: Site Productivity Layer Distribution by THLB and Non-THLB



With the SIA project adjustment ratios applied to the PSPL site index values, the managed stand site index range was further increased. Figure 2-6 illustrates the distribution of the adjusted managed stand site index. Most of the stands in THLB are in site index group 27m, followed by 24m and 30m.

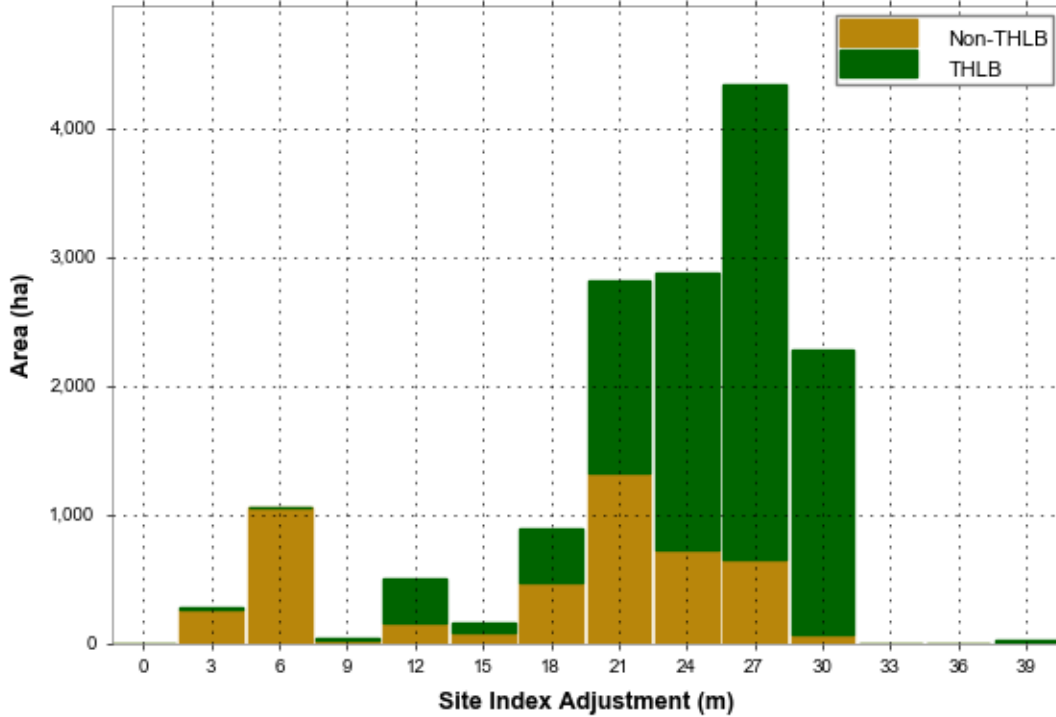


Figure 2-6: Site Index Adjustment Distribution by THLB and Non-THLB

## 2.7 Biogeoclimatic Ecosystem Classification

The TCF is mainly distributed amongst 2 Biogeoclimatic Ecosystem Classification (BEC) zones: Coastal Western Hemlock Zone (CWH), and Mountain Hemlock Zone (MH). The TCF BEC subzones include CWH ws1 (Wet Submaritime, Submontane), CWH ws2 (Wet Submaritime, Montane), MHmm2 (Moist Maritime, Leeward) and MH mmp (Moist Maritime Parkland) as shown in Figure 2-7. The majority of the THLB area concentrates in the CWH ws1 (Submontane Wet Submaritime) subzone and accounts for 77% of the THLB.

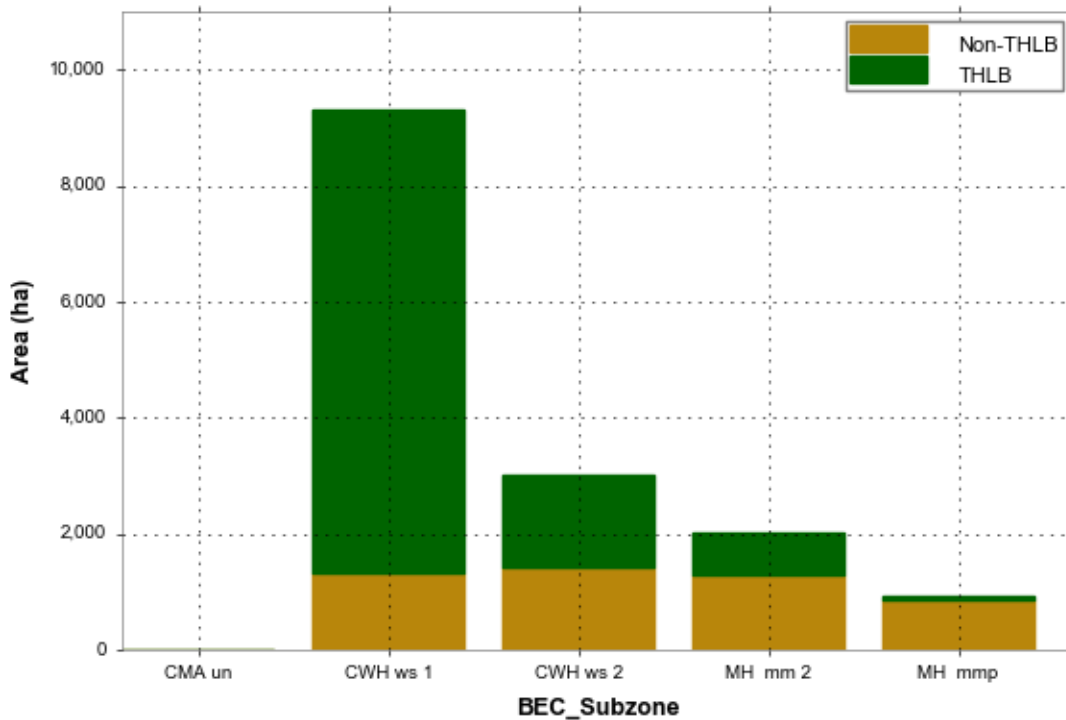


Figure 2-7: BEC Subzones

## 2.8 Volume Classes

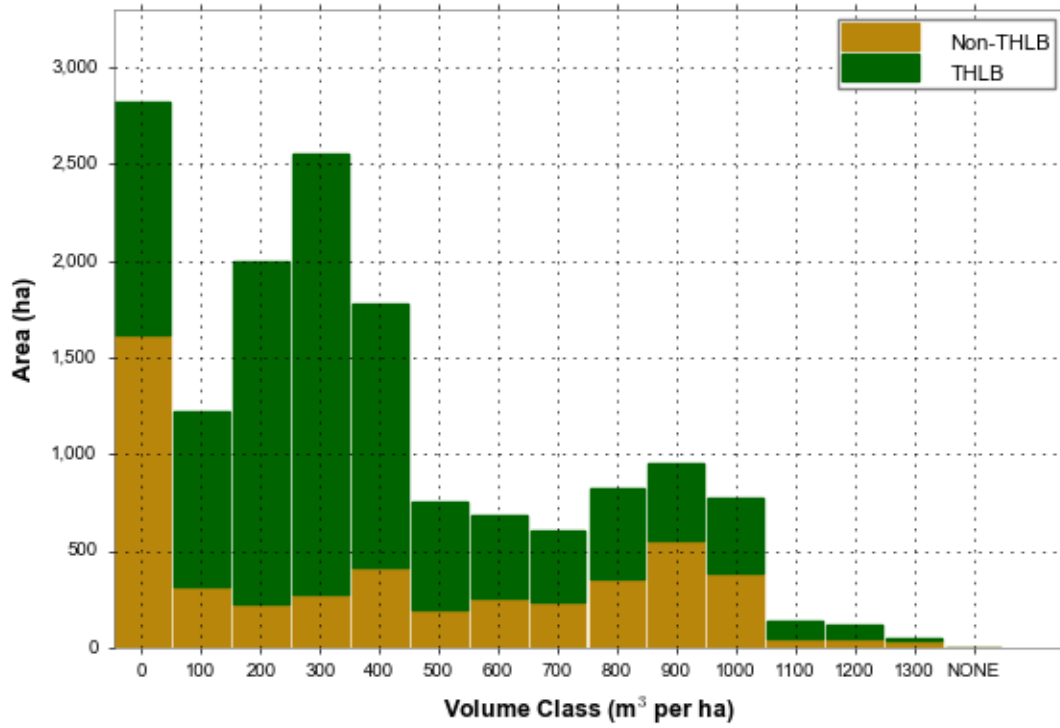


Figure 2-8 displays the volume per hectare characteristics of the CFLB grouped into 100 m<sup>3</sup>/ha classes. This figure shows the distribution of volume per hectare across the community forest. Young stands within the THLB are represented in volume class 0 (0 m<sup>3</sup>/ha to 99 m<sup>3</sup>/ha). Mature and old stands are represented in the higher volume classes. The volume classes are based on the minimum value within each; for example, the zero-volume class includes 0 to 99 m<sup>3</sup>/ha and the 100 to 199 as volume class 100. This graph also shows a very productive forest with a significant portion of the THLB in the 400 m<sup>3</sup>/ha and greater volume classes. The majority of the non-THLB is concentrated in 0 m<sup>3</sup>/ha class. 12% of the THLB are in 0 m<sup>3</sup>/ha class, 9% in 100 m<sup>3</sup>/ha class, 17% in 200 m<sup>3</sup>/ha class, 22% in 300 m<sup>3</sup>/ha class, 13% in 400 m<sup>3</sup>/ha class, and 28% in 500 m<sup>3</sup>/ha class and above.

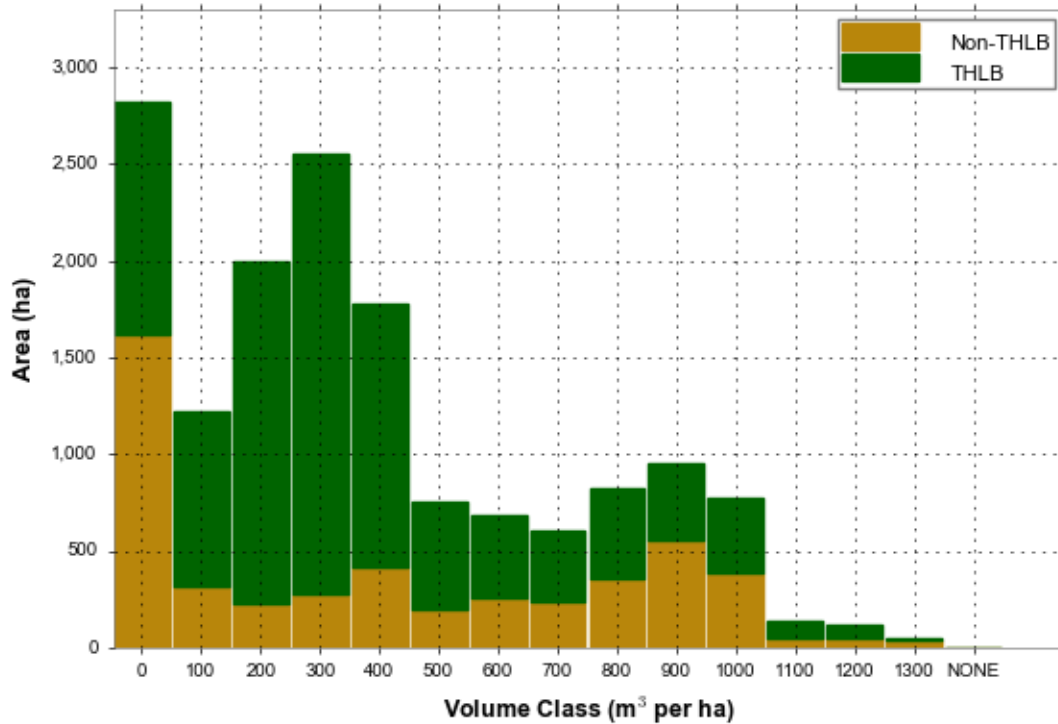


Figure 2-8: Volume Class Distribution

## 3. Base Case Timber Supply Analysis

The base case is the best representation of “current management” on the TCF landbase. It contains the data and assumptions that combined, form the best estimate of timber supply for the landbase. Recognizing that uncertainty exists in both data and assumptions, sensitivity analyses are undertaken to attempt to quantify the impact of this uncertainty on the overall harvest level for the community forest.

This section presents the results of the base case timber supply analysis and provides background information on different aspects of the timber supply. The base case and all sensitivity analyses have been carried out using the forest estate model Patchworks. All harvest levels are reported net of non-recoverable losses (NRL) (643 m<sup>3</sup> per year). The forest estate model uses five-year planning periods over a 250-year planning horizon.

### 3.1 Harvest Forecast

Targets in Patchworks are not generally absolute – the levels of targets such as harvest volume are allowed to vary somewhat from the target value and therefore harvest levels may vary from period to period. As such, harvest volumes for each scenario have been summarized as average values for each period.

Figure 3-1 and Table 3-1 shows the average harvest level over the 250-year planning horizon. The harvest volume starts slightly below 60,000 m<sup>3</sup>/yr for the first 100 years, stepping up to 69,000 m<sup>3</sup>/yr thereafter when the managed stands become available for harvest. This base case scenario allows the model to apply PCT treatment and CT treatment to candidate stands. There is no REHAB treatment applied to REHAB candidate stands and harvest is deferred in these stands for 100 years. After 100 years, it is expected that natural thinning will have occurred, and these stands will achieve minimum merchantability requirements. An average of 16,500 m<sup>3</sup>/yr or 29% of the total harvest volume is from commercial thinning entry for the first 30 years. The CT volume drops to around 4,500 m<sup>3</sup>/yr as young managed stand reach minimum harvestable criteria.

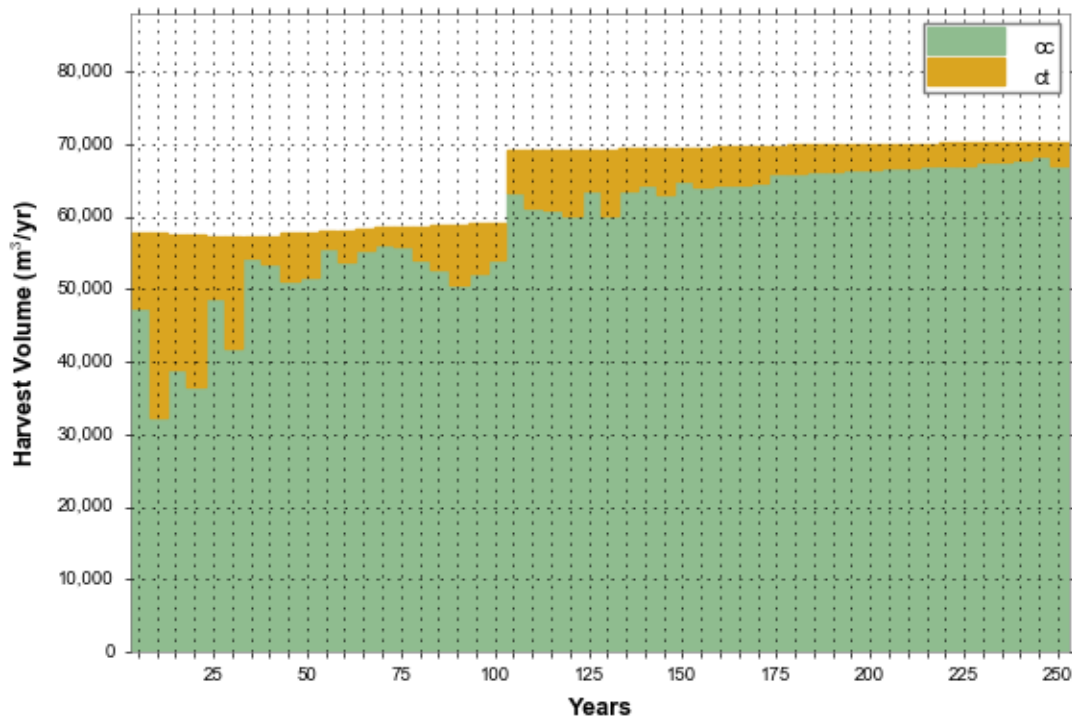


Figure 3-1: Base Case Harvest Volume by Treatment Type

Table 3-1: Base Case Average Annual Harvest Levels

| Harvest Volume (1000's of m <sup>3</sup> /yr) | Years  |         |          |           |            |
|---|--------|---------|----------|-----------|------------|
|   | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                               | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      |

The total THLB growing stock is shown in Figure 3-2. The total growing stock starts at approximately 3,540,000 m<sup>3</sup> in the first period, increases gradually as natural stands transition to managed stands. The total growing stock reaches the peak level at year 140, when the growing stock is approximately 4,570,000 m<sup>3</sup> and achieves a relatively even flow through the remainder of the planning horizon.

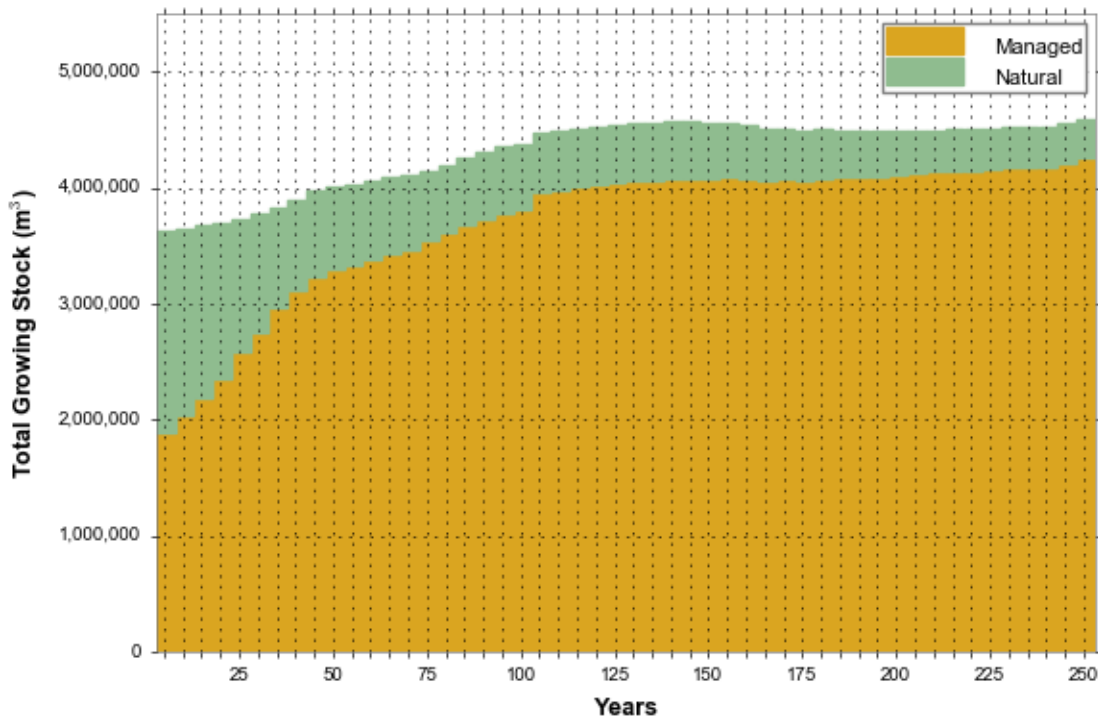


Figure 3-2: Total Growing Stock

## 3.2 Base Case Harvest Characteristics

The total harvest volume by current stand types in the base case is shown in Figure 3-3. Current stand types classification criteria are listed in Table 3-2 below. These stand types determine the silviculture pathway options available for each stand.

Table 3-2: Current Stand Conditions

| Current Stand Conditions | Criteria        |                 |                  |           |         | THLB area (ha) |
|--------------------------|-----------------|-----------------|------------------|-----------|---------|----------------|
|                          | Leading species | Spacing history | Thinning history | Stand age | Density |                |
| Regular PCT              | HW, BA          | No              | No               | <= 25     | All     | 580            |
| Regular CT               | HW, BA          | Yes             | No               | <=50      | All     | 1,682          |
| Low-value CT             | HW, BA          | No              | No               | 25 -50    | >= 1000 | 1,450          |
| REHAB                    | HW, BA          | Yes             | No               | > 50      | All     | 458            |
|                          |                 | No              |                  | 50 - 80   | >= 1000 | 137            |
| Treatment CC             | HW, BA          | All             | Yes              | All       | All     | 583            |
| Deciduous                | All Deciduous   | No              | No               | All       | All     | 153            |
| Natural Treatment Stand  | HW, BA          | No              | No               | All       | All     | 1,263          |
| Natural Stand            | Other Conifer   | No              | No               | All       | All     | 3,821          |
| <b>Total</b>             |                 |                 |                  |           |         | <b>10,127</b>  |

The REHAB stands are densely regenerated stands that have passed the CT window and will be unavailable for harvest for 100 years. As a result, all of the harvest volume for the first 100 years are from the remaining forest types on the landbase. From year 100 to 130, about 30% of the harvested volume is from REHAB stands once

the harvest deferral is lifted. Once harvested, the current REHAB stands are treated following the conventional forest management pathway of the TCF, which is to PCT at age 20, CT at age 40 and clear-cut after age 80 throughout the remainder of the planning horizon.

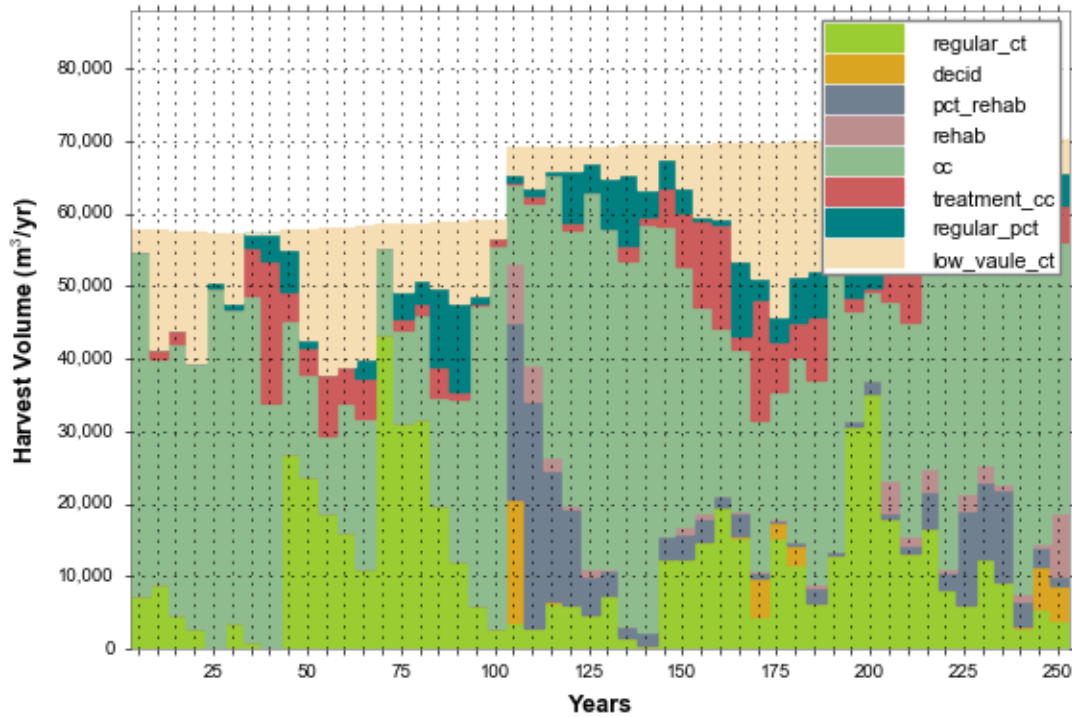


Figure 3-3: Harvest Volume by Current Stand Types



Figure 3-4 shows the distribution and transition of the harvest volume between natural and managed stands. For the first 40 years, harvesting is mostly in natural stands in age classes 7 to 9 as shown in Figure 3-5 and Figure 3-6. After year 40, harvesting begins to transition into managed stands and gradually increases until almost all of the harvest volume is derived from managed stands. From year 100 to 105, harvest in natural stands increases again to 37% of the total volume due to the lifted deferral in REHAB stands.

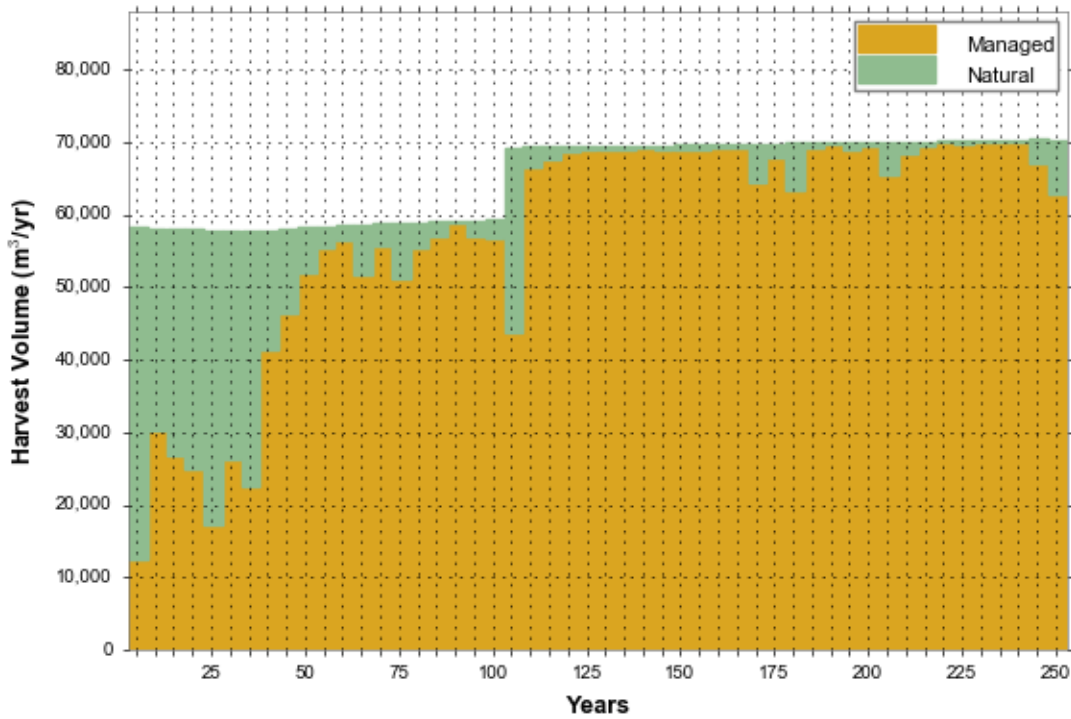


Figure 3-4: Harvest Volume by Natural and Managed Stands

Figure 3-5 shows how the average harvest age changes over the planning horizon. For the first 40 years, the average harvest age starts at approximately age 200, oscillating between age 200 and age 250 while the harvest profile is made up exclusively by natural stands. As harvesting transitions into younger, more productive managed stands, the average harvest age drops to around age 100. The second increase in average harvest age can be found after year 100 when the problem forest type and deciduous leading stands become available for harvest.

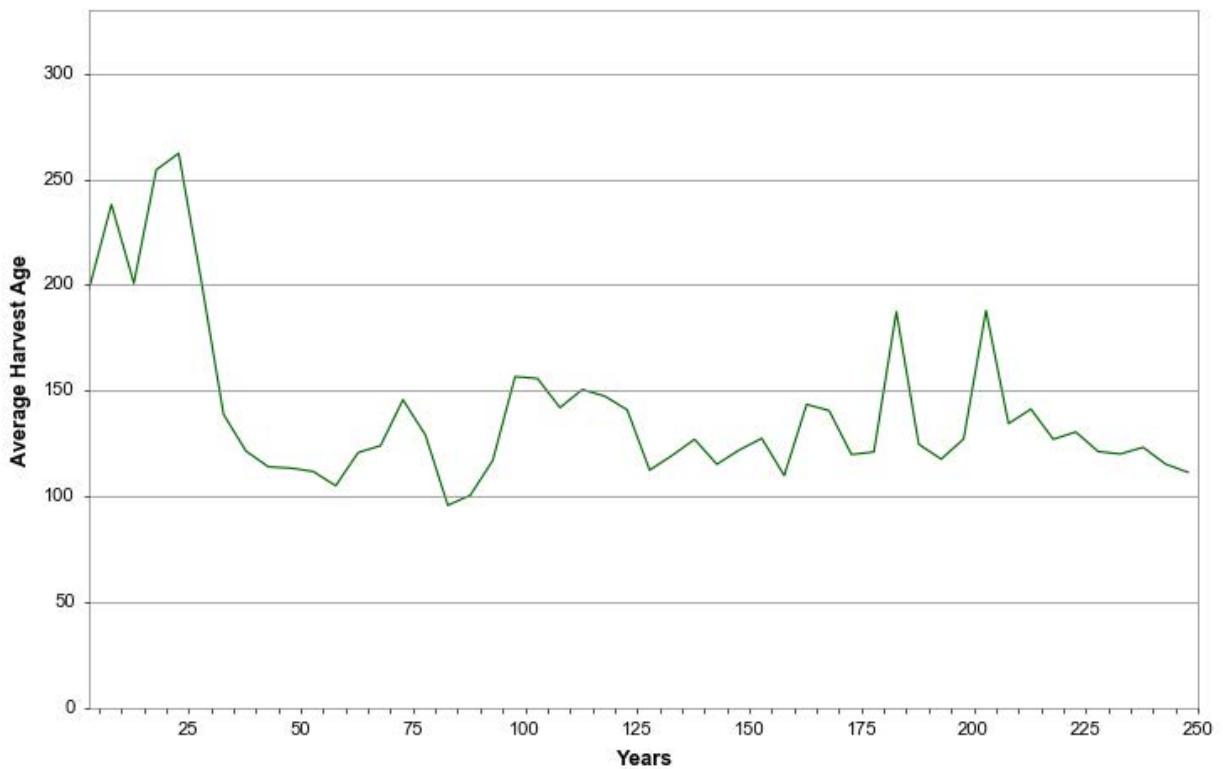


Figure 3-5: Average Harvest Age

As shown in Figure 3-6, average harvest volume per hectare starts just below 600 m<sup>3</sup>/ha. As older low-volume stands are harvested, the average harvest volume increases and peaks around year 100 at approximately 1,140 m<sup>3</sup>/ha when the problem forest type stands become available for harvest. After most of the mature REHAB stands are harvested, the average harvest volume per hectare decreases to oscillating between 600 m<sup>3</sup>/ha and 1,000 m<sup>3</sup>/ha for the remainder of the planning horizon.

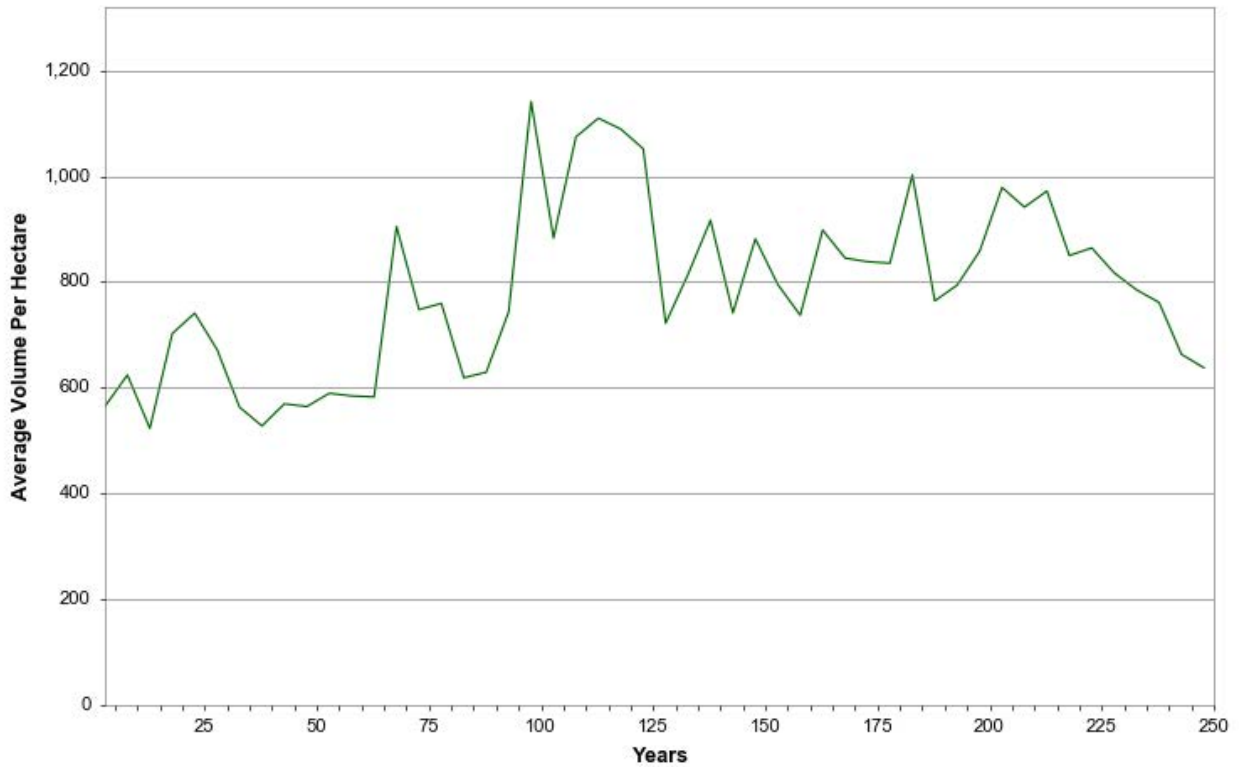


Figure 3-6: Average Harvested Volume Per Hectare

Figure 3-7 shows the harvest volume by leading species. The THLB is primarily comprised of hemlock-leading stands, therefore the majority of the harvest volume is in western hemlock. The remainder of the THLB is split between mountain hemlock, balsam, spruce, and pine leading. After year 100, volume from western hemlock stands increases because most REHAB stands are also hemlock leading.

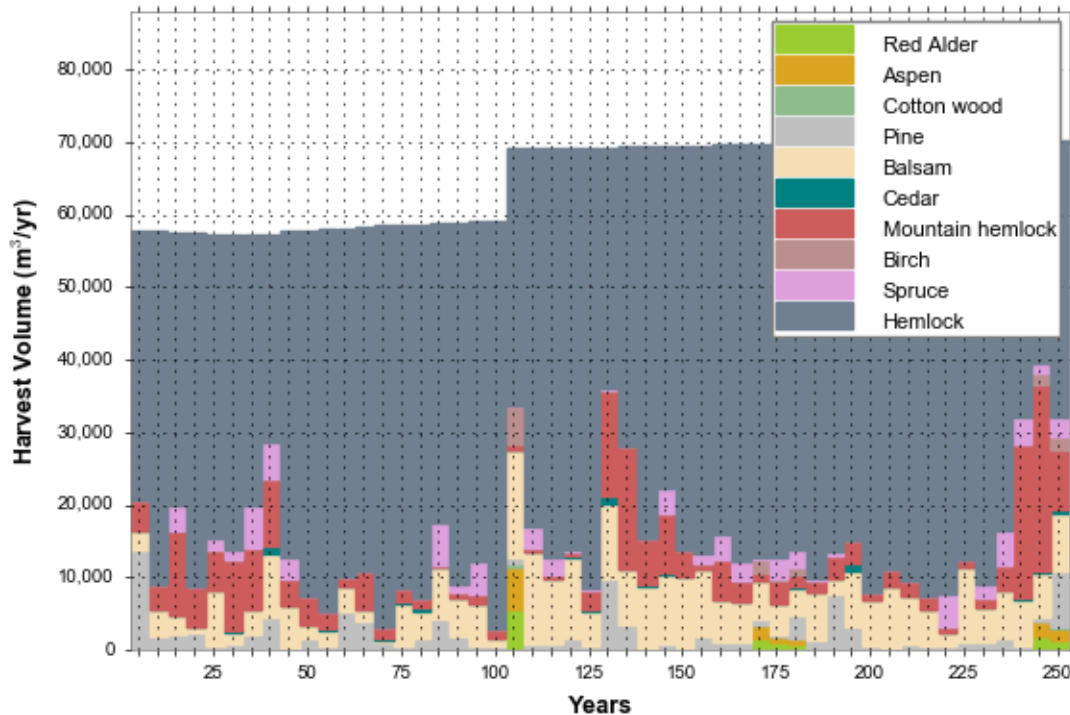


Figure 3-7: Harvest by Leading Species

### 3.3 Age Class Distribution

The age class graphs in Figure 3-8 display the changing age class distribution of the landbase over the 250-year planning horizon. Initially, the THLB is mainly composed of stands in age classes 1, 2, 3, 8 and 9. As time progresses the model modifies the age class distribution while managing the transition from old natural stands to young managed stands. Non-THLB areas remain in older age classes, collecting at age class 9 at the final periods of the planning horizon. Eventually, the THLB portion of the landbase achieves a much more even age class distribution.

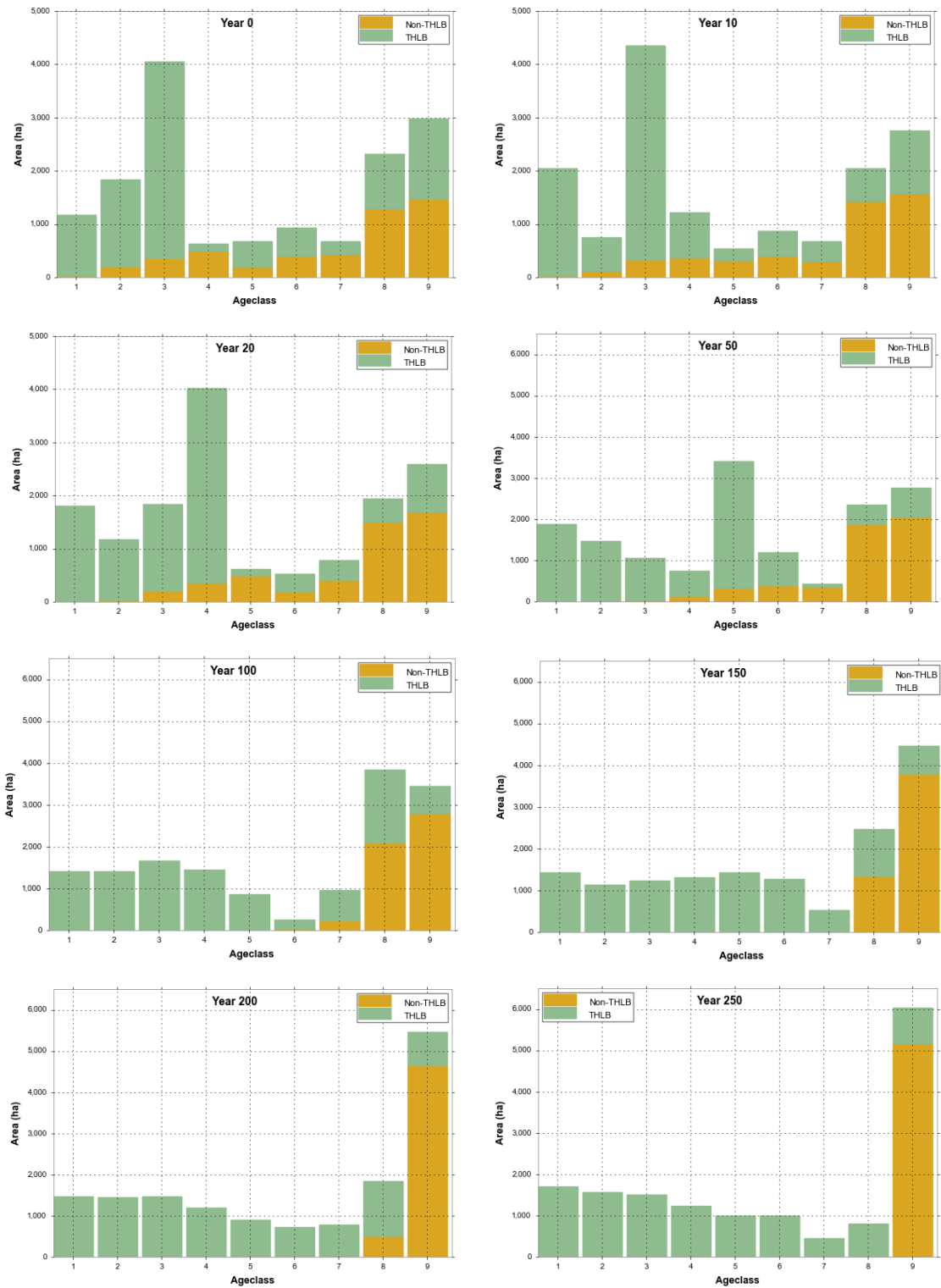


Figure 3-8: Age Class Distribution

## 3.4 Alternative Harvest Flow

### 3.4.1 Even-flow Harvest Alternative

An even-flow harvest alternative scenario tests the highest even flow harvest level that can be achieved on the landbase. This scenario acts as a guide of the LTHL for the base case in a step-up harvest flow. Figure 3-10 shows the harvest flow comparison between the base case and the even-flow harvest alternative scenario and Table 3-3 shows the average harvest volume between the two.

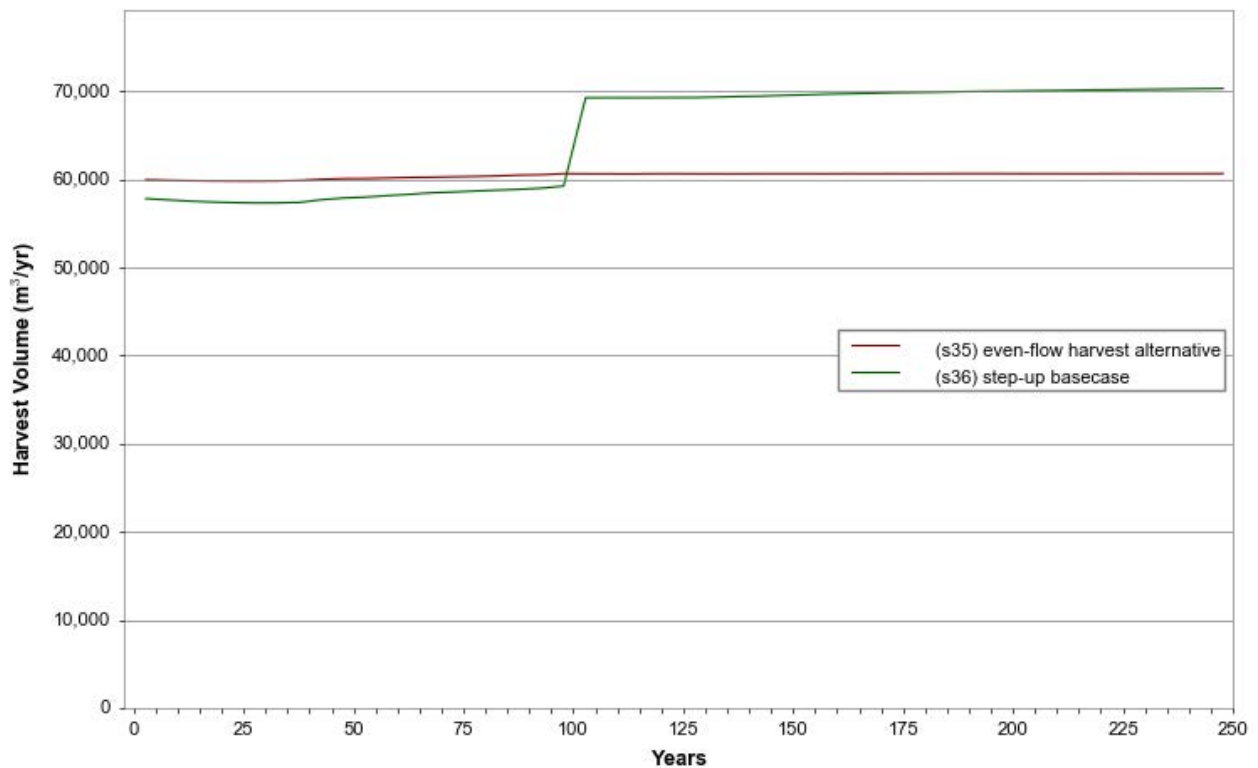


Figure 3-9: Even-flow Alternative versus Base Case Harvest Flow

Table 3-3: Even-flow Alternative versus Base Case Annual Harvest Levels

| Harvest Volume (1000's of m <sup>3</sup> /yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|---|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|   | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                               | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| Even harvest flow (s35)                       | 59.30  | 59.23   | 59.37    | 59.86     | 59.99      | 4%                                    | 4%      | 4%       | 3%        | -13%       |

### 3.4.2 Early Step-up Harvest Alternative

An early step-up harvest alternative scenario was designed to test the earliest year that a step-up in harvest level can be achieved on the landbase. The s36b harvest alternative scenario can step up 20 years earlier than the base case s36 at year 80 with no impacts on the short-term harvest level and a 3% decrease in the harvest flow after year 100. The results of this scenario suggest that the landbase is able to transition from natural stands to more productive managed stands within 80 years.

Figure 3-10 shows the harvest flow comparison between the base case and the early step-up harvest alternative scenario and Table 3-4 compares the average harvest volume between the two.

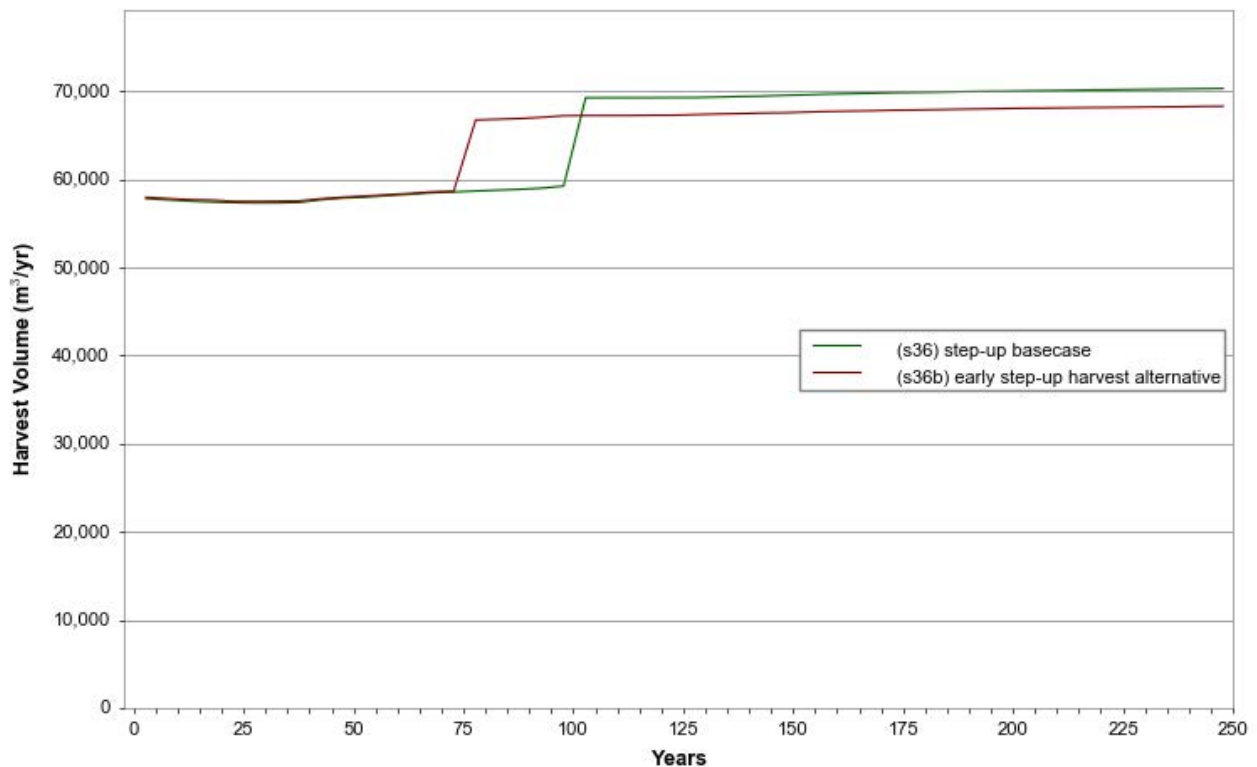


Figure 3-10: Early Step-up Alternative versus Base Case Harvest Flow

Table 3-4: Early Step-up Alternative versus Base Case Annual Harvest Levels

| Harvest Volume (1000's of m³/yr)         | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|--|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|  | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                          | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| Early Step-up Harvest Alternative (s36b) | 57.31  | 57.17   | 57.92    | 66.34     | 67.14      | 0%                                    | 0%      | 1%       | 14%       | -3%        |

## 4. Sensitivity Analysis

Sensitivity analysis provides information on the degree to which uncertainty in the base case data and assumptions might affect the proposed harvest level for the landbase. The magnitudes of the change in the sensitivity variable(s) reflect the degree of risks associated with a particular uncertainty – a very uncertain variable that has minimal impact on the harvest forecast represents a low risk. By developing and testing a number of sensitivity issues, it is possible to determine which variables most affect the results and make management decisions based on these uncertainties.

Each sensitivity listed in Table 4-1 is modelled as its own scenario to test the impact of changing a variable from the base case. The impacts are measured against the base case scenario. The reported results shown in the following sections display the total harvest level net of non-recoverable losses.

**Table 4-1: Sensitivity Analysis Scenarios**

| Sensitivity                            | Range Tested  | Scenarios   |
|--|---|---|
| Removal of SIA                         | To assess the impact of removing site index adjustment on hemlock/balsam leading managed stand yields | The use of the site productivity layer for managed stands   |
| Cutblock Size                          | To assess the impact of limiting small cutblocks  | Limit the number of undersized cutblocks (i.e. less than 5 ha)  |
| Yield Assumption                       | To assess the impact of increasing/decreasing both managed and natural stand yields                   | Natural Stand Yield Tables +/- 10%  |
|  |   | Managed Stand Yield Tables +/- 10%  |
| REHAB Treatment without Volume Return  | To assess the impact of treating REHAB candidate stands without volume return                         | Apply REHAB treatment without volume return to candidate stands for the first rotation, followed by three-path treatment of PCT=> CT=> CC |
| REHAB Treatment with 65% Volume Return | To assess the impact of treating REHAB candidate stands with commercial volume return                 | Apply REHAB treatment with 65% volume as commercial products for the first rotation, followed by three-path treatment of PCT=> CT=> CC    |
| Budget Maximum Silviculture Scenario   | It allows the model to better represent where optimal treatments should go based on a fixed budget.   | Limited budget pre-commercial thinning of \$300,000 per 5 years at \$2,200 per hectare  |
| No PCT Treatment Scenario              | To assess the impact of spacing silviculture treatments   | Restrict PCT treatment and defer harvest in balsam/hemlock leading stands   |
| No Silviculture Treatment Scenario     | To assess the combined impact of silviculture treatments  | Restrict all silviculture treatments and defer harvest in balsam/hemlock leading stands   |

### 4.1 Removal of SIA Scenario

This scenario assesses the impact of removing the site index adjustments on managed stand yields. This scenario includes the same non-timber objectives as the base case but with the unadjusted PSPL site index applied to managed stands. Figure 4-1 and Table 4-2 illustrates the harvest flow of the two runs where the no site index adjustment scenario is referred to as 'no SIA sensitivity'. The REHAB stands are unavailable for harvest for 100 years in both scenarios and all silviculture treatment assumptions are the same.



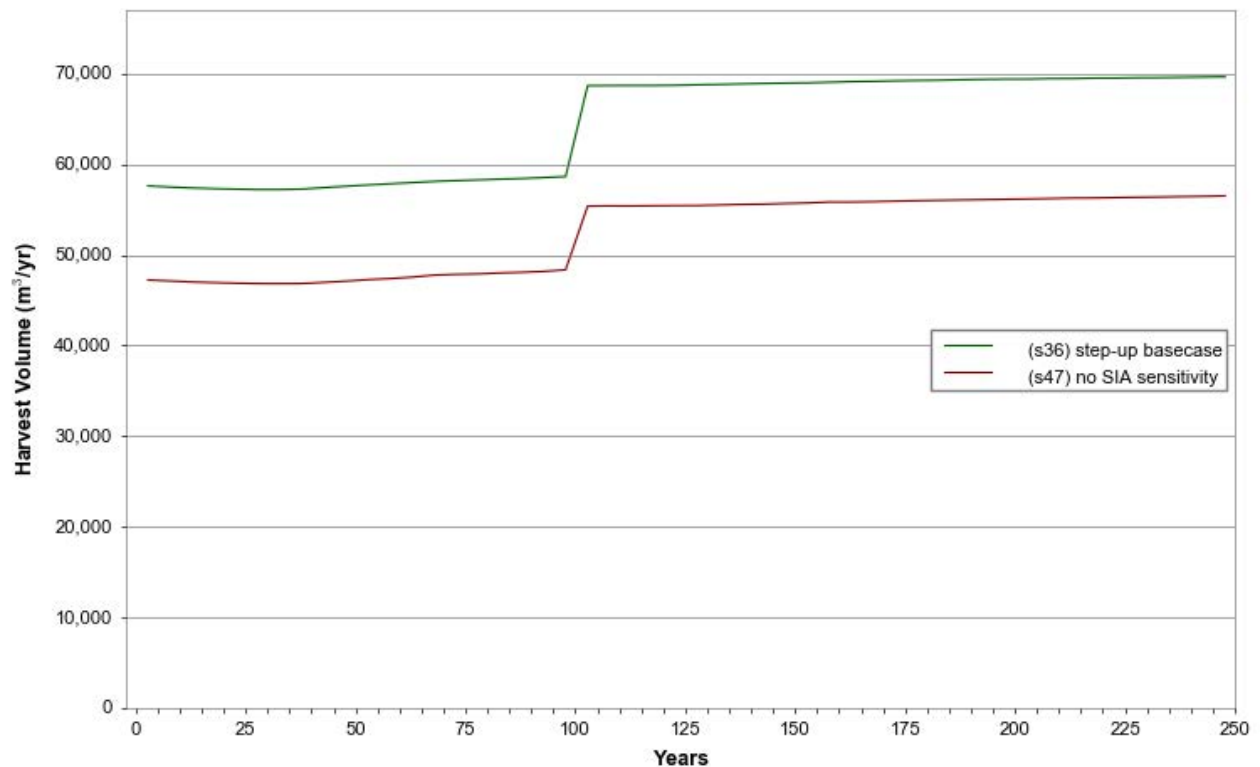


Figure 4-1: No SIA Sensitivity versus Base Case Harvest Flow

Table 4-2: No SIA Sensitivity versus Base Case Annual Harvest Levels

| Harvest Volume (1000's of m³/yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|----------------------------------|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|                                  | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                  | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| No SIA (s47)                     | 47.22  | 47.12   | 47.21    | 48.14     | 55.91      | -17%                                  | -17%    | -17%     | -17%      | -19%       |

The no SIA sensitivity harvest volume is around 47,000 m³/yr in the first 100 years, and levels at 56,000 m³/yr thereafter. The harvest level of the no SIA sensitivity scenario is 17% less than that of the base case in the first 100 years and is 19% less for the rest of the planning horizon.

The TCF currently holds an AAC level of 30,000 m³/yr. The increase in long-term harvest level in the base case when compared to the no SIA sensitivity is mainly a result of the improved data including the new VRI, road classification and stream classification.

Figure 4-2 shows a comparison of the THLB total growing stock of the two scenarios. The initial total growing stock value of the base case is 3,540,839 m³, which is 338,220 m³ or 10.6% higher than that of the no SIA sensitivity. Similar to the base case, the growing stock regains an even flow through the remainder of the planning horizon once the REHAB stands become available after year 100.

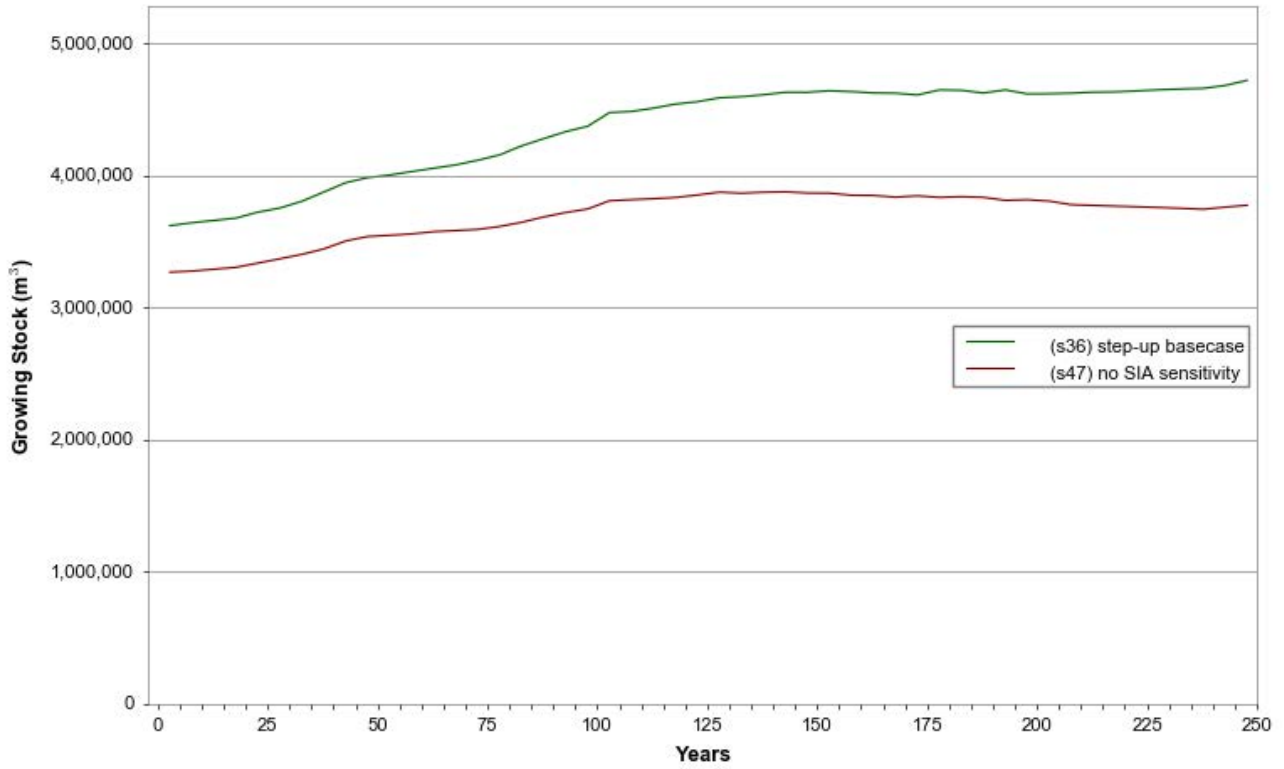


Figure 4-2: No SIA Sensitivity versus Base Case Growing Stock

## 4.2 Cutblock Size Limit

Impacts of limiting undersized cutblocks on the harvest level are assessed by restricting the number of cutblocks that are less than 5 hectares in size. Figure 4-3 and Table 4-3 below show the model results of the limited undersized cutblock sensitivity (s40a). s40a's harvest level is about 3% lower than the base case in the first 100 years on average. The long-term harvest level of this scenario is only 1% lower than that of the base case, suggesting that after the landbase has transitioned into mainly managed stands, block size limitation is no longer constraining the harvest level. This scenario was able to reduce 73% of the undersized cutblocks in the first 100 years and 82% in the remaining horizon when compared to the base case.

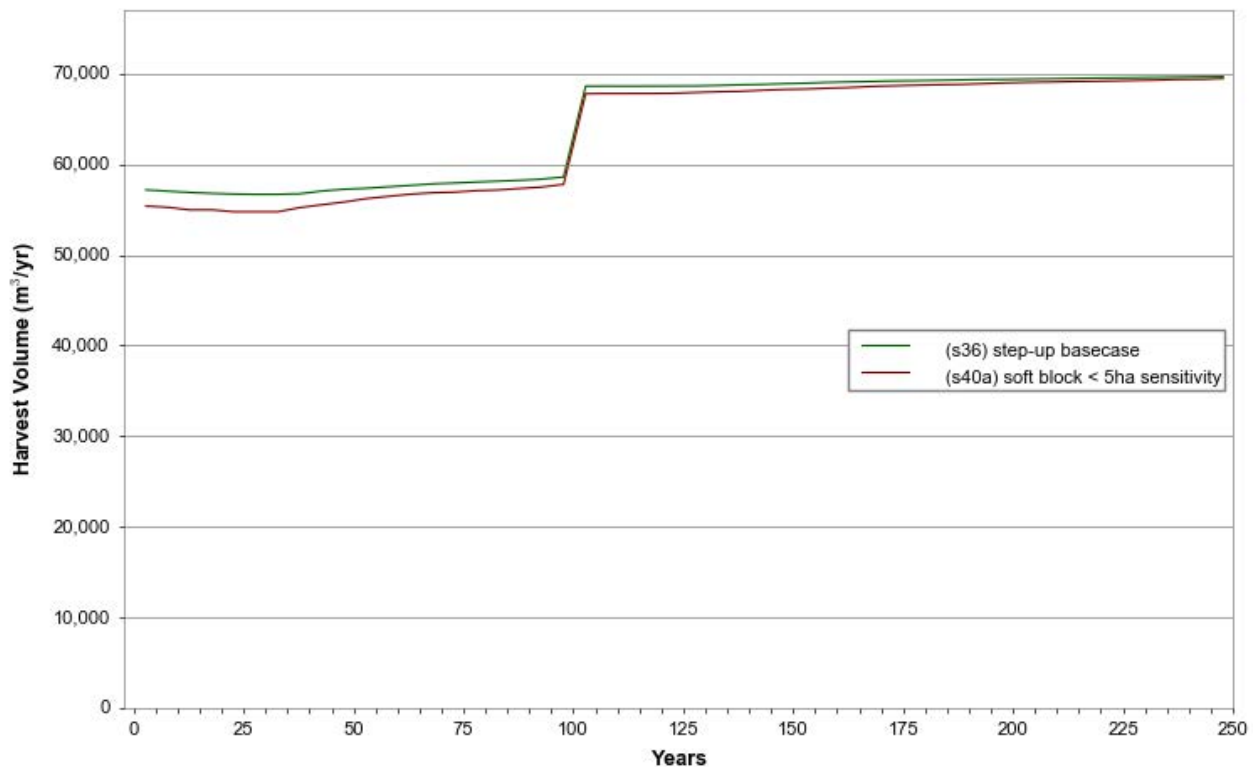


Figure 4-3: Cutblock Size Restriction Sensitivity versus Base Case Harvest Flow

Table 4-3: Cutblock Sizes Restriction Sensitivity versus Base Case Harvest Flow

| Harvest Volume (1000's of m <sup>3</sup> /yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|---|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|   | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                               | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| Limit block < 5 ha (s40a)                     | 55.38  | 55.24   | 55.78    | 57.43     | 68.60      | -3%                                   | -3%     | -2%      | -2%       | -1%        |

## 4.3 Yield Assumptions

Sensitivity analysis around natural and managed stand yields help to understand the degree to which uncertainty in yield models and assumptions such as site index and genetic worth may affect the short, mid and long-term harvest forecast for the TCF landbase.

### 4.3.1 Natural Stand Yield Tables

Figure 4-4 and

Table 4-4 shows the impact of increasing and decreasing natural stand yield tables (NSYT) by 10% on harvest level. Decreasing the natural growing stock by 10% has a 5% impact on the initial growing stock. The harvest flow is also decreased by about 5% for the first 100 years while there is no impact on the long-term harvest level.

Conversely, when NSYT is increased by 10%, the model shows a 5% increase in the initial growing stock and only a 2% increase in harvest volume on average for the first 100 years and a 1% increase to the long-term harvest level.

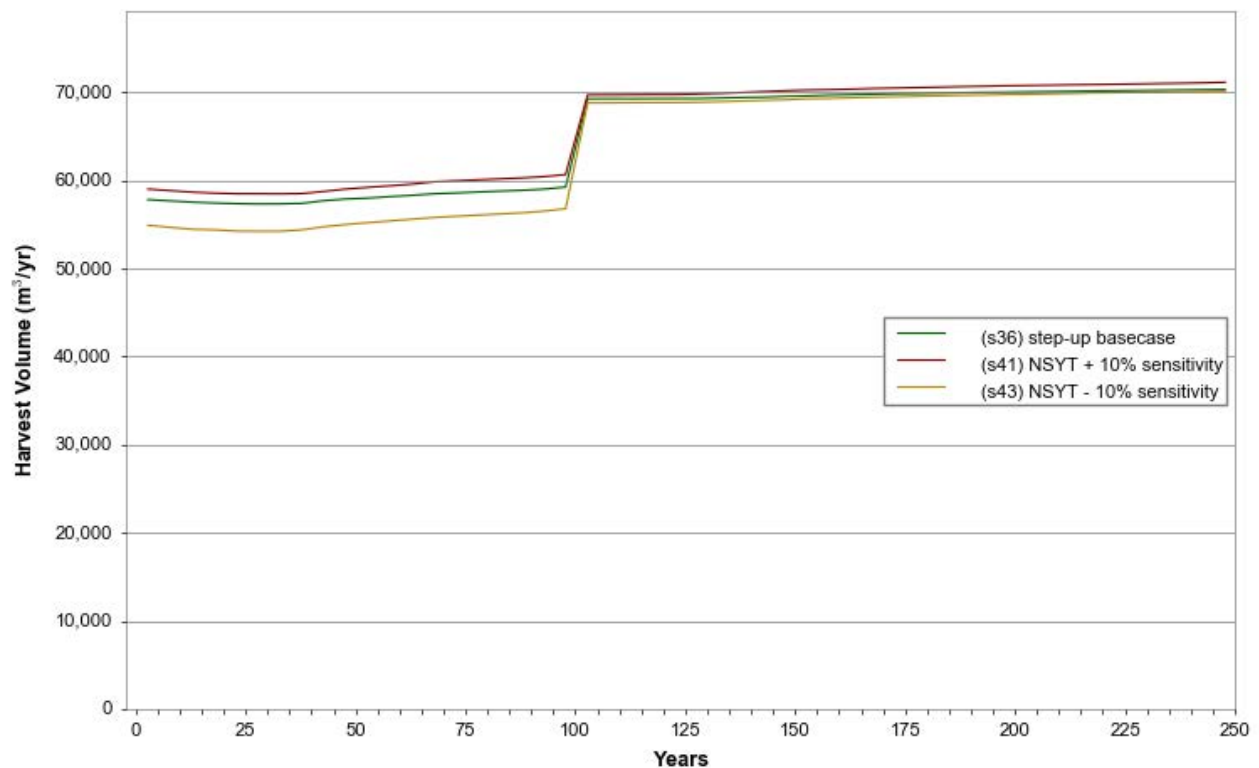


Figure 4-4: NSYT Sensitivities versus Base Case Harvest Flow

**Table 4-4: NSYT versus Base Case Harvest Volume and Percent Difference**

| Harvest Volume (1000's<br>of m <sup>3</sup> /yr) | Years     |            |             |              |               | Percent (%) Change from the Base Case |            |             |              |               |
|--|-----------|------------|-------------|--------------|---------------|---------------------------------------|------------|-------------|--------------|---------------|
|  | 1 to<br>5 | 6 to<br>10 | 11 to<br>80 | 81 to<br>100 | 101 to<br>250 | 1 to<br>5                             | 6 to<br>10 | 11 to<br>80 | 81 to<br>100 | 101 to<br>250 |
| Base Case (s36)                                  | 57.16     | 57.02      | 57.21       | 58.32        | 69.13         | -                                     | -          | -           | -            | -             |
| NSYT - 10% (s43)                                 | 54.25     | 54.02      | 54.32       | 55.79        | 68.80         | -5%                                   | -5%        | -5%         | -4%          | 0%            |
| NSYT + 10% (s41)                                 | 58.35     | 58.18      | 58.41       | 59.73        | 69.77         | 2%                                    | 2%         | 2%          | 2%           | 1%            |

### 4.3.2 Managed Stand Yield Tables

Figure 4-5 and

Table 4-5 illustrates the impact on timber supply if managed stand yield tables (MSYT) are increased and decreased by 10%. The 10% changes in MSYT has an impact of approximately 4.5% on the initial growing stock.

Decreasing managed stand yields decreases the harvest level by 10% in the first 100 years while also decreasing the long-term harvest level by 9%. When the managed stand yields are increased by 10%, there is an 11% increase in the long-term harvest level. Only a 5% increase in harvest volume was achieved in the first 100 years as natural stand makes up the majority of the harvest profile in the first 50 years.

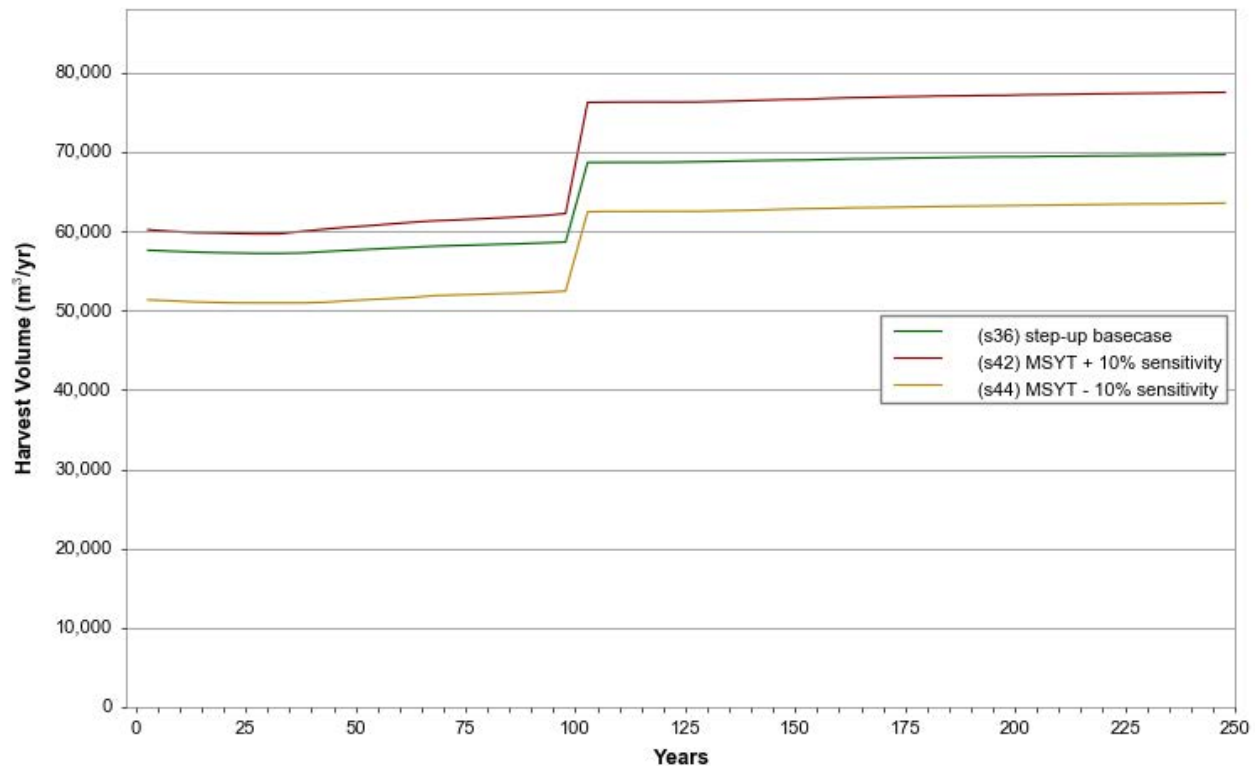


Figure 4-5: MSYT Sensitivities versus Base Case Harvest Flow

Table 4-5: MSYT versus Base Case Harvest Volume and Percent Difference

| Harvest Volume (1000's of m <sup>3</sup> /yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|---|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|   | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                               | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| MSYT - 10% (s44)                              | 51.34  | 51.22   | 51.32    | 52.26     | 62.99      | -10%                                  | -10%    | -10%     | -10%      | -9%        |
| MSYT + 10% (s42)                              | 60.18  | 59.98   | 60.45    | 61.92     | 76.88      | 5%                                    | 5%      | 6%       | 6%        | 11%        |

## 4.4 Silviculture Scenarios

As described in Section 3.2 above and Section 6.2.3 of the data package, the conventional forest management pathway of the TCF is to PCT at age 20, CT at age 40 and clear-cut after age 80. The impacts of pre-commercial thinning, commercial thinning and stand rehabilitation treatments on harvest flow have been assessed in the sensitivity analysis.

Each silviculture treatment sensitivity listed in Table 4-6 is modelled as its own scenario to test the impact of changing a variable from the base case. The impacts are measured against the base case scenario. The reported results display the harvest level net of NRL, and the percent difference has been rounded.

**Table 4-6: Silviculture Treatment Sensitivity Analysis Scenarios**

| Sensitivity                            | Range Tested  | Scenarios   |
|--|---|---|
| REHAB Treatment without Volume Return  | To assess the impact of treating REHAB candidate stands without volume return                       | Apply REHAB treatment without volume return to candidate stands for the first rotation, followed by three-path treatment of PCT=> CT=> CC |
| REHAB Treatment with 65% Volume Return | To assess the impact of treating REHAB candidate stands with commercial volume return               | Apply REHAB treatment with 65% volume as commercial products for the first rotation, followed by three-path treatment of PCT=> CT=> CC    |
| Budget Maximum Silviculture Scenario   | It allows the model to better represent where optimal treatments should go based on a fixed budget. | Limited budget pre-commercial thinning of \$300,000 per 5 years at \$2,200 per hectare  |
| No PCT Treatment Scenario              | To assess the impact of spacing silviculture treatments   | Restrict PCT treatment and defer harvest in balsam/hemlock leading stands   |
| No Silviculture Treatment Scenario     | To assess the combined impact of silviculture treatments  | Restrict all silviculture treatments and defer harvest in balsam/hemlock leading stands   |

### 4.4.1 REHAB Treatment

TCF has been awarded funding from FESBC for “on the ground” implementation of the silviculture strategy as described in ‘*Silviculture Strategy Treatment on the Ground Implementation for Terrace Community Forest Final Version v1.0*’. The purpose of the project is for “on the ground” verification and implementation of the silviculture strategy. It seeks to undertake treatment on 100 ha of forest that is a problem forest type and obtain the results of field calibrations on the prioritized treatment areas.

A clear focus for the CF is to rehabilitate the marginal-merchantable stands and monitor the long-term impact of silviculture treatment on harvest level and landbase characteristics. Applying REHAB treatment not only shifts volume availability to an earlier stage but also allows the residual stands to become economical more quickly and are therefore available for harvest earlier.

REHAB thinning treatment also provides benefits including employment benefits for the local community and beneficial ecological values. Thinning can improve spatial and temporal forest cover density (MOF, 1999) and can play a role in accelerating the development of old-growth characteristics in second-growth stands (MOF, 1999). As a result, thinning treatment is beneficial for wildlife as the diverse wildlife in the region requires a mixture of habitats that range from early to late seral stages. Thinning will also be beneficial to biodiversity as it will allow for a mixture of stands with a wide range of crown closures, stocking, and diameters rather than the current stand characteristics of those stands harvested before the 1980s that are even-age small-diameter stands (MOF, 1999).

The REHAB sensitivity is conducted by shifting the yields to a post-CT curve after the rehabilitation thinning treatment has been applied, which is 65% of the original curve. The REHAB treatment targets on stands that

have passed the age for juvenile spacing (PCT) and remove woods that are marginal in merchantability and therefore may be difficult to find a market for. Two sensitivity scenarios are tested to assess REHAB treatment impacts on harvest level under different market conditions.

#### 4.4.1.1 REHAB Treatment without Volume Return

s38a is a REHAB sensitivity scenario designed to mimic a market downturn for small-diameter wood. It acts as a 'worst case' scenario where volume from REHAB thinning is considered non-economical and therefore not contributing to the commercial harvest volume. Once treated, the stand volume will be reduced by 65% and the 35% residual stands will become available for clear-cut harvest after 40 years.

As shown in Figure 4-6 and Table 4-7, with REHAB treatment available for the candidate stands, annual harvest volume for the first 100 years is increased by 2% and the long-term harvest level stays the same.

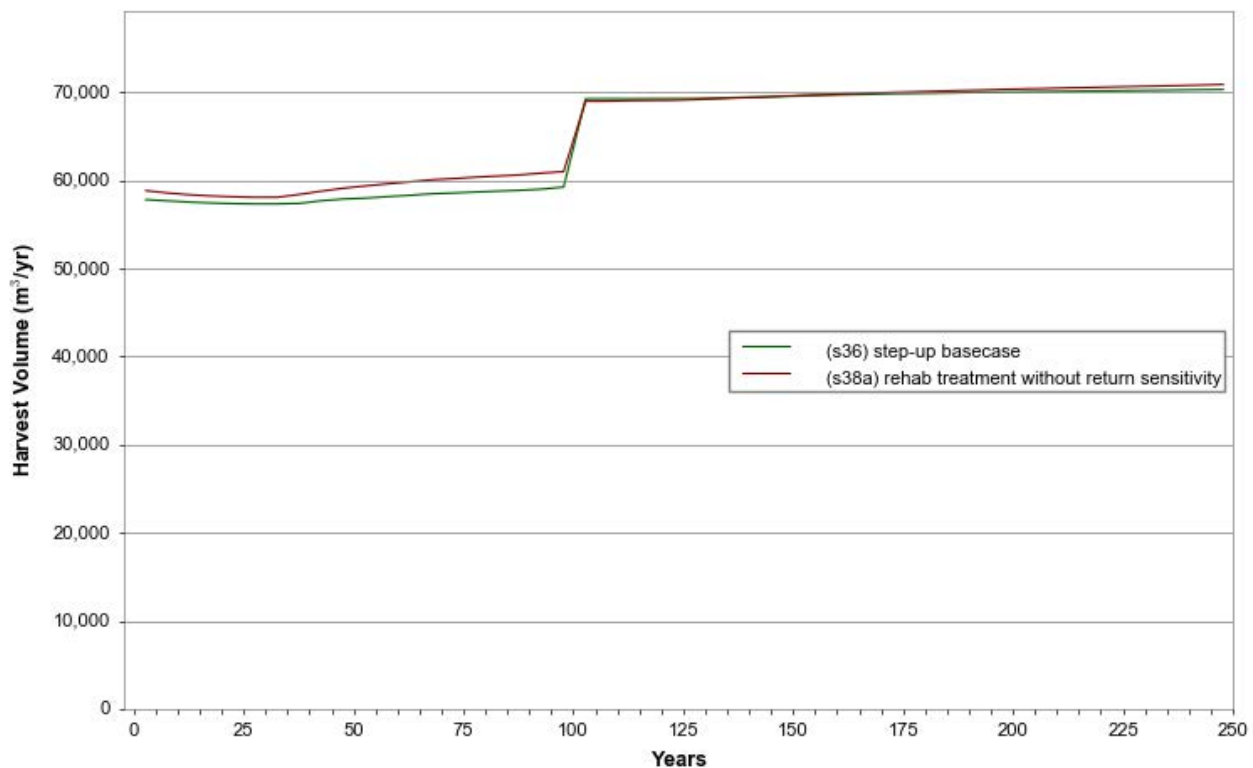


Figure 4-6: REHAB Treatment without Return Sensitivity versus Base Case Harvest Flow

Table 4-7: REHAB Treatment without Return Sensitivity versus Base Case Harvest Volume and Percent Difference

| Harvest Volume (1000's of m³/yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|----------------------------------|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|                                  | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                  | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| REHAB without Return (s38a)      | 58.18  | 57.91   | 58.39    | 60.08     | 69.29      | 2%                                    | 2%      | 2%       | 3%        | 0%         |



Figure 4-7 shows the harvest volume distribution by current stand types with REHAB available for the REHAB candidate stands. This REHAB scenario does not limit access to REHAB areas but delays for 100 years if a REHAB stand is left untreated to mimic the current unavailability of these stands for clear-cut. From year 40, the model starts to harvest the REHAB area, which indicates that the rehabilitation treatment allows treated REHAB stands to become available earlier.

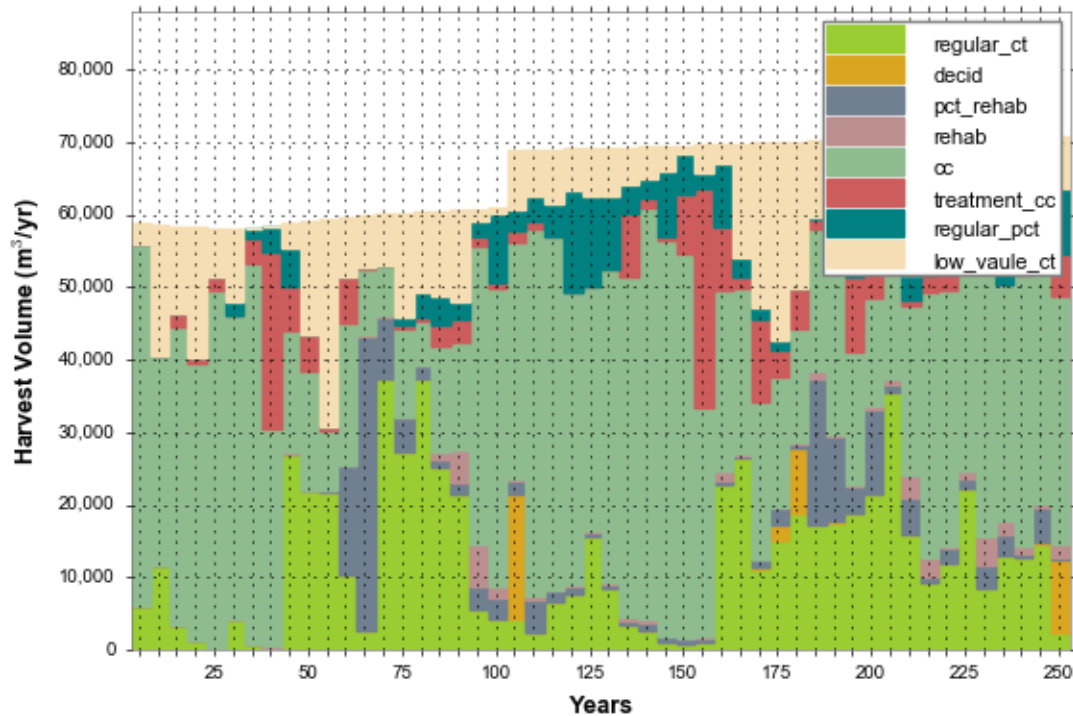


Figure 4-7: REHAB Treatment without Return Sensitivity Harvest Volume by Current Stand Types

#### 4.4.1.2 REHAB Treatment with 65% volume return

s38b is a sensitivity to test the REHAB treatment impacts on harvest profile if the volume from REHAB thinning is commercial. Once treated, 65% of the stand volume will contribute to the harvest volume of the treatment year and the 35% residual stands will become available for clear-cut harvest after 40 years.

As shown in Figure 4-8 and Table 4-8, with REHAB treatment available for the candidate stands, annual harvest volume for the first 100 years is increased by over 4% and the long-term harvest level stays the same.

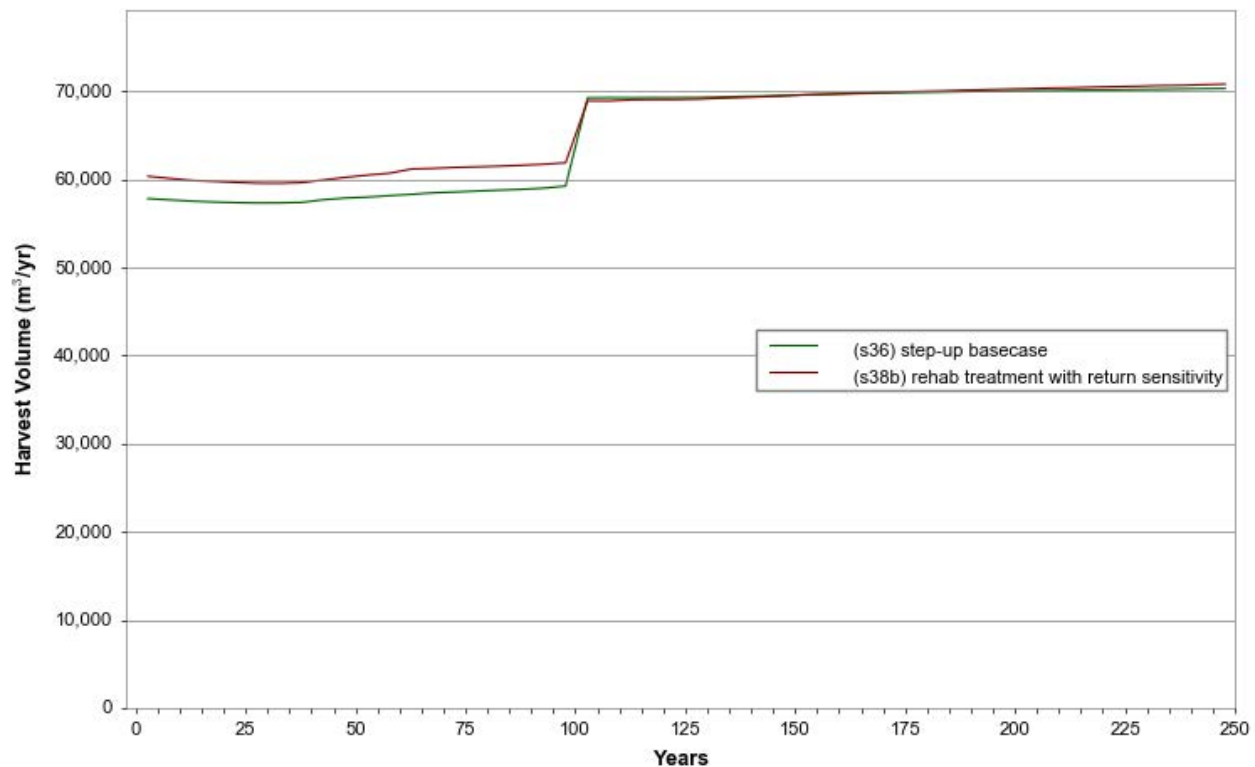


Figure 4-8: REHAB Treatment with 65% Return Sensitivity versus Base Case Harvest Flow

Table 4-8: REHAB Treatment with 65% Return Sensitivity versus Base Case Harvest Volume and Percent Difference

| Harvest Volume (1000's of m <sup>3</sup> /yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|---|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|   | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                               | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| Rehab with Return (s38b)                      | 59.70  | 59.45   | 59.68    | 61.02     | 69.22      | 4%                                    | 4%      | 4%       | 5%        | 0%         |

Similar to the s38a scenario, this Rehab scenario does not limit access to REHAB areas but delays for 100 years if a REHAB stand is left untreated. In this scenario, a total of 214 ha of REHAB stands was treated over the first 35 years, which is about 36% of the total 595 ha of the REHAB candidate stands. The REHAB treatment costs approximately \$2,500 per hectare, suggesting a total cost of \$535,000 over 35 years.

The model did not choose to treat all the REHAB stands as REHAB treatment has minimal benefits to stand volume but allows them to be harvested 40 years after the treatment. As a result, the current deficit in the short-term timber supply for the first 40 years won't be compensated by applying more REHAB treatment. The increase in the mid-term timber supply from year 40 to year 100 may be more significant if the REHAB treatment was forced to be applied to REHAB stands in the model.

## 4.4.2 Limited Budget PCT Treatment Sensitivity

Pre-commercial thinning or juvenile spacing removes trees within a young stand, allowing the stand to reach a minimum harvestable size at a quicker rate (Ministry of Forests MOF, 2001). To demonstrate the importance of PCT in the management of this landbase, scenario s45 assesses the impact of limited budget pre-commercial thinning treatment on timber supply.

Similar to the base case, PCT treatment is only available to balsam and hemlock leading stands that are younger than 25 years in age. There is no commercial product from PCT treatment because the stems removed are traditionally too small to be sold as a commercial crop. Without a cost and budget set to the model, the base case applied PCT treatment to an average of 185 hectares every 5 years.

In this s45 scenario, a \$2,200 per hectare cost is assigned to PCT treatment in the model with a maximum budget of \$300,000 or 135 hectares every 5 years. This scenario assesses the harvest flow impacts by constraining approximately 50 ha of PCT treatment area from the base case for each 5-year period. The results of the s45 scenario are described below in Table 4-9 and Figure 4-9. Limited PCT treatment decreases harvest flow by an average of 5% for the first 100 years while also decreasing the long-term harvest level by about 2%. The more significant decrease in the short-term timber supply is because the removal of PCT treatment also removes CT opportunities on these stands and therefore deferring their availability.

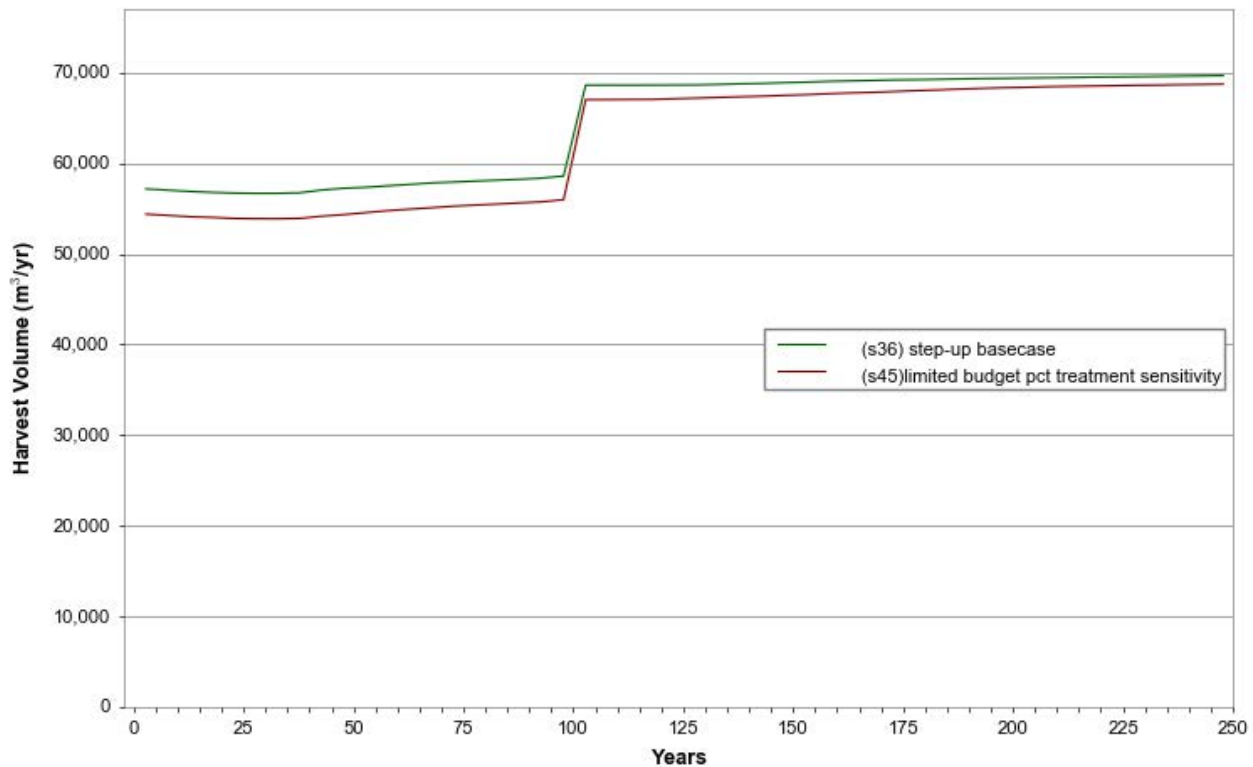


Figure 4-9: Limited Budget PCT Treatment Sensitivity versus Base Case Harvest Flow

**Table 4-9: Limited Budget PCT Treatment Sensitivity versus Base Case Harvest Volume and Percent Difference**

| Harvest Volume (1000's of m <sup>3</sup> /yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|---|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|   | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                               | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| Limited Budget PCT Treatment (s45)            | 54.38  | 54.24   | 54.43    | 55.70     | 67.89      | -5%                                   | -5%     | -5%      | -4%       | -2%        |

### 4.4.3 No PCT Treatment Sensitivity

Scenario s37 is a no PCT treatment sensitivity scenario designed to assess the impacts of spacing treatments on harvest level. This scenario can also be viewed as no future silviculture treatment sensitivity as the removal of PCT treatment also removes CT opportunities on these stands.

Similar to the base case, no REHAB treatment is available in this scenario and REHAB stands are deferred for 100 years for harvest. PCT treatment is restricted in this scenario for the entire planning horizon. CT treatment is available to currently spaced balsam and hemlock leading stands aged 35-55 and is not available after the first rotation.

The results of this scenario s37 are described below in Table 4-10 and Figure 4-10. Restrictions on PCT silviculture treatment decreased harvest flow by 16% for the first 100 years while it has minimal impact on the long-term harvest level. This can be explained as the three-step management method of PCT at age 20, CT at age 40 and clear-cut after age 80 creates a minor difference in total volume but provides early access to timber without compromising the long-term sustainable yield while also improves the wood quality.

As described in Section 6.2.3 of the data package, the three-step silviculture system mimics the natural thinning (canopy shading) ahead of time and creates a well-spaced stand with fewer trees per hectare but a larger basal area and higher merchantable volume per tree. Stands without treatment are smaller in diameter and are therefore delayed in reaching merchantable size when compared to treated stands. These untreated stands are not necessarily low in volume and can be harvested earlier (e.g., after 60 years), but are low value, small diameter wood that is difficult to find a market for. However, if these stands are spaced at age 20 and commercially thinned at about 40, it not only allows for early access to the timber but also improves the wood quality at the time of the final entry cut.

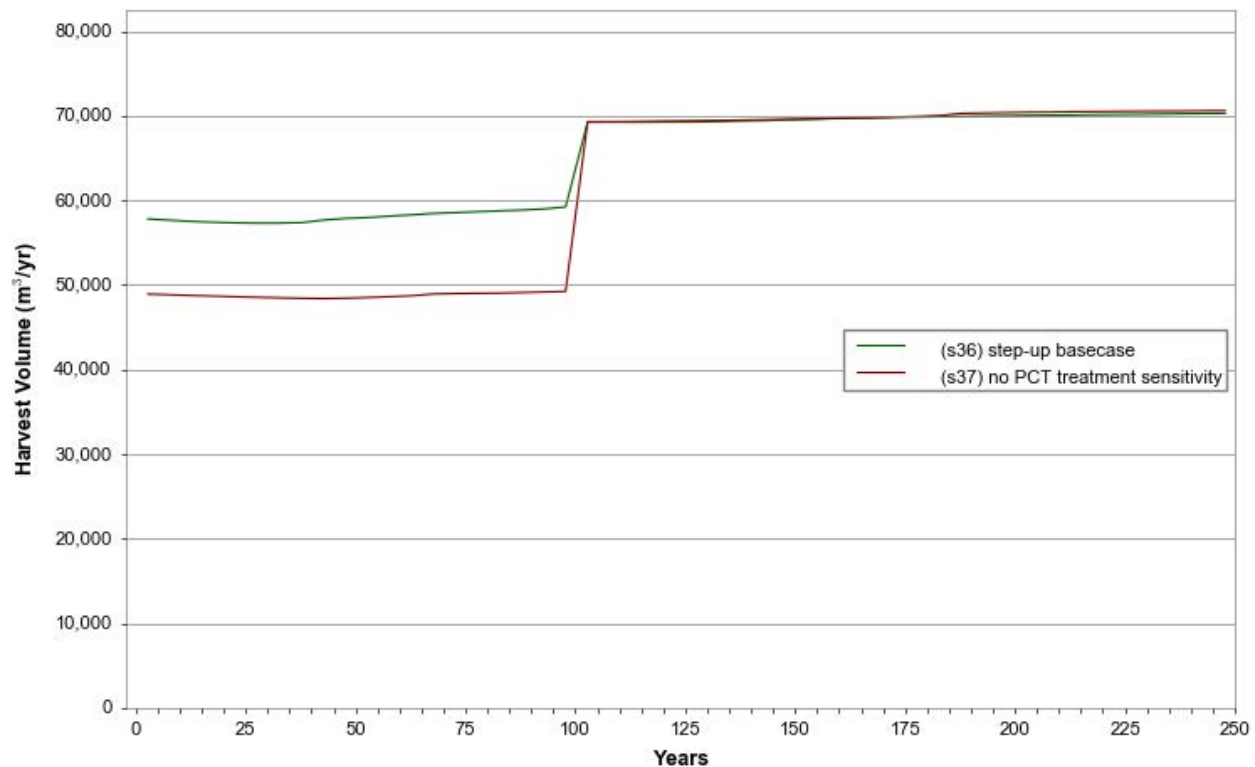


Figure 4-10: No Future Treatment Sensitivity versus Base Case Harvest Flow

Table 4-10: No Future Treatment Sensitivity versus Base Case Harvest Volume and Percent Difference

| Harvest Volume (1000's of m³/yr)   | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|------------------------------------|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|                                    | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                    | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| No PCT Treatment Sensitivity (s37) | 48.29  | 48.21   | 48.02    | 48.50     | 69.32      | -16%                                  | -15%    | -16%     | -17%      | 0%         |

#### 4.4.4 No Incremental Silviculture Treatment Sensitivity

Scenario s46 is the no incremental silviculture treatment sensitivity designed to assess the combined impact of no incremental silviculture treatments (i.e. PCT, REHAB, CT) on harvest level.

Similar to the base case, REHAB treatment is not available in this scenario and REHAB stands are deferred for 100 years for harvest. PCT and CT treatments are also restricted in this scenario for the entire planning horizon. All balsam and hemlock leading stands are deferred for 100 years for harvest, assuming that once harvested, they will be naturally regenerated and regain REHAB characteristics if left untreated. The difference between this s46 scenario and the s37 no PCT sensitivity above is that s37 only restricts PCT treatment with CT treatment remain available to existing managed stands within the CT treatment age window (i.e. 'regular\_ct' and 'low\_value\_ct' stands) for the first rotation while this s46 scenario prohibits both PCT and CT treatments.

The results of the s46 scenario are described below in Table 4-11 and Figure 4-10. Restrictions on silviculture treatments have a significant impact on the short-term harvest level, decreasing the harvest flow by 38% for the first 60 years and have no impact to the long-term harvest level. Similar to the findings from the s37 scenario, the

model results suggest that the current deficit in short-term harvestable volume can be complemented by CT treatment without compromising the long-term sustainable yield and improve the wood quality of final entry cut.

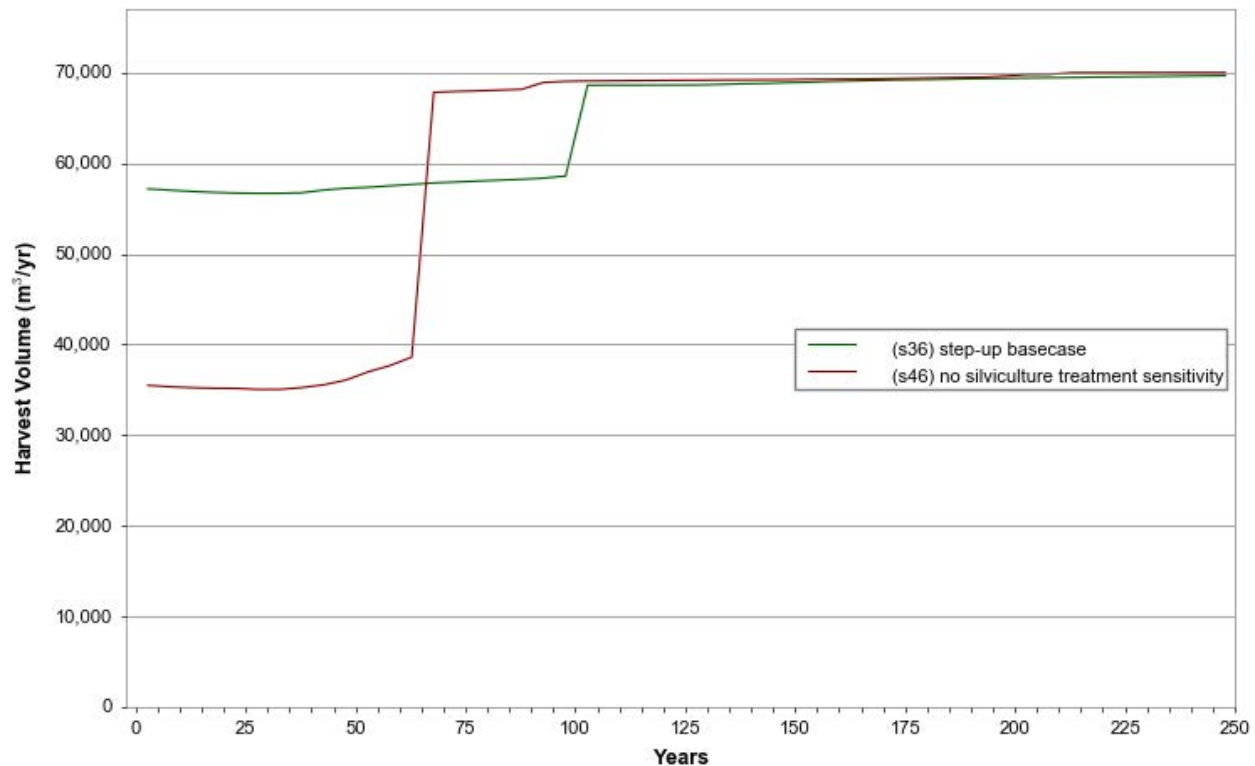


Figure 4-11: No Silviculture Treatment Sensitivity versus Base Case Harvest Flow

Table 4-11: No Silviculture Treatments Sensitivity versus Base Case Harvest Volume and Percent Difference

| Harvest Volume (1000's of m³/yr) | Years  |         |          |           |            | Percent (%) Change from the Base Case |         |          |           |            |
|----------------------------------|--------|---------|----------|-----------|------------|---------------------------------------|---------|----------|-----------|------------|
|                                  | 1 to 5 | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                                | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                  | 57.16  | 57.02   | 57.21    | 58.32     | 69.13      | -                                     | -       | -        | -         | -          |
| No Silviculture Treatment (s46)  | 35.49  | 35.33   | 42.82    | 68.53     | 69.49      | -38%                                  | -38%    | -25%     | 18%       | 1%         |

Figure 4-12 shows the model results of harvest volume by current forest type distribution. When compared to that of the base case shown in Figure 3-3, the availability of 'regular\_ct', 'low\_value\_ct' and 'regular\_pct' stands are deferred due to the lack of silviculture treatments. From year 70 to year 100, 'regular\_ct' stands take up most of the harvest profile as those stands are available for harvest earlier than the 'low\_value\_ct' stands due to the spacing history. Even though the model results show that the restrictions on silviculture treatment are no longer impacting the harvest flow after about 70 years, it is believed that the wood quality is lower than that of the base case as stands without treatments are small in diameter and low in value.

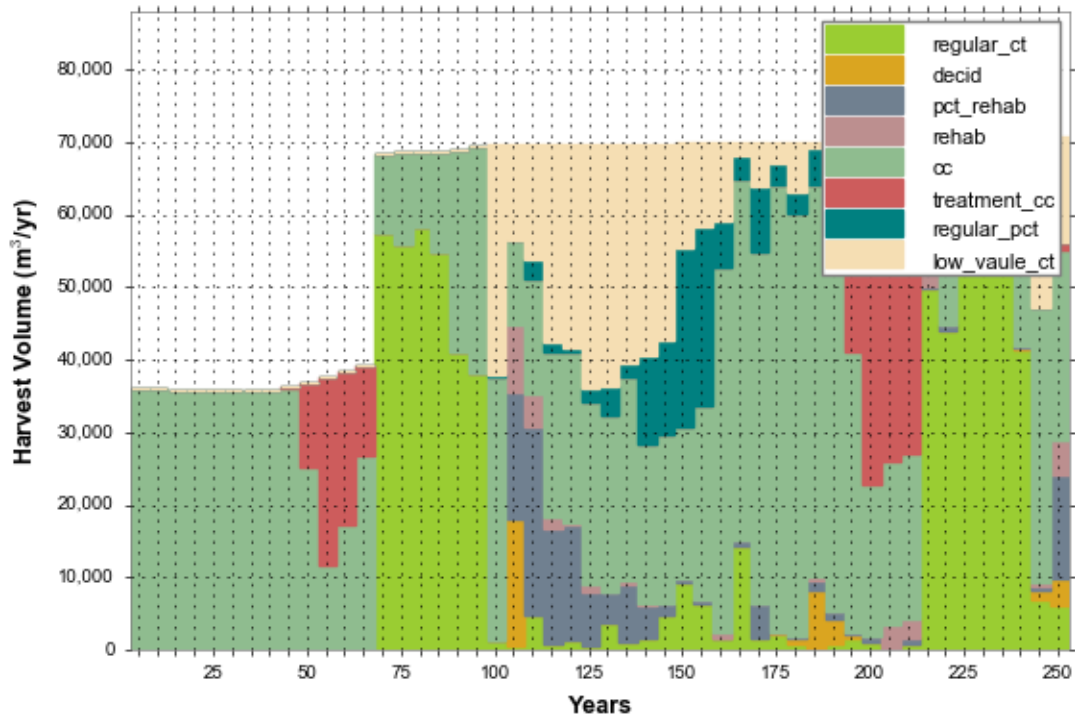


Figure 4-12: No Silviculture Treatment Scenario Harvest Volume by Current Stand Types

## 5. Discussion

The role of the base case in timber supply analysis is to present the set of data and assumptions that best reflects current management, harvest forecast and the best representation of timber supply available on the TCF over the next 250 years. The base case scenario demonstrates the potential harvest forecast based on the timber and non-timber objectives.

The sensitivity scenarios seek to quantify the degree to which uncertainty in data and assumptions might affect timber supply. In this timber supply analysis, factors of SIA, cutblock size, yield assumptions, REHAB treatment, limited budget silviculture treatments, no PCT treatment and no silviculture intervention are examined to better understand their impacts on harvest flow.

Table 5-1 summarises the impacts of each scenario on harvest level relative to the base case.

**Table 5-1: Summary of Analysis Results**

| Sensitivity                      | Harvest Volume (1000's of m <sup>3</sup> /yr) |         |          |           |            | % Change from the Base Case |         |          |           |            |
|----------------------------------|---|---------|----------|-----------|------------|-----------------------------|---------|----------|-----------|------------|
|                                  | 1 to 5  | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 | 1 to 5                      | 6 to 10 | 11 to 80 | 81 to 100 | 101 to 250 |
| Base Case (s36)                  | 57.16   | 57.02   | 57.21    | 58.32     | 69.13      | -                           | -       | -        | -         | -          |
| Even-flow Alternative (s35)      | 59.30   | 59.23   | 59.37    | 59.86     | 59.99      | 4%                          | 4%      | 4%       | 3%        | -13%       |
| Early Step-up Alternative (s36b) | 57.31   | 57.17   | 57.92    | 66.34     | 67.14      | 0%                          | 0%      | 1%       | 14%       | -3%        |
| Removal of SIA (s47)             | 47.22   | 47.12   | 47.21    | 48.14     | 55.91      | -17%                        | -17%    | -17%     | -17%      | -19%       |
| Block < 5 ha Constraint (s40a)   | 55.38   | 55.24   | 55.78    | 57.43     | 68.60      | -3%                         | -3%     | -2%      | -2%       | -1%        |
| NSYT + 10% (s41)                 | 58.35   | 58.18   | 58.41    | 59.73     | 69.77      | 2%                          | 2%      | 2%       | 2%        | 1%         |
| NSYT - 10% (s43)                 | 54.25   | 54.02   | 54.32    | 55.79     | 68.80      | -5%                         | -5%     | -5%      | -4%       | 0%         |
| MSYT + 10% (s42)                 | 60.18   | 59.98   | 60.45    | 61.92     | 76.88      | 5%                          | 5%      | 6%       | 6%        | 11%        |
| MSYT - 10% (s44)                 | 51.34   | 51.22   | 51.32    | 52.26     | 62.99      | -10%                        | -10%    | -10%     | -10%      | -9%        |
| REHAB without Return (s38a)      | 58.18   | 57.91   | 58.39    | 60.08     | 69.29      | 2%                          | 2%      | 2%       | 3%        | 0%         |
| REHAB with Return (s38b)         | 59.70   | 59.45   | 59.68    | 61.02     | 69.22      | 4%                          | 4%      | 4%       | 5%        | 0%         |
| Limited budget PCT (s45)         | 54.38   | 54.24   | 54.14    | 55.43     | 67.89      | -5%                         | -5%     | -5%      | -5%       | -2%        |
| No Future Treatments (s37)       | 48.29   | 48.21   | 47.91    | 48.39     | 69.32      | -16%                        | -15%    | -16%     | -17%      | 0%         |
| No Silviculture Treatments (s46) | 35.49   | 35.33   | 35.71    | 64.55     | 69.49      | -38%                        | -38%    | -37%     | 11%       | 1%         |

Scenario s36 is the base case scenario for this timber supply analysis as described above in Section 3. The base case run incorporates SIA project findings by applying an adjustment ratio to managed stands yields. The base case reflects the current management practice of the TCF with both PCT and CT treatment available to stands meeting the selection criteria. The base case also blocks harvest access in the REHAB areas for 100 years to mimic the delayed availability of these stands. This scenario represents the best available information for the community forest and the set of management assumptions that best reflect current practice and therefore should be considered as the 'base case' timber supply forecast.

The harvest level of the base case starts from 57,000 m<sup>3</sup>/yr, stepping up to 69,000 m<sup>3</sup>/yr, which is 39,000 m<sup>3</sup>/yr higher than the TCF's current AAC level of 30,000 m<sup>3</sup>/yr in the long term. The increase in the harvest flow is a combined result of the improved data including the new VRI, road and stream classification as well as the adjustments to the managed stand site index.



A step-up harvest pattern can best accommodate the management objectives of TCF mainly because of the low-volume unmanaged stands currently on the landbase. Once the landbase has completed the transition from natural stands to more productive managed stands, a higher harvest level can be reached without compromising the long-term sustainable growing stock.

The s36b base case alternative suggests that the level step-up in the base case can occur 20 years earlier with a 3% decrease to the long-term harvest level. The results of this scenario suggest that the landbase is able to transition from natural stands to more productive managed stands within 80 years. This is also consistent with three-path management rotation of the CF, which is to PCT at age 20, CT at age 40 and clear-cut around age 80.

Changes in MSYT would impact the long-term harvest level more than changes in NSYT especially on the long-term harvest level because the landbase transitions to mainly composed of managed stands after 80 years.

The REHAB without return scenario (s38a) set the assumption that there is no market for the small-diameter wood harvested from REHAB thinning. Treating REHAB candidate stands in this scenario reduces stand volume by 65% without any commercial return. The model is able to achieve a 2% increase for the first 100 years because the REHAB treatment opens up the availability of those treated stands for harvest. Another note when interpreting the modelling results is that the Patchworks model does not consider lumber value and therefore could not reflect the size increase in the residual stands after the treatment. Section 6.2.3 of the data package discussed the changes in stand characteristics changes with thinning treatments.

With REHAB thinning volume accounted into commercial volume, the REHAB with return scenario (s38b) was able to identify 2,700 m<sup>3</sup>/ha (5%) increase in harvest level for the first 100 years by applying rehabilitation to a total of 214 ha of REHAB stands over the first 35 years. s38b scenario is a preferred best practice for the TCF and it reflects the current management on the CF landbase. However, it is not presented as the 'base case' in this timber supply analysis because the market for the small-diameter wood harvested from the REHAB thinning treatment is volatile and hard to predict.

With \$300,000 funding to apply PCT treatment every five years, scenario s45 is limited to treat a maximum of 135 hectares every 5 years. This resulted in an annual decrease of 2,700 m<sup>3</sup> in the harvest volume for the first 100 years. In contrast, the base case treated approximately 185 ha every 5 years.

The s37 no PCT silviculture treatment scenario shows a 16% decrease in the short-term harvest flow. Similarly, the no silviculture treatment sensitivity s46 decreased short-term harvest by 38%. The two scenario results indicate that silviculture treatments can shift harvest window to an earlier stage without compromising the long-term harvest level. Apart from that, silviculture treatments would also improve the wood quality, leading to a better return in value, which has not been explicitly accounted for in these model results. Other benefits to enhanced silviculture intervention on the landbase include enhance biodiversity and wildlife values, promote understory tree growth and increase crop value, and create local job opportunities.

This timber supply analysis indicates that the base case harvest level is sustainable and suitable for the TCF, after considering the results of the sensitivity analyses.

## 5.1 Recommendations and Next Steps

This section provides a summary of recommendations for improved data, analysis approach and additional analyses. Besides, recommendations are made for strategic projects that are traditionally not funded through silviculture treatment programs.

### 5.1.1 Quality Assessment of Different Managed Stand Regimes

Given the importance of the minimum harvest criteria, including impacts on timber quality, mid-term timber supply and value recovery, it is important to increase our understanding of the linkage between yields, values and costs associated with different silviculture regimes (species mixes and densities).

The first recommendation would be to support the development of projects to assess managed stand values resulting from different harvesting/treatment regimes. These projects could include the analysis of monetary values of standing timber using industrial and government log grades and prices, cruising information, and milling studies.

### 5.1.2 Monitor Treatment Stands for Future Improvements

The second recommendation is to monitor changes in values for the treatment stands resulting from different silviculture treatments. Continuously update the feedback loop of modelling and on the ground knowledge to better identify the problem forest types and their corresponding future management suggestions.

## References

- Bennett, Jason. 2014-2017. TCF Thinning Photos. Personal Communication
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## **Appendix B: Articles of Terrace Community Forest Limited**

**TERRACE COMMUNITY FOREST LIMITED**  
**(the "Company")**

The Company has as its articles the following articles.

| Full name and signature of the Incorporator  | Date of signing |
|--|-----------------|
| BULL, HOUSSER & TUPPER LLP<br><br>Per: _____ | _____<br>_____  |

*Incorporation number:* \_\_\_\_\_

**ARTICLES**

|  |          |
|--|----------|
| <b>1. INTERPRETATION .....</b>   | <b>1</b> |
| 1.1 Definitions .....  | 1        |
| 1.2 Business Corporations Act and Interpretation Act Definitions Applicable..... | 1        |
| <b>2. SHARES AND SHARE CERTIFICATES .....</b>                                    | <b>1</b> |
| 2.1 Authorized Share Structure .....   | 1        |
| 2.2 Form of Share Certificate .....  | 2        |
| 2.3 Shareholder Entitled to Certificate or Acknowledgment.....                   | 2        |
| 2.4 Delivery by Mail.....  | 2        |
| 2.5 Replacement of Worn Out or Defaced Certificate or Acknowledgement.....       | 2        |
| 2.6 Replacement of Lost, Stolen or Destroyed Certificate or Acknowledgment ..... | 2        |
| 2.7 Splitting Share Certificates .....   | 3        |
| 2.8 Certificate Fee.....   | 3        |
| 2.9 Recognition of Trusts .....  | 3        |
| <b>3. ISSUE OF SHARES .....</b>  | <b>3</b> |
| 3.1 Shareholders Authorized.....   | 3        |
| 3.2 Commissions and Discounts .....  | 3        |
| 3.3 Brokerage .....  | 3        |
| 3.4 Conditions of Issue.....   | 4        |
| 3.5 Share Purchase Warrants and Rights .....                                     | 4        |
| <b>4. SHARE REGISTERS.....</b>   | <b>4</b> |
| 4.1 Central Securities Register.....   | 4        |
| 4.2 Closing Register.....  | 4        |

|   |           |
|---|-----------|
| <b>5. SHARE TRANSFERS .....</b>                                   | <b>4</b>  |
| 5.1 Registering Transfers .....                                   | 4         |
| 5.2 Form of Instrument of Transfer .....                          | 5         |
| 5.3 Transferor Remains Shareholder .....                          | 5         |
| 5.4 Signing of Instrument of Transfer .....                       | 5         |
| 5.5 Enquiry as to Title Not Required .....                        | 5         |
| 5.6 Transfer Fee .....  | 6         |
| <b>6. TRANSMISSION OF SHARES .....</b>                            | <b>6</b>  |
| 6.1 Legal Personal Representative Recognized on Death .....       | 6         |
| 6.2 Rights of Legal Personal Representative .....                 | 6         |
| <b>7. PURCHASE OF SHARES .....</b>                                | <b>6</b>  |
| 7.1 Company Authorized to Purchase Shares .....                   | 6         |
| 7.2 Purchase When Insolvent .....                                 | 6         |
| 7.3 Sale and Voting of Purchased Shares .....                     | 6         |
| <b>8. BORROWING POWERS .....</b>                                  | <b>7</b>  |
| <b>9. ALTERATIONS .....</b>                                       | <b>8</b>  |
| 9.1 Alteration of Authorized Share Structure .....                | 8         |
| 9.2 Special Rights and Restrictions .....                         | 8         |
| 9.3 Change of Name .....  | 8         |
| 9.4 Other Alterations .....                                       | 9         |
| 9.5 Consent to Alterations .....                                  | 9         |
| <b>10. MEETINGS OF SHAREHOLDERS .....</b>                         | <b>9</b>  |
| 10.1 Annual General Meetings .....                                | 9         |
| 10.2 Resolution Instead of Annual General Meeting .....           | 9         |
| 10.3 Calling of Meetings of Shareholders .....                    | 9         |
| 10.4 Notice for Meetings of Shareholders .....                    | 9         |
| 10.5 Record Date for Notice .....                                 | 10        |
| 10.6 Record Date for Voting .....                                 | 10        |
| 10.7 Failure to Give Notice and Waiver of Notice .....            | 10        |
| 10.8 Notice of Special Business at Meetings of Shareholders ..... | 10        |
| <b>11. PROCEEDINGS AT MEETINGS OF SHAREHOLDERS .....</b>          | <b>11</b> |
| 11.1 Special Business .....                                       | 11        |
| 11.2 No Waiver of Auditor .....                                   | 11        |
| 11.3 Disclosure of Financial Statements .....                     | 11        |
| 11.4 Special Majority .....                                       | 12        |
| 11.5 Quorum .....   | 12        |
| 11.6 One Shareholder May Constitute Quorum .....                  | 12        |
| 11.7 Other Persons May Attend .....                               | 12        |
| 11.8 Requirement of Quorum .....                                  | 12        |
| 11.9 Lack of Quorum .....   | 12        |
| 11.10 Lack of Quorum at Succeeding Meeting .....                  | 13        |

|            |  |           |
|------------|--|-----------|
| 11.11      | Chair .....  | 13        |
| 11.12      | Selection of Alternate Chair.....                              | 13        |
| 11.13      | Adjournments.....  | 13        |
| 11.14      | Notice of Adjourned Meeting .....                              | 13        |
| 11.15      | Decisions by Show of Hands or Poll.....                        | 13        |
| 11.16      | Declaration of Result.....                                     | 14        |
| 11.17      | Motion Need Not be Seconded .....                              | 14        |
| 11.18      | Casting Vote .....   | 14        |
| 11.19      | Manner of Taking Poll .....                                    | 14        |
| 11.20      | Demand for Poll on Adjournment .....                           | 14        |
| 11.21      | Chair Must Resolve Dispute.....                                | 14        |
| 11.22      | Casting of Votes.....  | 15        |
| 11.23      | Demand for Poll .....  | 15        |
| 11.24      | Demand for Poll Not to Prevent Continuance of Meeting .....    | 15        |
| 11.25      | Retention of Ballots and Proxies .....                         | 15        |
| <b>12.</b> | <b>VOTES OF SHAREHOLDERS.....</b>                              | <b>15</b> |
| 12.1       | Number of Votes by Shareholder or by Shares .....              | 15        |
| 12.2       | Votes of Persons in Representative Capacity.....               | 15        |
| 12.3       | Votes by Joint Holders .....                                   | 15        |
| 12.4       | Legal Personal Representatives as Joint Shareholders .....     | 16        |
| 12.5       | Representative of a Corporate Shareholder .....                | 16        |
| 12.6       | Proxy Provisions Do Not Apply to All Companies.....            | 16        |
| 12.7       | Appointment of Proxy Holders.....                              | 17        |
| 12.8       | Alternate Proxy Holders .....                                  | 17        |
| 12.9       | When Proxy Holder Need Not Be Shareholder.....                 | 17        |
| 12.10      | Deposit of Proxy.....  | 17        |
| 12.11      | Validity of Proxy Vote .....                                   | 17        |
| 12.12      | Form of Proxy .....  | 18        |
| 12.13      | Revocation of Proxy .....                                      | 18        |
| 12.14      | Revocation of Proxy Must Be Signed .....                       | 18        |
| 12.15      | Production of Evidence of Authority to Vote .....              | 19        |
| <b>13.</b> | <b>DIRECTORS .....</b>   | <b>19</b> |
| 13.1       | First Directors; Number of Directors .....                     | 19        |
| 13.2       | Change in Number of Directors.....                             | 19        |
| 13.3       | Directors' Acts Valid Despite Vacancy.....                     | 20        |
| 13.4       | Qualifications of Directors .....                              | 20        |
| 13.5       | Remuneration of Directors .....                                | 20        |
| 13.6       | Reimbursement of Expenses of Directors .....                   | 20        |
| 13.7       | Special Remuneration for Directors.....                        | 20        |
| 13.8       | Gratuity, Pension or Allowance on Retirement of Director ..... | 20        |
| <b>14.</b> | <b>ELECTION AND REMOVAL OF DIRECTORS.....</b>                  | <b>21</b> |
| 14.1       | Election at Annual General Meeting .....                       | 21        |
| 14.2       | Consent to be a Director .....                                 | 21        |



|            |  |           |
|------------|--|-----------|
| 14.3       | Failure to Elect or Appoint Directors .....                  | 21        |
| 14.4       | Places of Retiring Directors Not Filled.....                 | 21        |
| 14.5       | Directors May Fill Casual Vacancies.....                     | 22        |
| 14.6       | Remaining Directors Power to Act .....                       | 22        |
| 14.7       | Shareholders May Fill Vacancies.....                         | 22        |
| 14.8       | Additional Directors.....                                    | 22        |
| 14.9       | Ceasing to be a Director .....                               | 22        |
| 14.10      | Removal of Director by Shareholders .....                    | 23        |
| 14.11      | Removal of Director by Directors .....                       | 23        |
| <b>15.</b> | <b>ALTERNATE DIRECTORS.....</b>                              | <b>23</b> |
| 15.1       | Appointment of Alternate Director .....                      | 23        |
| 15.2       | Notice of Meetings.....                                      | 23        |
| 15.3       | Alternate for More Than One Director Attending Meetings..... | 23        |
| 15.4       | Consent Resolutions.....                                     | 24        |
| 15.5       | Alternate Director Not an Agent .....                        | 24        |
| 15.6       | Revocation of Appointment of Alternate Director .....        | 24        |
| 15.7       | Ceasing to be an Alternate Director .....                    | 24        |
| 15.8       | Remuneration and Expenses of Alternate Director .....        | 24        |
| <b>16.</b> | <b>POWERS AND DUTIES OF DIRECTORS .....</b>                  | <b>25</b> |
| 16.1       | Powers of Management.....                                    | 25        |
| 16.2       | Appointment of Attorney of Company .....                     | 25        |
| <b>17.</b> | <b>DIRECTORS' CONFLICTS OF INTEREST.....</b>                 | <b>25</b> |
| 17.1       | Scope of Conflict Provisions .....                           | 25        |
| 17.2       | Disclosure of Interest .....                                 | 25        |
| 17.3       | Consequences of Disclosable Interest.....                    | 26        |
| 17.4       | Record of Disclosure .....                                   | 26        |
| 17.5       | Prohibitions.....  | 26        |
| 17.6       | Exceptions to Conflict Provisions .....                      | 26        |
| 17.7       | Duty to Account and Disqualification.....                    | 27        |
| 17.8       | Interested Director Counted in Quorum .....                  | 27        |
| 17.9       | Director Holding Other Office in the Company .....           | 27        |
| 17.10      | No Disqualification.....                                     | 27        |
| 17.11      | Professional Services by Director or Officer.....            | 27        |
| 17.12      | Director or Officer in Other Companies .....                 | 27        |
| <b>18.</b> | <b>PROCEEDINGS OF DIRECTORS .....</b>                        | <b>28</b> |
| 18.1       | Meetings of Directors.....                                   | 28        |
| 18.2       | Voting at Meetings.....                                      | 28        |
| 18.3       | Chair of Meetings.....                                       | 28        |
| 18.4       | Meetings by Telephone or Other Communications Medium.....    | 28        |
| 18.5       | Calling of Meetings .....                                    | 29        |
| 18.6       | Notice of Meetings.....                                      | 29        |
| 18.7       | When Notice Not Required .....                               | 29        |

|            |  |           |
|------------|--|-----------|
| 18.8       | Meeting Valid Despite Failure to Give Notice .....               | 29        |
| 18.9       | Waiver of Notice of Meetings .....                               | 29        |
| 18.10      | Quorum.....  | 29        |
| 18.11      | Validity of Acts Where Appointment Defective.....                | 30        |
| 18.12      | Consent Resolutions in Writing .....                             | 30        |
| <b>19.</b> | <b>EXECUTIVE AND OTHER COMMITTEES.....</b>                       | <b>30</b> |
| 19.1       | Appointment and Powers of Executive Committee .....              | 30        |
| 19.2       | Appointment and Powers of Other Committees.....                  | 31        |
| 19.3       | Obligations of Committees .....                                  | 31        |
| 19.4       | Powers of Board .....  | 31        |
| 19.5       | Committee Meetings .....   | 32        |
| <b>20.</b> | <b>OFFICERS .....</b>  | <b>32</b> |
| 20.1       | Directors May Appoint Officers.....                              | 32        |
| 20.2       | Functions, Duties and Powers of Officers.....                    | 32        |
| 20.3       | Qualifications .....   | 32        |
| 20.4       | Remuneration and Terms of Appointment.....                       | 33        |
| <b>21.</b> | <b>INDEMNIFICATION.....</b>                                      | <b>33</b> |
| 21.1       | Definitions .....  | 33        |
| 21.2       | Mandatory Indemnification of Directors and Former Directors..... | 33        |
| 21.3       | Indemnification of Other Persons .....                           | 33        |
| 21.4       | Non-Compliance with <i>Business Corporations Act</i> .....       | 34        |
| 21.5       | Company May Purchase Insurance .....                             | 34        |
| <b>22.</b> | <b>DIVIDENDS .....</b>   | <b>34</b> |
| 22.1       | Payment of Dividends Subject to Special Rights .....             | 34        |
| 22.2       | Declaration of Dividends .....                                   | 34        |
| 22.3       | No Notice Required.....  | 34        |
| 22.4       | Record Date.....   | 34        |
| 22.5       | Manner of Paying Dividend .....                                  | 35        |
| 22.6       | Settlement of Difficulties.....                                  | 35        |
| 22.7       | When Dividend Payable.....                                       | 35        |
| 22.8       | Dividends to be Paid in Accordance with Number of Shares .....   | 35        |
| 22.9       | Receipt by Joint Shareholders .....                              | 35        |
| 22.10      | Dividend Bears No Interest .....                                 | 35        |
| 22.11      | Fractional Dividends.....  | 35        |
| 22.12      | Payment of Dividends .....                                       | 35        |
| 22.13      | Capitalization of Surplus .....                                  | 36        |
| <b>23.</b> | <b>DOCUMENTS, RECORDS AND REPORTS .....</b>                      | <b>36</b> |
| 23.1       | Recording of Financial Affairs .....                             | 36        |
| 23.2       | Inspection of Company Records .....                              | 36        |

|   |           |
|---|-----------|
| <b>24. NOTICES .....</b>  | <b>36</b> |
| 24.1 Method of Giving Notice.....   | 36        |
| 24.2 Deemed Receipt of Mailing.....   | 37        |
| 24.3 Certificate of Sending .....   | 37        |
| 24.4 Notice to Joint Shareholders.....                                      | 37        |
| 24.5 Notice to Trustees.....  | 37        |
| <b>25. SEAL .....</b>   | <b>38</b> |
| 25.1 Who May Attest Seal .....  | 38        |
| 25.2 Sealing Copies .....   | 38        |
| 25.3 Mechanical Reproduction of Seal .....                                  | 38        |
| <b>26. PROHIBITIONS .....</b>   | <b>39</b> |
| 26.1 Definitions.....   | 39        |
| 26.2 Application.....   | 39        |
| 26.3 Consent Required for Transfer of Shares or Designated Securities ..... | 39        |
| <b>27. SPECIAL PROVISIONS.....</b>  | <b>39</b> |
| 27.1 Purpose of Incorporation.....  | 39        |
| 27.2 Public Access .....  | 40        |

**PROVINCE OF BRITISH COLUMBIA**  
***BUSINESS CORPORATIONS ACT***  
**ARTICLES OF**  
**TERRACE COMMUNITY FOREST LIMITED**

**1. INTERPRETATION**

**1.1 Definitions**

In these Articles, unless the context otherwise requires:

- (1) “board of directors”, “directors” and “board” mean the directors or sole director of the Company for the time being;
- (2) “*Business Corporations Act*” means the *Business Corporations Act* (British Columbia) from time to time in force and all amendments thereto and includes all regulations and amendments thereto made pursuant to that Act;
- (3) “Inspector of Municipalities” means the inspector of municipalities of British Columbia appointed, from time to time, under the Local Government Act (British Columbia);
- (4) “legal personal representative” means the personal or other legal representative of the shareholder;
- (5) “registered address” of a shareholder means the shareholder’s address as recorded in the central securities register;
- (6) “seal” means the seal of the Company, if any.

**1.2 Business Corporations Act and Interpretation Act Definitions Applicable**

The definitions in the *Business Corporations Act* and the definitions and rules of construction in the *Interpretation Act*, with the necessary changes, so far as applicable, and unless the context requires otherwise, apply to these Articles as if they were an enactment. If there is a conflict between a definition in the *Business Corporations Act* and a definition or rule in the *Interpretation Act* relating to a term used in these Articles, the definition in the *Business Corporations Act* will prevail in relation to the use of the term in these Articles. If there is a conflict between these Articles and the *Business Corporations Act*, the *Business Corporations Act* will prevail.

**2. SHARES AND SHARE CERTIFICATES**

**2.1 Authorized Share Structure**

The authorized share structure of the Company consists of shares of the class or classes and series, if any, described in the Notice of Articles of the Company.

## **2.2 Form of Share Certificate**

Each share certificate issued by the Company must comply with, and be signed as required by, the *Business Corporations Act*.

## **2.3 Shareholder Entitled to Certificate or Acknowledgment**

Each shareholder is entitled, without charge, to (a) one share certificate representing the shares of each class or series of shares registered in the shareholder's name or (b) a non-transferable written acknowledgment of the shareholder's right to obtain such a share certificate, provided that in respect of a share held jointly by several persons, the Company is not bound to issue more than one share certificate and delivery of a share certificate for a share to one of several joint shareholders or to one of the shareholders' duly authorized agents will be sufficient delivery to all.

## **2.4 Delivery by Mail**

Any share certificate or non-transferable written acknowledgment of a shareholder's right to obtain a share certificate may be sent to the shareholder by mail at the shareholder's registered address and neither the Company nor any director, officer or agent of the Company is liable for any loss to the shareholder because the share certificate or acknowledgement is lost in the mail or stolen.

## **2.5 Replacement of Worn Out or Defaced Certificate or Acknowledgement**

If the directors are satisfied that a share certificate or a non-transferable written acknowledgment of the shareholder's right to obtain a share certificate is worn out or defaced, they must, on production to them of the share certificate or acknowledgment, as the case may be, and on such other terms, if any, as they think fit:

- (1) order the share certificate or acknowledgment, as the case may be, to be cancelled; and
- (2) issue a replacement share certificate or acknowledgment, as the case may be.

## **2.6 Replacement of Lost, Stolen or Destroyed Certificate or Acknowledgment**

If a share certificate or a non-transferable written acknowledgment of a shareholder's right to obtain a share certificate is lost, stolen or destroyed, a replacement share certificate or acknowledgment, as the case may be, must be issued to the person entitled to that share certificate or acknowledgment, as the case may be, if the directors receive:

- (1) proof satisfactory to them that the share certificate or acknowledgment is lost, stolen or destroyed; and
- (2) any indemnity the directors consider adequate.

## **2.7 Splitting Share Certificates**

If a shareholder surrenders a share certificate to the Company with a written request that the Company issue in the shareholder's name two or more share certificates, each representing a specified number of shares and in the aggregate representing the same number of shares as the share certificate so surrendered, the Company must cancel the surrendered share certificate and issue replacement share certificates in accordance with that request.

## **2.8 Certificate Fee**

There must be paid to the Company, in relation to the issue of any share certificate under Articles 2.5, 2.6 or 2.7, the amount, if any and which must not exceed the amount prescribed under the *Business Corporations Act*, determined by the directors.

## **2.9 Recognition of Trusts**

Except as required by law or statute or these Articles, no person will be recognized by the Company as holding any share upon any trust, and the Company is not bound by or compelled in any way to recognize (even when having notice thereof) any equitable, contingent, future or partial interest in any share or fraction of a share or (except as by law or statute or these Articles provided or as ordered by a court of competent jurisdiction) any other rights in respect of any share except an absolute right to the entirety thereof in the shareholder.

# **3. ISSUE OF SHARES**

## **3.1 Shareholders Authorized**

Subject to the *Business Corporations Act* and the rights of the holders of issued shares of the Company, the Company may issue, allot, sell or otherwise dispose of the unissued shares, and issued shares held by the Company, at the times, to the persons, including directors, in the manner, on the terms and conditions and for the issue prices (including any premium at which shares with par value may be issued) that, pursuant to section 137 of the *Business Corporations Act*, the shareholders may determine by an ordinary resolution. The issue price for a share with par value must be equal to or greater than the par value of the share.

## **3.2 Commissions and Discounts**

The Company may at any time pay a reasonable commission or allow a reasonable discount to any person in consideration of that person purchasing or agreeing to purchase shares of the Company from the Company or any other person or procuring or agreeing to procure purchasers for shares of the Company.

## **3.3 Brokerage**

The Company may pay such brokerage fee or other consideration as may be lawful for or in connection with the sale or placement of its securities.

### **3.4 Conditions of Issue**

Except as provided for by the *Business Corporations Act*, no share may be issued until it is fully paid. A share is fully paid when:

- (1) consideration is provided to the Company for the issue of the share by one or more of the following:
  - (a) past services performed for the Company;
  - (b) property;
  - (c) money; and
  - (d) the value of the consideration received by the Company equals or exceeds the issue price set for the share under Article 3.1.

### **3.5 Share Purchase Warrants and Rights**

Subject to the *Business Corporations Act*, the Company may issue share purchase warrants, options and rights upon such terms and conditions as the directors determine, which share purchase warrants, options and rights may be issued alone or in conjunction with debentures, debenture stock, bonds, shares or any other securities issued or created by the Company from time to time.

## **4. SHARE REGISTERS**

### **4.1 Central Securities Register**

As required by and subject to the *Business Corporations Act*, the Company must maintain in British Columbia a central securities register. The directors may, subject to the *Business Corporations Act*, appoint an agent to maintain the central securities register. The directors may also appoint one or more agents, including the agent which keeps the central securities register, as transfer agent for its shares or any class or series of its shares, as the case may be, and the same or another agent as registrar for its shares or such class or series of its shares, as the case may be. The directors may terminate such appointment of any agent at any time and may appoint another agent in its place.

### **4.2 Closing Register**

The Company must not at any time close its central securities register.

## **5. SHARE TRANSFERS**

### **5.1 Registering Transfers**

A transfer of a share of the Company must not be registered unless:

- (1) a duly signed instrument of transfer in respect of the share has been received by the Company;
- (2) if a share certificate has been issued by the Company in respect of the share to be transferred, that share certificate has been surrendered to the Company; and
- (3) if a non-transferable written acknowledgment of the shareholder's right to obtain a share certificate has been issued by the Company in respect of the share to be transferred, that acknowledgment has been surrendered to the Company.

## **5.2 Form of Instrument of Transfer**

The instrument of transfer in respect of any share of the Company must be either in the form, if any, on the back of the Company's share certificates or in any other form that may be approved by the directors from time to time.

## **5.3 Transferor Remains Shareholder**

Except to the extent that the *Business Corporations Act* otherwise provides, the transferor of shares is deemed to remain the holder of the shares until the name of the transferee is entered in a securities register of the Company in respect of the transfer.

## **5.4 Signing of Instrument of Transfer**

If a shareholder, or his or her duly authorized attorney, signs an instrument of transfer in respect of shares registered in the name of the shareholder, the signed instrument of transfer constitutes a complete and sufficient authority to the Company and its directors, officers and agents to register the number of shares specified in the instrument of transfer or specified in any other manner, or, if no number is specified, all the shares represented by the share certificates or set out in the written acknowledgments deposited with the instrument of transfer:

- (1) in the name of the person named as transferee in that instrument of transfer; or
- (2) if no person is named as transferee in that instrument of transfer, in the name of the person on whose behalf the instrument is deposited for the purpose of having the transfer registered.

## **5.5 Enquiry as to Title Not Required**

Neither the Company nor any director, officer or agent of the Company is bound to inquire into the title of the person named in the instrument of transfer as transferee or, if no person is named as transferee in the instrument of transfer, of the person on whose behalf the instrument is deposited for the purpose of having the transfer registered or is liable for any claim related to registering the transfer by the shareholder or by any intermediate owner or holder of the shares, of any interest in the shares, of any share certificate representing such shares or of any written acknowledgment of a right to obtain a share certificate for such shares.



## **5.6 Transfer Fee**

There must be paid to the Company, in relation to the registration of any transfer, the amount, if any, determined by the directors.

## **6. TRANSMISSION OF SHARES**

### **6.1 Legal Personal Representative Recognized on Death**

In case of the death of a shareholder, the legal personal representative, or if the shareholder was a joint holder, the surviving joint holder, will be the only person recognized by the Company as having any title to the shareholder's interest in the shares. Before recognizing a person as a legal personal representative, the directors may require proof of appointment by a court of competent jurisdiction, a grant of letters probate, letters of administration or such other evidence or documents as the directors consider appropriate.

### **6.2 Rights of Legal Personal Representative**

The legal personal representative has the same rights, privileges and obligations that attach to the shares held by the shareholder, including the right to transfer the shares in accordance with these Articles, provided the documents required by the *Business Corporations Act* and the directors have been deposited with the Company.

## **7. PURCHASE OF SHARES**

### **7.1 Company Authorized to Purchase Shares**

Subject to Article 7.2, the special rights and restrictions attached to the shares of any class or series and the *Business Corporations Act*, the Company may, if authorized by the directors, purchase or otherwise acquire any of its shares at the price and upon the terms specified in such resolution.

### **7.2 Purchase When Insolvent**

The Company must not make a payment or provide any other consideration to purchase or otherwise acquire any of its shares if there are reasonable grounds for believing that:

- (1) the Company is insolvent; or
- (2) making the payment or providing the consideration would render the Company insolvent.

### **7.3 Sale and Voting of Purchased Shares**

If the Company retains a share redeemed, purchased or otherwise acquired by it, the Company may sell, gift or otherwise dispose of the share, but, while such share is held by the Company, it:

- (1) is not entitled to vote the share at a meeting of its shareholders;

- (2) must not pay a dividend in respect of the share; and
- (3) must not make any other distribution in respect of the share.

## **8. BORROWING POWERS**

The Company, if authorized by the directors, may:

- (1) borrow money in the manner and amount, on the security, from the sources and on the terms and conditions that they consider appropriate;
- (2) issue bonds, debentures and other debt obligations either outright or as security for any liability or obligation of the Company or any other person and at such discounts or premiums and on such other terms as they consider appropriate;
- (3) guarantee the repayment of money by any other person or the performance of any obligation of any other person; and
- (4) mortgage, charge, whether by way of specific or floating charge, grant a security interest in, or give other security on, the whole or any part of the present and future assets and undertaking of the Company,

except that:

- (5) the Company must not borrow or guarantee as permitted in paragraphs (1) and (3) above if such borrowing or guarantee will then result in the aggregate debt obligations and guaranteed amount of the Company being increased to an amount in excess of CDN\$300,000 unless, not more than 42 days and not less than 21 days prior to the Company incurring such new debt, the Company sends a written notice to each registered shareholder at that shareholder's registered address, which notice must include full, true and plain disclosure of the proposed new debt or guarantee;
- (6) if at any time that the Company's aggregate debt obligations exceed CDN\$300,000, the Company must not borrow or guarantee as permitted in paragraphs (1) and (3) above unless, not more than 42 days and not less than 21 days prior to the Company incurring such new debt, the Company sends a written notice to each registered shareholder at that shareholder's registered address, which notice must include full, true and plain disclosure of the proposed new debt or guarantee;
- (7) the aggregate debt obligations of the Company must not at any time, exceed CDN\$300,000 without the approval of the shareholders by an ordinary resolution; and
- (8) the Company is restricted from exercising the power to borrow money on the security of the City of Terrace, British Columbia.

## **9. ALTERATIONS**

### **9.1 Alteration of Authorized Share Structure**

Subject to Article 9.2 and the *Business Corporations Act*, the Company may by special resolution:

- (1) create one or more classes or series of shares or, if none of the shares of a class or series of shares are allotted or issued, eliminate that class or series of shares;
- (2) increase, reduce or eliminate the maximum number of shares that the Company is authorized to issue out of any class or series of shares or establish a maximum number of shares that the Company is authorized to issue out of any class or series of shares for which no maximum is established;
- (3) subdivide or consolidate all or any of its unissued, or fully paid issued, shares;
- (4) if the Company is authorized to issue shares of a class of shares with par value:
  - (a) decrease the par value of those shares; or
  - (b) if none of the shares of that class of shares are allotted or issued, increase the par value of those shares;
- (5) change all or any of its unissued, or fully paid issued, shares with par value into shares without par value or any of its unissued shares without par value into shares with par value;
- (6) alter the identifying name of any of its shares; or
- (7) otherwise alter its shares or authorized share structure when required or permitted to do so by the *Business Corporations Act*.

### **9.2 Special Rights and Restrictions**

Subject to the *Business Corporations Act*, the Company may by special resolution:

- (1) create special rights or restrictions for, and attach those special rights or restrictions to, the shares of any class or series of shares, whether or not any or all of those shares have been issued; or
- (2) vary or delete any special rights or restrictions attached to the shares of any class or series of shares, whether or not any or all of those shares have been issued.

### **9.3 Change of Name**

The Company may by special resolution authorize an alteration of its Notice of Articles in order to change its name.

#### **9.4 Other Alterations**

If the *Business Corporations Act* does not specify the type of resolution and these Articles do not specify another type of resolution, the Company may by special resolution alter these Articles.

#### **9.5 Consent to Alterations**

Notwithstanding the other provisions of these Articles, including Article 9.4, for so long as the City of Terrace, British Columbia, is a shareholder of the Company, the Company will not alter or amend these Articles in any way without the prior written consent of the Inspector of Municipalities.

### **10. MEETINGS OF SHAREHOLDERS**

#### **10.1 Annual General Meetings**

Unless an annual general meeting is deferred or waived in accordance with the *Business Corporations Act*, the Company must hold its first annual general meeting within 18 months after the date on which it was incorporated or otherwise recognized, and after that must hold an annual general meeting at least once in each calendar year and not more than 15 months after the last annual reference date at such time and place as may be determined by the directors.

#### **10.2 Resolution Instead of Annual General Meeting**

If all the shareholders who are entitled to vote at an annual general meeting consent by a unanimous resolution under the *Business Corporations Act* to all of the business that is required to be transacted at that annual general meeting, the annual general meeting is deemed to have been held on the date of the unanimous resolution. The shareholders must, in any unanimous resolution passed under this Article 10.2, select as the Company's annual reference date a date that would be appropriate for the holding of the applicable annual general meeting.

#### **10.3 Calling of Meetings of Shareholders**

The directors may, whenever they think fit, call a meeting of shareholders.

#### **10.4 Notice for Meetings of Shareholders**

The Company must send notice of the date, time and location of any meeting of shareholders, in the manner provided in these Articles, or in such other manner, if any, as may be prescribed by ordinary resolution (whether previous notice of the resolution has been given or not), to each shareholder entitled to attend the meeting, to each director and to the auditor of the Company, unless these Articles otherwise provide, at least the following number of days before the meeting:

- (1) if and for so long as the Company is a public company, 21 days;

- (2) otherwise, 10 days.

### **10.5 Record Date for Notice**

The directors may set a date as the record date for the purpose of determining shareholders entitled to notice of any meeting of shareholders. The record date must not precede the date on which the meeting is to be held by more than two months or, in the case of a general meeting requisitioned by shareholders under the *Business Corporations Act*, by more than four months. The record date must not precede the date on which the meeting is held by fewer than:

- (1) if and for so long as the Company is a public company, 21 days;
- (2) otherwise, 10 days.

If no record date is set, the record date is 5 p.m. on the day immediately preceding the first date on which the notice is sent or, if no notice is sent, the beginning of the meeting.

### **10.6 Record Date for Voting**

The directors may set a date as the record date for the purpose of determining shareholders entitled to vote at any meeting of shareholders. The record date must not precede the date on which the meeting is to be held by more than two months or, in the case of a general meeting requisitioned by shareholders under the *Business Corporations Act*, by more than four months. If no record date is set, the record date is 5 p.m. on the day immediately preceding the first date on which the notice is sent or, if no notice is sent, the beginning of the meeting.

### **10.7 Failure to Give Notice and Waiver of Notice**

The accidental omission to send notice of any meeting to, or the non-receipt of any notice by, any of the persons entitled to notice does not invalidate any proceedings at that meeting. Any person entitled to notice of a meeting of shareholders may, in writing or otherwise, waive or reduce the period of notice of such meeting.

### **10.8 Notice of Special Business at Meetings of Shareholders**

If a meeting of shareholders is to consider special business within the meaning of Article 11.1, the notice of meeting must:

- (1) state the general nature of the special business; and
- (2) if the special business includes considering, approving, ratifying, adopting or authorizing any document or the signing of or giving of effect to any document, have attached to it a copy of the document or state that a copy of the document will be available for inspection by shareholders:
  - (a) at the Company's records office, or at such other reasonably accessible location in British Columbia as is specified in the notice; and

- (b) during statutory business hours on any one or more specified days before the day set for the holding of the meeting.

## **11. PROCEEDINGS AT MEETINGS OF SHAREHOLDERS**

### **11.1 Special Business**

At a meeting of shareholders, the following business is special business:

- (1) at a meeting of shareholders that is not an annual general meeting, all business is special business except business relating to the conduct of or voting at the meeting;
- (2) at an annual general meeting, all business is special business except for the following:
  - (a) business relating to the conduct of or voting at the meeting;
  - (b) consideration of any financial statements of the Company presented to the meeting;
  - (c) consideration of any reports of the directors or auditor;
  - (d) the setting or changing of the number of directors;
  - (e) the election or appointment of directors;
  - (f) the appointment of an auditor;
  - (g) the setting of the remuneration of an auditor;
  - (h) business arising out of a report of the directors not requiring the passing of a special resolution or an exceptional resolution;
  - (i) any other business which, under these Articles or the *Business Corporations Act*, may be transacted at a meeting of shareholders without prior notice of the business being given to the shareholders.

### **11.2 No Waiver of Auditor**

Notwithstanding the provisions of the *Business Corporations Act*, including subsection 203(2) of the *Business Corporations Act*, a resolution to waive the appointment of an auditor will be of no force or effect.

### **11.3 Disclosure of Financial Statements**

For so long as the City of Terrace is a shareholder of the Company, the Company will present at an open meeting of the municipal council of the City of Terrace the financial statements of the Company presented to the annual general meeting of the Company within 120 days of the Company's fiscal year end.

#### **11.4 Special Majority**

The majority of votes required for the Company to pass a special resolution at a meeting of shareholders is two-thirds of the votes cast on the resolution.

#### **11.5 Quorum**

Subject to the special rights and restrictions attached to the shares of any class or series of shares, the quorum for the transaction of business at a meeting of shareholders is two persons who are, or who represent by proxy, shareholders who, in the aggregate, hold at least 5% of the issued shares entitled to be voted at the meeting.

#### **11.6 One Shareholder May Constitute Quorum**

If there is only one shareholder entitled to vote at a meeting of shareholders:

- (1) the quorum is one person who is, or who represents by proxy, that shareholder, and
- (2) that shareholder, present in person or by proxy, may constitute the meeting.

#### **11.7 Other Persons May Attend**

The directors, the president (if any), the secretary (if any), the assistant secretary (if any), any lawyer for the Company, the auditor of the Company and any other persons invited by the directors are entitled to attend any meeting of shareholders, but if any of those persons does attend a meeting of shareholders, that person is not to be counted in the quorum and is not entitled to vote at the meeting unless that person is a shareholder or proxy holder entitled to vote at the meeting.

#### **11.8 Requirement of Quorum**

No business, other than the election of a chair of the meeting and the adjournment of the meeting, may be transacted at any meeting of shareholders unless a quorum of shareholders entitled to vote is present at the commencement of the meeting, but such quorum need not be present throughout the meeting.

#### **11.9 Lack of Quorum**

If, within one-half hour from the time set for the holding of a meeting of shareholders, a quorum is not present:

- (1) in the case of a general meeting requisitioned by shareholders, the meeting is dissolved, and
- (2) in the case of any other meeting of shareholders, the meeting stands adjourned to the same day in the next week at the same time and place.

**11.10 Lack of Quorum at Succeeding Meeting**

If, at the meeting to which the meeting referred to in Article 11.9 was adjourned, a quorum is not present within one-half hour from the time set for the holding of the meeting, the person or persons present and being, or representing by proxy, one or more shareholders entitled to attend and vote at the meeting constitute a quorum.

**11.11 Chair**

The following individual is entitled to preside as chair at a meeting of shareholders:

- (1) the chair of the board, if any; or
- (2) if the chair of the board is absent or unwilling to act as chair of the meeting, the president, if any.

**11.12 Selection of Alternate Chair**

If, at any meeting of shareholders, there is no chair of the board or president present within 15 minutes after the time set for holding the meeting, or if the chair of the board and the president are unwilling to act as chair of the meeting, or if the chair of the board and the president have advised the secretary, if any, or any director present at the meeting, that they will not be present at the meeting, the directors present must choose one of their number to be chair of the meeting or if all of the directors present decline to take the chair or fail to so choose or if no director is present, the shareholders entitled to vote at the meeting who are present in person or by proxy may choose any person present at the meeting to chair the meeting.

**11.13 Adjournments**

The chair of a meeting of shareholders may, and if so directed by the meeting must, adjourn the meeting from time to time and from place to place, but no business may be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place.

**11.14 Notice of Adjourned Meeting**

It is not necessary to give any notice of an adjourned meeting or of the business to be transacted at an adjourned meeting of shareholders except that, when a meeting is adjourned for 30 days or more, notice of the adjourned meeting must be given as in the case of the original meeting.

**11.15 Decisions by Show of Hands or Poll**

Subject to the *Business Corporations Act*, every motion put to a vote at a meeting of shareholders will be decided on a show of hands unless a poll, before or on the declaration of the result of the vote by show of hands, is directed by the chair or demanded by at least one shareholder entitled to vote who is present in person or by proxy.



**11.16 Declaration of Result**

The chair of a meeting of shareholders must declare to the meeting the decision on every question in accordance with the result of the show of hands or the poll, as the case may be, and that decision must be entered in the minutes of the meeting. A declaration of the chair that a resolution is carried by the necessary majority or is defeated is, unless a poll is directed by the chair or demanded under Article 11.15, conclusive evidence without proof of the number or proportion of the votes recorded in favour of or against the resolution.

**11.17 Motion Need Not be Seconded**

No motion proposed at a meeting of shareholders need be seconded unless the chair of the meeting rules otherwise, and the chair of any meeting of shareholders is entitled to propose or second a motion.

**11.18 Casting Vote**

In case of an equality of votes, the chair of a meeting of shareholders does not, either on a show of hands or on a poll, have a second or casting vote in addition to the vote or votes to which the chair may be entitled as a shareholder.

**11.19 Manner of Taking Poll**

Subject to Article 11.20, if a poll is duly demanded at a meeting of shareholders:

- (1) the poll must be taken:
  - (a) at the meeting, or within seven days after the date of the meeting, as the chair of the meeting directs; and
  - (b) in the manner, at the time and at the place that the chair of the meeting directs;
- (2) the result of the poll is deemed to be the decision of the meeting at which the poll is demanded; and
- (3) the demand for the poll may be withdrawn by the person who demanded it.

**11.20 Demand for Poll on Adjournment**

A poll demanded at a meeting of shareholders on a question of adjournment must be taken immediately at the meeting.

**11.21 Chair Must Resolve Dispute**

In the case of any dispute as to the admission or rejection of a vote given on a poll, the chair of the meeting must determine the dispute, and his or her determination made in good faith is final and conclusive.

**11.22 Casting of Votes**

On a poll, a shareholder entitled to more than one vote need not cast all the votes in the same way.

**11.23 Demand for Poll**

No poll may be demanded in respect of the vote by which a chair of a meeting of shareholders is elected.

**11.24 Demand for Poll Not to Prevent Continuance of Meeting**

The demand for a poll at a meeting of shareholders does not, unless the chair of the meeting so rules, prevent the continuation of a meeting for the transaction of any business other than the question on which a poll has been demanded.

**11.25 Retention of Ballots and Proxies**

The Company must, for at least three months after a meeting of shareholders, keep each ballot cast on a poll and each proxy voted at the meeting, and, during that period, make them available for inspection during normal business hours by any shareholder or proxyholder entitled to vote at the meeting. At the end of such three month period, the Company may destroy such ballots and proxies.

**12. VOTES OF SHAREHOLDERS****12.1 Number of Votes by Shareholder or by Shares**

Subject to any special rights or restrictions attached to any shares and to the restrictions imposed on joint shareholders under Article 12.3:

- (1) on a vote by show of hands, every person present who is a shareholder or proxy holder and entitled to vote on the matter has one vote; and
- (2) on a poll, every shareholder entitled to vote on the matter has one vote in respect of each share entitled to be voted on the matter and held by that shareholder and may exercise that vote either in person or by proxy.

**12.2 Votes of Persons in Representative Capacity**

A person who is not a shareholder may vote at a meeting of shareholders, whether on a show of hands or on a poll, and may appoint a proxy holder to act at the meeting, if, before doing so, the person satisfies the chair of the meeting, or the directors, that the person is a legal personal representative or a trustee in bankruptcy for a shareholder who is entitled to vote at the meeting.

**12.3 Votes by Joint Holders**

If there are joint shareholders registered in respect of any share:

- (1) any one of the joint shareholders may vote at any meeting, either personally or by proxy, in respect of the share as if that joint shareholder were solely entitled to it; or
- (2) if more than one of the joint shareholders is present at any meeting, personally or by proxy, and more than one of them votes in respect of that share, then only the vote of the joint shareholder present whose name stands first on the central securities register in respect of the share will be counted.

#### **12.4 Legal Personal Representatives as Joint Shareholders**

Two or more legal personal representatives of a shareholder in whose sole name any share is registered are, for the purposes of Article 12.3, deemed to be joint shareholders.

#### **12.5 Representative of a Corporate Shareholder**

If a corporation, that is not a subsidiary of the Company, is a shareholder, that corporation may appoint a person to act as its representative at any meeting of shareholders of the Company, and:

- (1) for that purpose, the instrument appointing a representative must:
  - (a) be received at the registered office of the Company or at any other place specified, in the notice calling the meeting, for the receipt of proxies, at least the number of business days specified in the notice for the receipt of proxies, or if no number of days is specified, two business days before the day set for the holding of the meeting; or
  - (b) be provided, at the meeting, to the chair of the meeting or to a person designated by the chair of the meeting;
- (2) if a representative is appointed under this Article 12.5:
  - (a) the representative is entitled to exercise in respect of and at that meeting the same rights on behalf of the corporation that the representative represents as that corporation could exercise if it were a shareholder who is an individual, including, without limitation, the right to appoint a proxy holder; and
  - (b) the representative, if present at the meeting, is to be counted for the purpose of forming a quorum and is deemed to be a shareholder present in person at the meeting.

Evidence of the appointment of any such representative may be sent to the Company by written instrument, fax or any other method of transmitting legibly recorded messages.

#### **12.6 Proxy Provisions Do Not Apply to All Companies**

Articles 12.7 to 12.15 do not apply to the Company if and for so long as it is a public company.

### **12.7 Appointment of Proxy Holders**

Every shareholder of the Company, including a corporation that is a shareholder but not a subsidiary of the Company, entitled to vote at a meeting of shareholders of the Company may, by proxy, appoint one or more (but not more than five) proxy holders to attend and act at the meeting in the manner, to the extent and with the powers conferred by the proxy.

### **12.8 Alternate Proxy Holders**

A shareholder may appoint one or more alternate proxy holders to act in the place of an absent proxy holder.

### **12.9 When Proxy Holder Need Not Be Shareholder**

A person must not be appointed as a proxy holder unless the person is a shareholder, although a person who is not a shareholder may be appointed as a proxy holder if:

- (1) the person appointing the proxy holder is a corporation or a representative of a corporation appointed under Article 12.5;
- (2) the Company has at the time of the meeting for which the proxy holder is to be appointed only one shareholder entitled to vote at the meeting; or
- (3) the shareholders present in person or by proxy at and entitled to vote at the meeting for which the proxy holder is to be appointed, by a resolution on which the proxy holder is not entitled to vote but in respect of which the proxy holder is to be counted in the quorum, permit the proxy holder to attend and vote at the meeting.

### **12.10 Deposit of Proxy**

A proxy for a meeting of shareholders must:

- (1) be received at the registered office of the Company or at any other place specified, in the notice calling the meeting, for the receipt of proxies, at least the number of business days specified in the notice, or if no number of days is specified, two business days before the day set for the holding of the meeting; or
- (2) unless the notice provides otherwise, be provided, at the meeting, to the chair of the meeting or to a person designated by the chair of the meeting.

A proxy may be sent to the Company by written instrument, fax or any other method of transmitting legibly recorded messages.

### **12.11 Validity of Proxy Vote**

A vote given in accordance with the terms of a proxy is valid notwithstanding the death or incapacity of the shareholder giving the proxy and despite the revocation of the proxy or the

revocation of the authority under which the proxy is given, unless notice in writing of that death, incapacity or revocation is received:

- (1) at the registered office of the Company, at any time up to and including the last business day before the day set for the holding of the meeting at which the proxy is to be used; or
- (2) by the chair of the meeting, before the vote is taken.

**12.12 Form of Proxy**

A proxy, whether for a specified meeting or otherwise, must be either in the following form or in any other form approved by the directors or the chair of the meeting:

*name of company*  
**(the “Company”)**

The undersigned, being a shareholder of the Company, hereby appoints [name] or, failing that person, [name], as proxy holder for the undersigned to attend, act and vote for and on behalf of the undersigned at the meeting of shareholders of the Company to be held on [month, day, year] and at any adjournment of that meeting.

Number of shares in respect of which this proxy is given (if no number is specified, then this proxy is given in respect of all shares registered in the name of the shareholder): \_\_\_\_\_

Signed *[month, day, year]*

\_\_\_\_\_  
*[Signature of shareholder]*

\_\_\_\_\_  
*[Name of shareholder-printed]*

**12.13 Revocation of Proxy**

Subject to Article 12.14, every proxy may be revoked by an instrument in writing that is:

- (1) received at the registered office of the Company at any time up to and including the last business day before the day set for the holding of the meeting at which the proxy is to be used; or
- (2) provided, at the meeting, to the chair of the meeting.

**12.14 Revocation of Proxy Must Be Signed**

An instrument referred to in Article 12.13 must be signed as follows:

- (1) if the shareholder for whom the proxy holder is appointed is an individual, the instrument must be signed by the shareholder or his or her legal personal representative or trustee in bankruptcy;
- (2) if the shareholder for whom the proxy holder is appointed is a corporation, the instrument must be signed by the corporation or by a representative appointed for the corporation under Article 12.5.

### **12.15 Production of Evidence of Authority to Vote**

The chair of any meeting of shareholders may, but need not, inquire into the authority of any person to vote at the meeting and may, but need not, demand from that person production of evidence as to the existence of the authority to vote.

## **13. DIRECTORS**

### **13.1 First Directors; Number of Directors**

The first directors are the persons designated as directors of the Company in the Notice of Articles that applies to the Company when it is recognized under the *Business Corporations Act*. The number of directors, excluding additional directors appointed under Article 14.8, is set at:

- (1) subject to paragraphs (2) and (3), the number of directors that is equal to the number of the Company's first directors;
- (2) if the Company is a public company, the greater of three and the most recently set of:
  - (a) the number of directors set by ordinary resolution (whether or not previous notice of the resolution was given); and
  - (b) the number of directors set under Article 14.4;
- (3) if the Company is not a public company, the most recently set of:
  - (a) the number of directors set by ordinary resolution (whether or not previous notice of the resolution was given); and
  - (b) the number of directors set under Article 14.4.

### **13.2 Change in Number of Directors**

If the number of directors is set under Articles 13.1(2)(a) or 13.1(3)(a):

- (1) the shareholders may elect or appoint the directors needed to fill any vacancies in the board of directors up to that number;
- (2) if the shareholders do not elect or appoint the directors needed to fill any vacancies in the board of directors up to that number contemporaneously with the setting of that

number, then the directors may appoint, or the shareholders may elect or appoint, directors to fill those vacancies.

### **13.3 Directors' Acts Valid Despite Vacancy**

An act or proceeding of the directors is not invalid merely because fewer than the number of directors set or otherwise required under these Articles is in office.

### **13.4 Qualifications of Directors**

A director is not required to hold a share in the capital of the Company as qualification for his or her office but must be qualified as required by the *Business Corporations Act* to become, act or continue to act as a director.

### **13.5 Remuneration of Directors**

The directors are entitled to the remuneration for acting as directors, if any, as the directors may from time to time determine. If the directors so decide, the remuneration of the directors, if any, will be determined by the shareholders. That remuneration may be in addition to any salary or other remuneration paid to any officer or employee of the Company as such, who is also a director.

### **13.6 Reimbursement of Expenses of Directors**

The Company must reimburse each director for the reasonable expenses that he or she may incur in and about the business of the Company.

### **13.7 Special Remuneration for Directors**

If any director performs any professional or other services for the Company that in the opinion of the directors are outside the ordinary duties of a director, or if any director is otherwise specially occupied in or about the Company's business, he or she may be paid remuneration fixed by the directors, or, at the option of that director, fixed by ordinary resolution, and such remuneration may be either in addition to, or in substitution for, any other remuneration that he or she may be entitled to receive.

### **13.8 Gratuity, Pension or Allowance on Retirement of Director**

Unless otherwise determined by ordinary resolution, the directors on behalf of the Company may pay a gratuity or pension or allowance on retirement to any director who has held any salaried office or place of profit with the Company or to his or her spouse or dependants and may make contributions to any fund and pay premiums for the purchase or provision of any such gratuity, pension or allowance.

## **14. ELECTION AND REMOVAL OF DIRECTORS**

### **14.1 Election at Annual General Meeting**

At every annual general meeting and in every unanimous resolution contemplated by Article 10.2:

- (1) the shareholders entitled to vote at the annual general meeting for the election of directors must elect, or in the unanimous resolution appoint, a board of directors consisting of the number of directors for the time being set under these Articles; and
- (2) all the directors cease to hold office immediately before the election or appointment of directors under paragraph (1), but are eligible for re-election or re-appointment.

### **14.2 Consent to be a Director**

No election, appointment or designation of an individual as a director is valid unless:

- (1) that individual consents to be a director in the manner provided for in the *Business Corporations Act*,
- (2) that individual is elected or appointed at a meeting at which the individual is present and the individual does not refuse, at the meeting, to be a director; or
- (3) with respect to first directors, the designation is otherwise valid under the *Business Corporations Act*.

### **14.3 Failure to Elect or Appoint Directors**

If:

- (1) the Company fails to hold an annual general meeting, and all the shareholders who are entitled to vote at an annual general meeting fail to pass the unanimous resolution contemplated by Article 10.2, on or before the date by which the annual general meeting is required to be held under the *Business Corporations Act*; or
- (2) the shareholders fail, at the annual general meeting or in the unanimous resolution contemplated by Article 10.2, to elect or appoint any directors;

then each director then in office continues to hold office until the earlier of:

- (3) the date on which his or her successor is elected or appointed; and
- (4) the date on which he or she otherwise ceases to hold office under the *Business Corporations Act* or these Articles.

### **14.4 Places of Retiring Directors Not Filled**

If, at any meeting of shareholders at which there should be an election of directors, the places of any of the retiring directors are not filled by that election, those retiring directors



who are not re-elected and who are asked by the newly elected directors to continue in office will, if willing to do so, continue in office to complete the number of directors for the time being set pursuant to these Articles until further new directors are elected at a meeting of shareholders convened for that purpose. If any such election or continuance of directors does not result in the election or continuance of the number of directors for the time being set pursuant to these Articles, the number of directors of the Company is deemed to be set at the number of directors actually elected or continued in office.

#### **14.5 Directors May Fill Casual Vacancies**

Any casual vacancy occurring in the board of directors may be filled by the directors.

#### **14.6 Remaining Directors Power to Act**

The directors may act notwithstanding any vacancy in the board of directors, but if the Company has fewer directors in office than the number set pursuant to these Articles as the quorum of directors, the directors may only act for the purpose of appointing directors up to that number or of summoning a meeting of shareholders for the purpose of filling any vacancies on the board of directors or, subject to the *Business Corporations Act*, for any other purpose.

#### **14.7 Shareholders May Fill Vacancies**

If the Company has no directors or fewer directors in office than the number set pursuant to these Articles as the quorum of directors, the shareholders may elect or appoint directors to fill any vacancies on the board of directors.

#### **14.8 Additional Directors**

Notwithstanding Articles 13.1 and 13.2, between annual general meetings or unanimous resolutions contemplated by Article 10.2, the directors may appoint one or more additional directors, but the number of additional directors appointed under this Article 14.8 must not at any time exceed:

- (1) one-third of the number of first directors, if, at the time of the appointments, one or more of the first directors have not yet completed their first term of office; or
- (2) in any other case, one-third of the number of the current directors who were elected or appointed as directors other than under this Article 14.8.

Any director so appointed ceases to hold office immediately before the next election or appointment of directors under Article 14.1(1), but is eligible for re-election or re-appointment.

#### **14.9 Ceasing to be a Director**

A director ceases to be a director when:

- (1) the term of office of the director expires;

- (2) the director dies;
- (3) the director resigns as a director by notice in writing provided to the Company or a lawyer for the Company; or
- (4) the director is removed from office pursuant to Articles 14.10 or 14.11.

#### **14.10 Removal of Director by Shareholders**

The Company may remove any director before the expiration of his or her term of office by special resolution. In that event, the shareholders may elect, or appoint by ordinary resolution, a director to fill the resulting vacancy. If the shareholders do not elect or appoint a director to fill the resulting vacancy contemporaneously with the removal, then the directors may appoint or the shareholders may elect, or appoint by ordinary resolution, a director to fill that vacancy.

#### **14.11 Removal of Director by Directors**

The directors may remove any director before the expiration of his or her term of office if the director is convicted of an indictable offence, or if the director ceases to be qualified to act as a director of a company and does not promptly resign, and the directors may appoint a director to fill the resulting vacancy.

### **15. ALTERNATE DIRECTORS**

#### **15.1 Appointment of Alternate Director**

Any director (an "appointor") may by notice in writing received by the Company appoint any person (an "appointee") who is qualified to act as a director to be his or her alternate to act in his or her place at meetings of the directors or committees of the directors at which the appointor is not present unless (in the case of an appointee who is not a director) the directors have reasonably disapproved the appointment of such person as an alternate director and have given notice to that effect to his or her appointor within a reasonable time after the notice of appointment is received by the Company.

#### **15.2 Notice of Meetings**

Every alternate director so appointed is entitled to notice of meetings of the directors and of committees of the directors of which his or her appointor is a member and to attend and vote as a director at any such meetings at which his or her appointor is not present.

#### **15.3 Alternate for More Than One Director Attending Meetings**

A person may be appointed as an alternate director by more than one director, and an alternate director:

- (1) will be counted in determining the quorum for a meeting of directors once for each of his or her appointors and, in the case of an appointee who is also a director, once more in that capacity;

- (2) has a separate vote at a meeting of directors for each of his or her appointors and, in the case of an appointee who is also a director, an additional vote in that capacity;
- (3) will be counted in determining the quorum for a meeting of a committee of directors once for each of his or her appointors who is a member of that committee and, in the case of an appointee who is also a member of that committee as a director, once more in that capacity;
- (4) has a separate vote at a meeting of a committee of directors for each of his or her appointors who is a member of that committee and, in the case of an appointee who is also a member of that committee as a director, an additional vote in that capacity.

#### **15.4 Consent Resolutions**

Every alternate director, if authorized by the notice appointing him or her, may sign in place of his or her appointor any resolutions to be consented to in writing.

#### **15.5 Alternate Director Not an Agent**

Every alternate director is deemed not to be the agent of his or her appointor.

#### **15.6 Revocation of Appointment of Alternate Director**

An appointor may at any time, by notice in writing received by the Company, revoke the appointment of an alternate director appointed by him or her.

#### **15.7 Ceasing to be an Alternate Director**

The appointment of an alternate director ceases when:

- (1) his or her appointor ceases to be a director and is not promptly re-elected or re-appointed;
- (2) the alternate director dies;
- (3) the alternate director resigns as an alternate director by notice in writing provided to the Company or a lawyer for the Company;
- (4) the alternate director ceases to be qualified to act as a director; or
- (5) his or her appointor revokes the appointment of the alternate director.

#### **15.8 Remuneration and Expenses of Alternate Director**

The Company may reimburse an alternate director for the reasonable expenses that would be properly reimbursed if he or she were a director, and the alternate director is entitled to

receive from the Company such proportion, if any, of the remuneration otherwise payable to the appointor as the appointor may from time to time direct.

## **16. POWERS AND DUTIES OF DIRECTORS**

### **16.1 Powers of Management**

The directors must, subject to the *Business Corporations Act* and these Articles, manage or supervise the management of the business and affairs of the Company and have the authority to exercise all such powers of the Company as are not, by the *Business Corporations Act* or by these Articles, required to be exercised by the shareholders of the Company.

### **16.2 Appointment of Attorney of Company**

The directors may from time to time, by power of attorney or other instrument, under seal if so required by law, appoint any person to be the attorney of the Company for such purposes, and with such powers, authorities and discretions (not exceeding those vested in or exercisable by the directors under these Articles and excepting the power to fill vacancies in the board of directors, to remove a director, to change the membership of, or fill vacancies in, any committee of the directors, to appoint or remove officers appointed by the directors and to declare dividends) and for such period, and with such remuneration and subject to such conditions as the directors may think fit. Any such power of attorney may contain such provisions for the protection or convenience of persons dealing with such attorney as the directors think fit. Any such attorney may be authorized by the directors to sub-delegate all or any of the powers, authorities and discretions for the time being vested in him or her.

## **17. DIRECTORS' CONFLICTS OF INTEREST**

### **17.1 Scope of Conflict Provisions**

This Article 17 applies to directors in relation to meetings of the Company's board of directors, meetings of committees of the Company's board of directors, and resolutions in writing of the Company's board of directors.

### **17.2 Disclosure of Interest**

If a director attending a meeting or considering a resolution in writing considers that he or she is not entitled to and must not:

- (1) participate in the discussion of a matter; or
- (2) vote on or otherwise approve a resolution in respect of a matter,

because the director has a direct or indirect pecuniary interest in the matter, or for any other reason, then the director must declare this to the other directors and state the general nature of why the director considers this to be the case.

### **17.3 Consequences of Disclosable Interest**

After making a declaration on the basis described Article 17.2 a director must:

- (1) must not take part in the discussion of the matter and is not entitled to vote on or otherwise approve any question in respect of the matter;
- (2) must leave the meeting or that part of the meeting during which the matter in question is under consideration; and
- (3) must not attempt in any way, whether before, during or after the matter is considered by the other directors, to influence the directors decisions on any question in respect of the matter, provided that the director making the declaration must, to the extent he or she is able and in a timely manner, inform the remaining directors of any risks to the Company associated with the matter in question to the extent necessary to fulfil his or her duties to the Company.

### **17.4 Record of Disclosure**

If a declaration is made by a director pursuant to Article 17.2, the Chair or other person who presided at the meeting will ensure that minutes of the meeting record in writing the substance of the declaration and the fact that the director making the declaration was not present for that part of the meeting during which the matter in question was under consideration.

### **17.5 Prohibitions**

Whether or not a declaration is made under Article 17.2, if a director has a direct or indirect pecuniary interest in a matter the director must not:

- (1) participate in the discussion of a matter;
- (2) vote on or otherwise approve a resolution in respect of a matter; or
- (3) attempt in any way, whether before, during or after the matter is considered by the other directors, to influence the directors decisions on any question in respect of the matter, provided that the interested director must, to the extent he or she is able and in a timely manner, inform the remaining directors of any risks to the Company associated with the matter in question to the extent necessary to fulfil his or her duties to the Company.

### **17.6 Exceptions to Conflict Provisions**

Article 17.5 does not apply if:

- (1) the pecuniary interest of the director is a pecuniary interest in common with the residents of the City of Terrace, British Columbia generally;

- (2) the matter relates to remuneration or expenses payable to one or more directors in relation to their duties as directors; or
- (3) the pecuniary interest is so remote or insignificant that it cannot reasonably be regarded as likely to influence the director in relation to the matter.

### **17.7 Duty to Account and Disqualification**

A person who contravenes Article 17.5 is, in addition to any consequences that may arise under the provisions of the *Business Corporations Act*, disqualified from continuing to hold office as a director unless the contravention was due to reasonable inadvertence or because of an error in judgment made in good faith.

### **17.8 Interested Director Counted in Quorum**

Notwithstanding that, by operation of this Article 17, a director is prohibited from participating in the discussion of a matter, or voting on or otherwise approving a resolution in respect of a matter, such director(s) may be counted for the purpose of determining whether a quorum of directors is present for the transaction of business at any meeting of the Company's board of directors or a committee of the Company's board of directors.

### **17.9 Director Holding Other Office in the Company**

A director may hold any office or place of profit with the Company, other than the office of auditor of the Company, in addition to his or her office of director for the period and on the terms (as to remuneration or otherwise) that the directors may determine.

### **17.10 No Disqualification**

No director or intended director is disqualified by his or her office from contracting with the Company either with regard to the holding of any office or place of profit the director holds with the Company or as vendor, purchaser or otherwise, and no contract or transaction entered into by or on behalf of the Company in which a director is in any way interested is liable to be voided for that reason.

### **17.11 Professional Services by Director or Officer**

Subject to the *Business Corporations Act*, a director or officer, or any person in which a director or officer has an interest, may act in a professional capacity for the Company, except as auditor of the Company, and the director or officer or such person is entitled to remuneration for professional services as if that director or officer were not a director or officer.

### **17.12 Director or Officer in Other Companies**

A director or officer may be or become a director, officer or employee of, or otherwise interested in, any person in which the Company may be interested as a shareholder or otherwise, and, subject to the *Business Corporations Act*, the director or officer is not

accountable to the Company for any remuneration or other benefits received by him or her as director, officer or employee of, or from his or her interest in, such other person.

## **18. PROCEEDINGS OF DIRECTORS**

### **18.1 Meetings of Directors**

The directors may meet together for the conduct of business, adjourn and otherwise regulate their meetings as they think fit, and meetings of the directors held at regular intervals may be held at the place, at the time and on the notice, if any, as the directors may from time to time determine.

### **18.2 Voting at Meetings**

Questions arising at any meeting of directors are to be decided by a majority of votes and, in the case of an equality of votes, the chair of the meeting does not have a second or casting vote.

### **18.3 Chair of Meetings**

The following individual is entitled to preside as chair at a meeting of directors:

- (1) the chair of the board, if any;
- (2) in the absence of the chair of the board, the president, if any, if the president is a director; or
- (3) any other director chosen by the directors if:
  - (a) neither the chair of the board nor the president, if a director, is present at the meeting within 15 minutes after the time set for holding the meeting;
  - (b) neither the chair of the board nor the president, if a director, is willing to chair the meeting; or
  - (c) the chair of the board and the president, if a director, have advised the secretary, if any, or any other director, that they will not be present at the meeting.

### **18.4 Meetings by Telephone or Other Communications Medium**

A director may participate in a meeting of the directors or of any committee of the directors in person or by telephone if all directors participating in the meeting, whether in person or by telephone or other communications medium, are able to communicate with each other. A director may participate in a meeting of the directors or of any committee of the directors by a communications medium other than telephone if all directors participating in the meeting, whether in person or by telephone or other communications medium, are able to communicate with each other and if all directors who wish to participate in the meeting agree to such participation. A director who participates in a meeting in a manner contemplated by

this Article 18.4 is deemed for all purposes of the *Business Corporations Act* and these Articles to be present at the meeting and to have agreed to participate in that manner.

### **18.5 Calling of Meetings**

A director may, and the secretary or an assistant secretary of the Company, if any, on the request of a director must, call a meeting of the directors at any time.

### **18.6 Notice of Meetings**

Other than for meetings held at regular intervals as determined by the directors pursuant to Article 18.1, reasonable notice of each meeting of the directors, specifying the place, day and time of that meeting must be given to each of the directors and the alternate directors by any method set out in Article 24.1 or orally or by telephone.

### **18.7 When Notice Not Required**

It is not necessary to give notice of a meeting of the directors to a director or an alternate director if:

- (1) the meeting is to be held immediately following a meeting of shareholders at which that director was elected or appointed, or is the meeting of the directors at which that director is appointed; or
- (2) the director or alternate director, as the case may be, has waived notice of the meeting.

### **18.8 Meeting Valid Despite Failure to Give Notice**

The accidental omission to give notice of any meeting of directors to, or the non-receipt of any notice by, any director or alternate director, does not invalidate any proceedings at that meeting.

### **18.9 Waiver of Notice of Meetings**

Any director or alternate director may send to the Company a document signed by him or her waiving notice of any past, present or future meeting or meetings of the directors and may at any time withdraw that waiver with respect to meetings held after that withdrawal. After sending a waiver with respect to all future meetings and until that waiver is withdrawn, no notice of any meeting of the directors need be given to that director and, unless the director otherwise requires by notice in writing to the Company, to his or her alternate director, and all meetings of the directors so held are deemed not to be improperly called or constituted by reason of notice not having been given to such director or alternate director.

### **18.10 Quorum**

The quorum necessary for the transaction of the business of the directors may be set by the directors and, if not so set, is deemed to be set at three directors.



### **18.11 Validity of Acts Where Appointment Defective**

Subject to the *Business Corporations Act*, an act of a director or officer is not invalid merely because of an irregularity in the election or appointment or a defect in the qualification of that director or officer.

### **18.12 Consent Resolutions in Writing**

A resolution of the directors or of any committee of the directors may be passed without a meeting:

- (1) in all cases, if each of the directors entitled to vote on the resolution consents to it in writing; or
- (2) in the case of a resolution to approve a contract or transaction in respect of which a director has disclosed that he or she has or may have a disclosable interest, if each of the other directors who are entitled to vote on the resolution consents to it in writing.

A consent in writing under this Article may be by signed document, fax, email or any other method of transmitting legibly recorded messages. A consent in writing may be in two or more counterparts which together are deemed to constitute one consent in writing. A resolution of the directors or of any committee of the directors passed in accordance with this Article 18.12 is effective on the date stated in the consent in writing or on the latest date stated on any counterpart and is deemed to be a proceeding at a meeting of directors or of the committee of the directors and to be as valid and effective as if it had been passed at a meeting of the directors or of the committee of the directors that satisfies all the requirements of the *Business Corporations Act* and all the requirements of these Articles relating to meetings of the directors or of a committee of the directors.

## **19. EXECUTIVE AND OTHER COMMITTEES**

### **19.1 Appointment and Powers of Executive Committee**

The directors may, by resolution, appoint an executive committee consisting of the director or directors that they consider appropriate, and this committee has, during the intervals between meetings of the board of directors, all of the directors' powers, except:

- (1) the power to fill vacancies in the board of directors;
- (2) the power to remove a director;
- (3) the power to change the membership of, or fill vacancies in, any committee of the directors; and
- (4) such other powers, if any, as may be set out in the resolution or any subsequent directors' resolution.

## **19.2 Appointment and Powers of Other Committees**

The directors may, by resolution:

- (1) appoint one or more committees (other than the executive committee) consisting of the director or directors that they consider appropriate;
- (2) delegate to a committee appointed under paragraph (1) any of the directors' powers, except:
  - (a) the power to fill vacancies in the board of directors;
  - (b) the power to remove a director;
  - (c) the power to change the membership of, or fill vacancies in, any committee of the directors; and
  - (d) the power to appoint or remove officers appointed by the directors; and
- (3) make any delegation referred to in paragraph (2) subject to the conditions set out in the resolution or any subsequent directors' resolution.

## **19.3 Obligations of Committees**

Any committee appointed under Articles 19.1 or 19.2, in the exercise of the powers delegated to it, must:

- (1) conform to any rules that may from time to time be imposed on it by the directors; and
- (2) report every act or thing done in exercise of those powers at such times as the directors may require.

## **19.4 Powers of Board**

The directors may, at any time, with respect to a committee appointed under Articles 19.1 or 19.2:

- (1) revoke or alter the authority given to the committee, or override a decision made by the committee, except as to acts done before such revocation, alteration or overriding;
- (2) terminate the appointment of, or change the membership of, the committee; and
- (3) fill vacancies in the committee.

## **19.5 Committee Meetings**

Subject to Article 19.3(1) and unless the directors otherwise provide in the resolution appointing the committee or in any subsequent resolution, with respect to a committee appointed under Articles 19.1 or 19.2:

- (1) the committee may meet and adjourn as it thinks proper;
- (2) the committee may elect a chair of its meetings but, if no chair of a meeting is elected, or if at a meeting the chair of the meeting is not present within 15 minutes after the time set for holding the meeting, the directors present who are members of the committee may choose one of their number to chair the meeting;
- (3) a majority of the members of the committee constitutes a quorum of the committee; and
- (4) questions arising at any meeting of the committee are determined by a majority of votes of the members present, and in case of an equality of votes, the chair of the meeting does not have a second or casting vote.

## **20. OFFICERS**

### **20.1 Directors May Appoint Officers**

The directors may, from time to time, appoint such officers, if any, as the directors determine and the directors may, at any time, terminate any such appointment.

### **20.2 Functions, Duties and Powers of Officers**

The directors may, for each officer:

- (1) determine the functions and duties of the officer;
- (2) entrust to and confer on the officer any of the powers exercisable by the directors on such terms and conditions and with such restrictions as the directors think fit; and
- (3) revoke, withdraw, alter or vary all or any of the functions, duties and powers of the officer.

### **20.3 Qualifications**

No officer may be appointed unless that officer is qualified in accordance with the *Business Corporations Act*. One person may hold more than one position as an officer of the Company. Any person appointed as the chair of the board or as a managing director must be a director. Any other officer need not be a director.

## **20.4 Remuneration and Terms of Appointment**

All appointments of officers are to be made on the terms and conditions and at the remuneration (whether by way of salary, fee, commission, participation in profits or otherwise) that the directors thinks fit and are subject to termination at the pleasure of the directors, and an officer may in addition to such remuneration be entitled to receive, after he or she ceases to hold such office or leaves the employment of the Company, a pension or gratuity.

## **21. INDEMNIFICATION**

### **21.1 Definitions**

In this Article 21:

- (1) “eligible penalty” means a judgment, penalty or fine awarded or imposed in, or an amount paid in settlement of, an eligible proceeding;
- (2) “eligible proceeding” means a legal proceeding or investigative action, whether current, threatened, pending or completed, in which a director, former director or alternate director of the Company (an “eligible party”) or any of the heirs and legal personal representatives of the eligible party, by reason of the eligible party being or having been a director or alternate director of the Company:
  - (a) is or may be joined as a party; or
  - (b) is or may be liable for or in respect of a judgment, penalty or fine in, or expenses related to, the proceeding;
- (3) “expenses” has the meaning set out in the *Business Corporations Act*.

### **21.2 Mandatory Indemnification of Directors and Former Directors**

Subject to the *Business Corporations Act*, the Company must indemnify a director, former director or alternate director of the Company and his or her heirs and legal personal representatives against all eligible penalties to which such person is or may be liable, and the Company must, after the final disposition of an eligible proceeding, pay the expenses actually and reasonably incurred by such person in respect of that proceeding. Each director and alternate director is deemed to have contracted with the Company on the terms of the indemnity contained in this Article 21.2.

### **21.3 Indemnification of Other Persons**

Subject to any restrictions in the *Business Corporations Act*, the Company may indemnify any person.

#### **21.4 Non-Compliance with *Business Corporations Act***

The failure of a director, alternate director or officer of the Company to comply with the *Business Corporations Act* or these Articles does not invalidate any indemnity to which he or she is entitled under this Part.

#### **21.5 Company May Purchase Insurance**

The Company may purchase and maintain insurance for the benefit of any person (or his or her heirs or legal personal representatives) who:

- (1) is or was a director, alternate director, officer, employee or agent of the Company;
- (2) is or was a director, alternate director, officer, employee or agent of a corporation at a time when the corporation is or was an affiliate of the Company;
- (3) at the request of the Company, is or was a director, alternate director, officer, employee or agent of a corporation or of a partnership, trust, joint venture or other unincorporated entity;
- (4) at the request of the Company, holds or held a position equivalent to that of a director, alternate director or officer of a partnership, trust, joint venture or other unincorporated entity;

against any liability incurred by him or her as such director, alternate director, officer, employee or agent or person who holds or held such equivalent position.

### **22. DIVIDENDS**

#### **22.1 Payment of Dividends Subject to Special Rights**

The provisions of this Article 22 are subject to the rights, if any, of shareholders holding shares with special rights as to dividends.

#### **22.2 Declaration of Dividends**

Subject to the *Business Corporations Act*, the directors may from time to time declare and authorize payment of such dividends as they may deem advisable.

#### **22.3 No Notice Required**

The directors need not give notice to any shareholder of any declaration under Article 22.2.

#### **22.4 Record Date**

The directors may set a date as the record date for the purpose of determining shareholders entitled to receive payment of a dividend. The record date must not precede the date on which the dividend is to be paid by more than two months. If no record date is set, the record date is 5 p.m. on the date on which the directors pass the resolution declaring the dividend.

**22.5 Manner of Paying Dividend**

A resolution declaring a dividend may direct payment of the dividend wholly or partly by the distribution of specific assets or of fully paid shares or of bonds, debentures or other securities of the Company, or in any one or more of those ways.

**22.6 Settlement of Difficulties**

If any difficulty arises in regard to a distribution under Article 22.5, the directors may settle the difficulty as they deem advisable, and, in particular, may:

- (1) set the value for distribution of specific assets;
- (2) determine that cash payments in substitution for all or any part of the specific assets to which any shareholders are entitled may be made to any shareholders on the basis of the value so fixed in order to adjust the rights of all parties; and
- (3) vest any such specific assets in trustees for the persons entitled to the dividend.

**22.7 When Dividend Payable**

Any dividend may be made payable on such date as is fixed by the directors.

**22.8 Dividends to be Paid in Accordance with Number of Shares**

All dividends on shares of any class or series of shares must be declared and paid according to the number of such shares held.

**22.9 Receipt by Joint Shareholders**

If several persons are joint shareholders of any share, any one of them may give an effective receipt for any dividend, bonus or other money payable in respect of the share.

**22.10 Dividend Bears No Interest**

No dividend bears interest against the Company.

**22.11 Fractional Dividends**

If a dividend to which a shareholder is entitled includes a fraction of the smallest monetary unit of the currency of the dividend, that fraction may be disregarded in making payment of the dividend and that payment represents full payment of the dividend.

**22.12 Payment of Dividends**

Any dividend or other distribution payable in cash in respect of shares may be paid by cheque, made payable to the order of the person to whom it is sent, and mailed to the address of the shareholder, or in the case of joint shareholders, to the address of the joint shareholder who is first named on the central securities register, or to the person and to the address the shareholder or joint shareholders may direct in writing. The mailing of such

cheque will, to the extent of the sum represented by the cheque (plus the amount of the tax required by law to be deducted), discharge all liability for the dividend unless such cheque is not paid on presentation or the amount of tax so deducted is not paid to the appropriate taxing authority.

### **22.13 Capitalization of Surplus**

Notwithstanding anything contained in these Articles, the directors may from time to time capitalize any surplus of the Company and may from time to time issue, as fully paid, shares or any bonds, debentures or other securities of the Company as a dividend representing the surplus or any part of the surplus.

## **23. DOCUMENTS, RECORDS AND REPORTS**

### **23.1 Recording of Financial Affairs**

The directors must cause adequate accounting records to be kept to record properly the financial affairs and condition of the Company and to comply with the *Business Corporations Act*.

### **23.2 Inspection of Company Records**

Shareholders will be entitled to discovery of any and all information respecting any details or conduct of the Company's business and affairs, limited only to the extent that the directors, acting in good faith, determine it would be inexpedient in the interests of the Company to make certain information available and the *Business Corporations Act* does not otherwise require that the Company make such information available to its shareholders. Subject to the foregoing and the rights conferred by the *Business Corporations Act*, the directors may from time to time, determine whether and to what extent and at what time and place and under what conditions or regulations the documents, books and registers and accounting records of the Company or any of them will be open to the inspection of shareholders and no shareholder will have any right to inspect any document or book or register or accounting record of the Company except as conferred by statute or authorized by the board of directors or by a resolution of the shareholders.

## **24. NOTICES**

### **24.1 Method of Giving Notice**

Unless the *Business Corporations Act* or these Articles provides otherwise, a notice, statement, report or other record required or permitted by the *Business Corporations Act* or these Articles to be sent by or to a person may be sent by any one of the following methods:

- (1) mail addressed to the person at the applicable address for that person as follows:
  - (a) for a record mailed to a shareholder, the shareholder's registered address;
  - (b) for a record mailed to a director or officer, the prescribed address for mailing shown for the director or officer in the records kept by the Company or the

mailing address provided by the recipient for the sending of that record or records of that class;

- (c) in any other case, the mailing address of the intended recipient;
- (2) delivery at the applicable address for that person as follows, addressed to the person:
- (a) for a record delivered to a shareholder, the shareholder's registered address;
  - (b) for a record delivered to a director or officer, the prescribed address for delivery shown for the director or officer in the records kept by the Company or the delivery address provided by the recipient for the sending of that record or records of that class;
  - (c) in any other case, the delivery address of the intended recipient;
- (3) sending the record by fax to the fax number provided by the intended recipient for the sending of that record or records of that class;
- (4) sending the record by email to the email address provided by the intended recipient for the sending of that record or records of that class;
- (5) physical delivery to the intended recipient.

#### **24.2 Deemed Receipt of Mailing**

A record that is mailed to a person by ordinary mail to the applicable address for that person referred to in Article 24.1 is deemed to be received by the person to whom it was mailed on the day, Saturdays, Sundays and holidays excepted, following the date of mailing.

#### **24.3 Certificate of Sending**

A certificate signed by the secretary, if any, or other officer of the Company or of any other corporation acting in that behalf for the Company stating that a notice, statement, report or other record was addressed as required by Article 24.1, prepaid and mailed or otherwise sent as permitted by Article 24.1 is conclusive evidence of that fact.

#### **24.4 Notice to Joint Shareholders**

A notice, statement, report or other record may be provided by the Company to the joint shareholders of a share by providing the notice to the joint shareholder first named in the central securities register in respect of the share.

#### **24.5 Notice to Trustees**

A notice, statement, report or other record may be provided by the Company to the persons entitled to a share in consequence of the death, bankruptcy or incapacity of a shareholder by:



- (1) mailing the record, addressed to them:
  - (a) by name, by the title of the legal personal representative of the deceased or incapacitated shareholder, by the title of trustee of the bankrupt shareholder or by any similar description; and
  - (b) at the address, if any, supplied to the Company for that purpose by the persons claiming to be so entitled; or
- (2) if an address referred to in paragraph (1)(b) has not been supplied to the Company, by giving the notice in a manner in which it might have been given if the death, bankruptcy or incapacity had not occurred.

## **25. SEAL**

### **25.1 Who May Attest Seal**

Except as provided in Articles 25.2 and 25.3, the Company's seal, if any, must not be impressed on any record except when that impression is attested by the signatures of:

- (1) any two directors;
- (2) any officer, together with any director;
- (3) if the Company only has one director, that director; or
- (4) any one or more directors or officers or persons as may be determined by the directors.

### **25.2 Sealing Copies**

For the purpose of certifying under seal a certificate of incumbency of the directors or officers of the Company or a true copy of any resolution or other document, despite Article 25.1, the impression of the seal may be attested by the signature of any director or officer.

### **25.3 Mechanical Reproduction of Seal**

The directors may authorize the seal to be impressed by third parties on share certificates or bonds, debentures or other securities of the Company as they may determine appropriate from time to time. To enable the seal to be impressed on any share certificates or bonds, debentures or other securities of the Company, whether in definitive or interim form, on which facsimiles of any of the signatures of the directors or officers of the Company are, in accordance with the *Business Corporations Act* or these Articles, printed or otherwise mechanically reproduced, there may be delivered to the person employed to engrave, lithograph or print such definitive or interim share certificates or bonds, debentures or other securities one or more unmounted dies reproducing the seal and the chair of the board or any senior officer together with the secretary, treasurer, secretary-treasurer, an assistant secretary, an assistant treasurer or an assistant secretary-treasurer may in writing authorize such person to cause the seal to be impressed on such definitive or interim share certificates

or bonds, debentures or other securities by the use of such dies. Share certificates or bonds, debentures or other securities to which the seal has been so impressed are for all purposes deemed to be under and to bear the seal impressed on them.

## **26. PROHIBITIONS**

### **26.1 Definitions**

In this Article 26:

- (1) “designated security” means:
  - (a) a voting security of the Company;
  - (b) a security of the Company that is not a debt security and that carries a residual right to participate in the earnings of the Company or, on the liquidation or winding up of the Company, in its assets; or
  - (c) a security of the Company convertible, directly or indirectly, into a security described in paragraph (a) or (b);
- (2) “security” has the meaning assigned in the *Securities Act* (British Columbia);
- (3) “voting security” means a security of the Company that:
  - (a) is not a debt security, and
  - (b) carries a voting right either under all circumstances or under some circumstances that have occurred and are continuing.

### **26.2 Application**

Article 26.3 does not apply to the Company if and for so long as it is a public company or a pre-existing reporting company which has the Statutory Reporting Company Provisions as part of its Articles or to which the Statutory Reporting Company Provisions apply.

### **26.3 Consent Required for Transfer of Shares or Designated Securities**

No share or designated security may be sold, transferred or otherwise disposed of without, pursuant to section 137 of the *Business Corporations Act*, the consent of the shareholders by an ordinary resolution, and no shareholder is required to give any reason for refusing to consent to any such sale, transfer or other disposition.

## **27. SPECIAL PROVISIONS**

### **27.1 Purpose of Incorporation**

The Company has been incorporated for the specific purpose to act as the general partner of the Terrace Community Forest Limited Partnership to be formed under the laws of British

Columbia. Nothing in this Article will be construed as to restrict the Company from carrying on any business or from exercising any of its powers.

**27.2 Public Access**

Subject to the rules and regulations of the City of Terrace, the Company will keep a copy of these Articles at the Terrace city hall for the purposes of inspection by any person at the times permitted by the City of Terrace.

## **Appendix C: Maps of Operating Areas and Agreement Area for the Terrace Community Forest**

Terrace Community Forest - Licence K1X  
Deep Creek Operating Area

Date: October 15, 2020



Scale: 1:80,000



Hardse

Lean-to  
Lean To Creeks FSR  
Cr

KITSELAS  
MTN

Deep  
Cr

TERRACE

Legend

- K1X
- Paved Roads
- Railway
- Active Road Permit
- Existing Roads
- Lake and Rivers
- Streams

Digital Mapping By:  
Cypress Forest Consultants Ltd.  
5113 Keith Avenue  
Terrace BC V8G 1K8  
cypress@cypressfc.ca Drawn By: MRF

830000

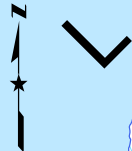
835000

# Terrace Community Forest - Licence K1X Kitimat Operating Area

Date: October 15, 2020



Scale: 1:50,000



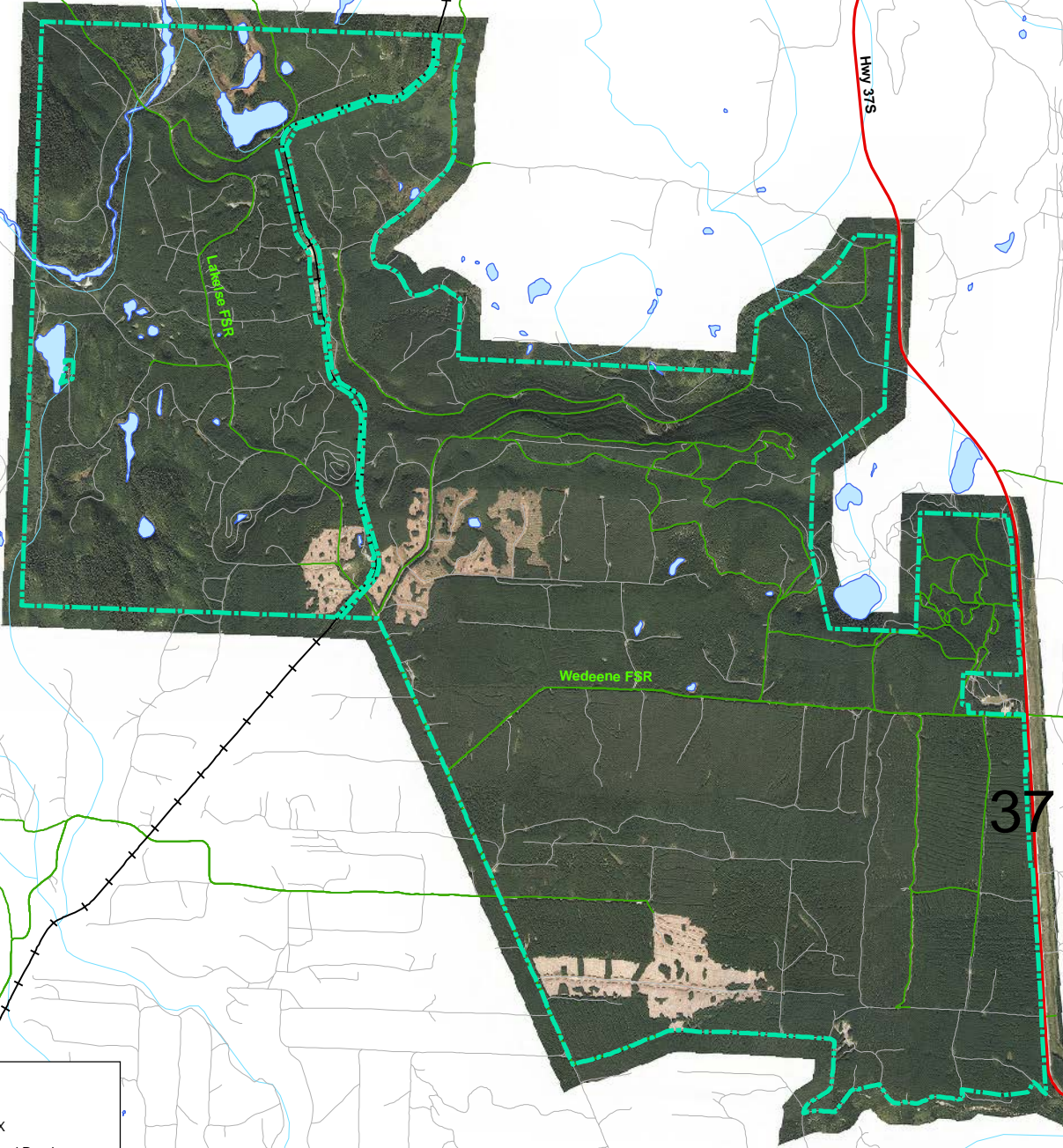
S

1040000

1040000

1035000

1035000



### Legend

-  K1X
-  Paved Roads
-  Railway
-  Active Road Permit
-  Existing Roads
-  Lake and Rivers
-  Streams

Digital Mapping By:



Cypress Forest Consultants Ltd.  
5113 Keith Avenue  
Terrace BC V8G 1K8  
cypress@cypressfc.ca

Drawn By: MRF

830000

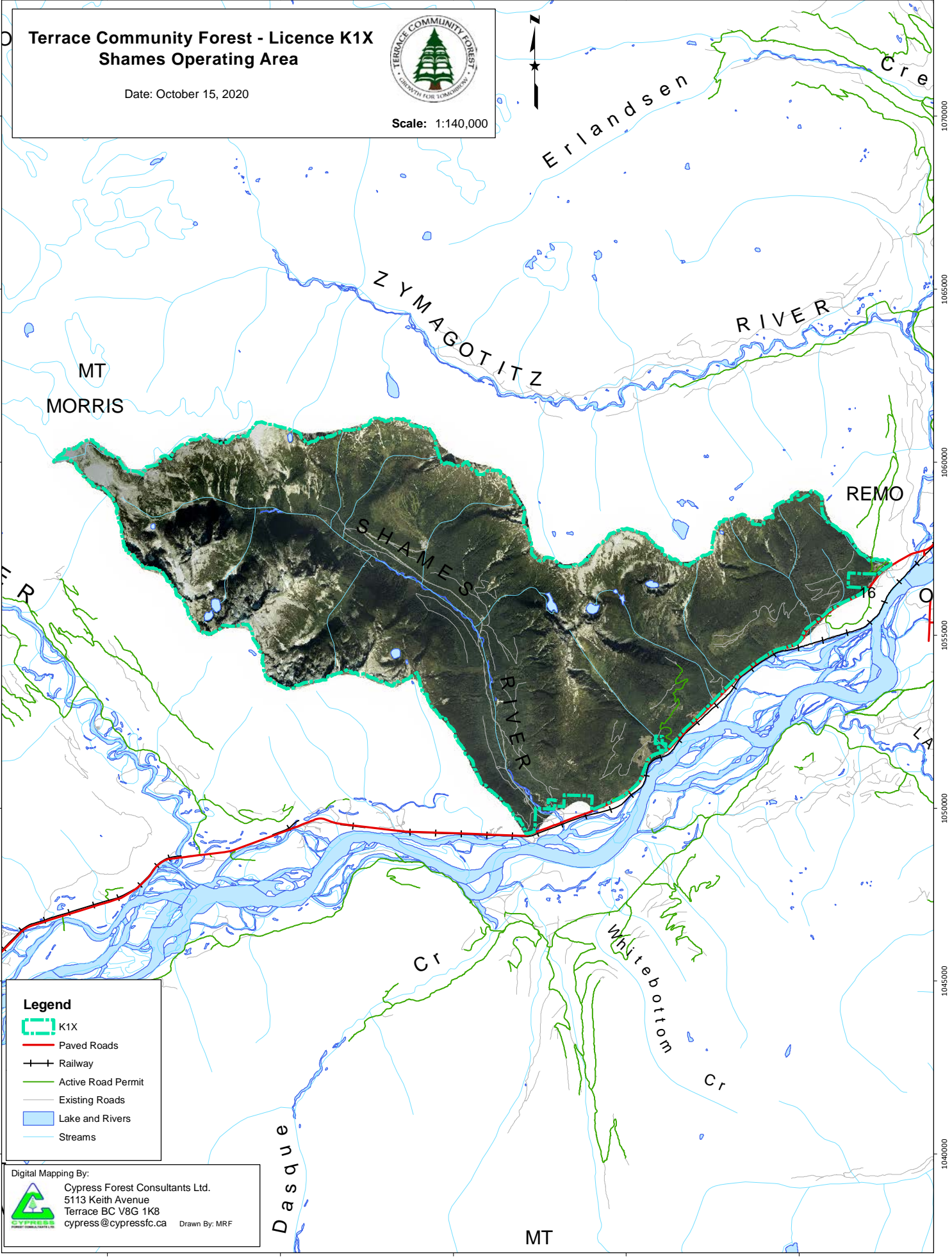
835000

# Terrace Community Forest - Licence K1X Shames Operating Area

Date: October 15, 2020



Scale: 1:140,000



### Legend

- K1X
- Paved Roads
- Railway
- Active Road Permit
- Existing Roads
- Lake and Rivers
- Streams

Digital Mapping By:



Cypress Forest Consultants Ltd.  
5113 Keith Avenue  
Terrace BC V8G 1K8  
cypress@cypressfc.ca Drawn By: MRF

## **Part B: Establishing the Annual Allowable Cut**

### **1. Proposed Allowable Annual Cut**

The annual allowable cut (AAC) for CFA K1X is 57,160 cubic meters

### **2. Allowable Annual Cut Rationale**

The TCF and Ecora modelled various sensitivity analysis scenarios. TCF is accepting the base case calculation presented in the enclosed Timber Supply Analysis Report.

### **3. Timber Supply Review**

Refer to ‘Terrace Community Forest Timber Supply Analysis: Analysis Report’ provided by Ecora.

### **4. RPF Declaration**

I Kim Haworth RPF # 1793 declare that the TSR has met the requirements of section 6.02 (a)-(f) of the community forest agreement document.

Signed August 20, 2020 Date