Purpose
This document is intended to define BC Timber Sales staff roles and responsibilities for ground based equipment planned and operating on steep slopes for TSL holders and contractors. This guidance is to be implemented during planning and operations of all ground based equipment activities. Steep slopes present a hazard to ground base equipment and workers.

Applicable WorkSafe BC Occupational Health & Safety Regulation

26.16 Slope Limitations
(3) If the manufacturer's maximum slope operating stability limit for logging equipment is not known, the equipment must be operated within the following limits:
   (a) a rubber tired skidder must not be operated on a slope which exceeds 35%;
   (b) a crawler tractor, feller-buncher, excavator and other similar equipment must not be operated on a slope which exceeds 40%;
   (c) any other forestry equipment specifically designed for use on a steep slope must not be operated on a slope which exceeds 50%.

(4) Despite subsections (2) and (3) but subject to subsection (5), logging equipment may be operated beyond the maximum slope operating stability limits specified in those subsections if
   (a) a qualified person conducts a risk assessment of that operation, and
   (b) a written safe work practices acceptable to the Board are developed and implemented to ensure the equipment's stability during operation.

(5) Despite anything in this section, logging equipment must not be operated in a particular location or manner if its stability cannot be assured during that operation.

Timber Sale Licence Activities

Planning Stage (Pre-TSL Award)
When slopes over 35% exist in a proposed project, BCTS staff and or planning development contractors will do the following:
1. Identify known slopes and relevant site information such as:
   - Long pitches of continuous slope
   - Terrain Stability Features e.g. fracture rock formation
   - Ground Roughness e.g. hummocks, depressions steep, ravines
   - Soil Conditions e.g. soil depth, exposed rock, loose gravels or soft mud.
   - Timber size and quality
   - Slopes or benches less than 35% but located above areas of greater slope
2. Identify logging system(s) that were considered in the design of each project area e.g. overhead cable and ground based.
3. Slope information to be documented/communicated on applicable project plan maps (HP), TSL
safety highlights and or 18-1.

**TSL Award and Operations Stage**

1. During pre-works BCTS staff should do the following:
   - Communicate steep slope information to TSL holder (Review TSL Safety and Highlights, 18-1).
   - Remind TSL holder of WSBC steep slope requirements 26.2 (completed risk assessment and safe work procedures).
   - Document details of items discussed.
2. During inspections, if staff observes ground based equipment exceeding slope limitations, they should ask the site supervisor if a site risk assessment has been completed, and if safe work practices have been developed. BCTS does not review or approve the site risk assessments or the safe work practices. Staff only asks if they are in place for each cut block. We can ask to see them, but only to prove they exist, not to determine their adequacy. Document your observations using appropriate checklists.
3. Despite a completed site risk assessment and a block specific safe work practice, if staff observes operations occurring that appear to put workers at risk, we should report and document potentially unsafe acts and or conditions to the site supervisor. If the client disregards our concerns and continues to put their workers at risk; we have an obligation under section 3.10 to report this to Worksafe BC.

**Contract Activities** e.g. mechanical site prep, mechanical felling.

**Planning stage (Pre-contract Award)**

When slopes over 35% exist in a proposed project, BCTS staff and or planning development contractors will do the following:

1. Identify known slopes and relevant site information, such as:
   - Long pitches of continuous slope
   - Terrain Stability Features e.g. fracture rock formation
   - Ground Roughness e.g. hummocks, depressions steep, ravines
   - Soil Conditions e.g. soil depth, exposed rock, loose gravels or soft mud.
   - Timber size and quality
   - Slopes or benches less than 35% but located above areas of greater slope.

**Note, where possible utilize existing steep slope information collected e.g. TSL/HP maps.**

2. Slope information to be documented/communicated on applicable project plan maps, information to bidders and or 19-1.

**Contract Award and Operational Stage**

1. During pre-works BCTS staff should do the following:
   - Communicate steep slope information to contractor (Review Info to Bidders, 19-1).
   - Remind Contractor of WSBC steep slope requirements 26.2 (completed risk assessment and safe work procedures).
   - Document details of items discussed.
2. During inspections BCTS staff should do the following:
   - Ensure contractor has conducted and documented a steep slope risk assessment
   - Ensure contractor has developed and implemented steep slope safety plan
   - Ensure contractor periodically evaluates effectiveness of the safety plan
   - Ensure you document your observations.
3. If staff observe operations occurring that appear to put worker at risk and or not meet WSBC requirements then BCTS should communicate observations to contractor or site supervisor and development of corrective action. Where necessary utilize contract provisions to remedy any unsafe conditions and or acts that are hazardous to the health or safety of workers e.g. stop work. If necessary report to Worksafe BC. Document observations using appropriate inspection checklists.

Appendix 1: Example of harvest plan map with known steep slopes identified.
Appendix 2: Example of steep slope hazard assessment and safety plan

References
Appendix 1 Harvest Plan Map example showing steep slope information
Appendix #2 Example: Steep slope hazard assessment and safety plan

<table>
<thead>
<tr>
<th>Machine Stability Factor</th>
<th>Risk Level 1</th>
<th>Risk Level 2</th>
<th>Risk Level 3</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope &amp; Slope Length, Tracked Machines</td>
<td>40 to 50% and Slope Length &lt;50m</td>
<td>40 to 50% and Slope Length &gt;50m</td>
<td>&gt;50% and Slope Length &gt;100m</td>
<td>2</td>
</tr>
<tr>
<td>Slope &amp; Slope Length, Wheeled Machines</td>
<td>35 to 45% and Slope Length &lt;50m</td>
<td>50 to 65% and Slope Length &gt;50m</td>
<td>&gt;45% and Slope Length &gt;100m</td>
<td>2</td>
</tr>
<tr>
<td>Terrain Stability / Classification</td>
<td>No instability indicators and slopes &lt;50%</td>
<td>Instability indicators and slopes &lt;50%</td>
<td>Slopes &gt;50%</td>
<td>2</td>
</tr>
<tr>
<td>Ground Roughness: Boulders, Outcrops, Hummocks, Depressions</td>
<td>&lt;30% of steep slope area covered by roughness features</td>
<td>30 to 50% of area covered by roughness features</td>
<td>&gt;50% of steep slope area covered by roughness features</td>
<td>2</td>
</tr>
<tr>
<td>Soils</td>
<td>Well-drained (e.g., gravel, coarse sand)</td>
<td>Moderately well-drained (fine sand, silt); indicators of sub-surface flows</td>
<td>Poorly-drained or saturated (silt, clay), high water table</td>
<td>2</td>
</tr>
<tr>
<td>Soil Depth</td>
<td>&gt;30 cm to bedrock</td>
<td>15 to 30 cm to bedrock</td>
<td>Thin soils (less than 15 cm), or bedrock exposures</td>
<td>2</td>
</tr>
<tr>
<td>Pre-Existing And Post-Harvest Debris</td>
<td>Open understorey, no windbreak</td>
<td>Moderate downed timber, understorey, stumps &lt;30 cm</td>
<td>Heavy downed timber, understorey, stumps &gt;30 cm</td>
<td>2</td>
</tr>
<tr>
<td>Human Factors: State of Mind</td>
<td>Consider operator focus, alertness, understanding of plan and how to implement, confidence, stress level, physical and mental workplace distractions, well-fed and well-rested. AVOID complacency, fatigue, rushing.</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Risk Ranking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operator Competency</td>
<td>Does the operator have adequate training and experience to complete this work? Has the operator demonstrated successful operations using this machine on sites with similar attributes and timber?</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Risk Ranking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of Exposure</td>
<td>How long will the operator be working on a specific steep site? Also consider shift length, # of scheduled breaks, # of consecutive shift days, etc.</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Risk Ranking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker Isolation - Time for Assistance to Reach Operator</td>
<td>&lt; 15 minutes</td>
<td>15 to 30 minutes</td>
<td>&gt; 30 minutes</td>
<td>2</td>
</tr>
<tr>
<td>Environmental Factors (Wind, Heavy Snow, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Features / Constraints (Danger Trees, Benches, Retention Strategy, etc.)</td>
<td>ICH type with hummocky ground, rock, blowdown, Snags</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Ranking</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timber Height (AVG.): 25m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Stem Diameter: 25cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timber Species:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Stem Diameter: 65cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Machine Stability Risk Rating:</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or More “Risk Level 3” Ratings Results In “No Go” Unless Additional Measures Are Taken (See Page 2).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Qualified Assessor: [Redacted]

Signature: [Redacted]
### STEEP SLOPE HAZARD ASSESSMENT TOOL

**PRACTICES AND CONTROLS TO ELIMINATE OR MITIGATE HAZARDS**

- **CUTTING PERMIT:** [Redacted]
- **BLOCK:** [Redacted]
- **SITE OR SUB-AREA:** 1/2

#### TYPE OF MACHINE:
- ☑️ Feller-Buncher
- ☑️ Skidder
- ☑️ Hoe-Chuck
- ☑️ Processor
- ☑️ Other: [Redacted]

**DESIGNATED NO GO FOR MECHANICAL OPERATIONS**

Identify Designated Machines / Name Designated Operators:
- **Buncher - [Redacted]**
- **Skidder - [Redacted]**
- **Hoe - [Redacted]**

Indicate those Mechanical Features Prescribed to Ensure Machine Stability
- ☑️ Non-Tilting Cab
- ☑️ Tilting Cab
- ☑️ Zero Tail Swing Design
- ☑️ Extended Tracks
- ☑️ Telescoping Boom
- ☑️ Non-swivel Head
- ☑️ Rotating Head
- ☑️ Intermittent Saw
- ☑️ Hot Saw
- ☑️ Shave Stumps, As Required
- ☑️ Power 2" Picks 2:1 pattern

#### Head Cutting Capacity (Diameter):
- 56 cm

#### Allowable Stump Height:
- 30 cm

#### Tree / Weight Handling Capacity:
- 1500 kg

**Target Bunch / Turn Size:**
- 1/2 - 1/2 turn

**Mechanical Features to Ensure Stability:**
- Skidder heavy with long wheelbase

**Approach Steep Slopes From Below**
- ☑️ Operations During Daylight Hours Only
- ☑️ Utilize Existing Benches
- ☑️ Construct & Use Machine Trails (identify on map)
- ☑️ All-season Operations
- ☑️ Summer Only
- ☑️ Winter Only
- ☑️ Maximum Snow Depth:

### Site-Specific Requirements & Notes

- **E. DRY**
- **- Skidder - Excavator**

**Poor Weather Shut-down Conditions (describe)**
- [Redacted]

**Available Assistance (machine, operator):**
- [Redacted]

**Operations:**
- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]

**Cutting:**
- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]
- [Redacted]

**Qualifying Person Building Plan:**
- [Redacted]

**SIGNATURE:**
- [Redacted]
DEVELOPMENT OF SITE-SPECIFIC SAFE WORK PRACTICES:

Workplace

Equipment Operator: [Redacted]

Equipment Type and Model: [Redacted]

Maximum Slope Limitation Under the Following Procedure: 45° (45° on graded) trails

- Illustrate on map the location of approved trails.
- Illustrate on map the skidding “flow” of logs.
- Illustrate on map no-work zones based upon completed risk assessments.
- Adhere to following safe work practices (planning, operating on steep slopes, check in procedure, and any additional site-specific safe work practices deemed necessary by the qualified person undertaking the risk assessment.

A. OPERATOR PLANNING:
- Operator must be trained and experienced with skidder operation on steep slopes.
- Operator must have reviewed the risk assessment and have been trained in the applicable steep slope procedures by the risk assessor.
- Operator must be made aware of block boundaries, block prescription, and any potential known and down slope hazards on site.
- Qualified operator must walk the ground on steep slopes and uncertain terrain prior to commencement of operations.
- Operator must identify, undertake a hazard assessment and address any and all hazards and risks (known or reasonably foreseeable) to worker inclining down slope hazards (in regards to planned operation area of the skidder).
- Assess all sites prior to operating that may pose problems for equipment mobility and/or stability (e.g. slope of unstable ground, lumps, slides, loose rock, exposed rock, thin soils on rock, cracks in the ground, gullied and/or broken terrain, wet ground, wet debris, and icy sites).
- Operator must also take into consideration other limiting factors that would include weather conditions, age and condition of equipment, training and experience of machine operator, slump height, tree size, soil conditions, and amount of ground debris.
- Operator must develop a plan and identify the area for carrying out their specific operation on the workplace in a safe manner acceptable to WCB.
- Operator must address in procedural detail on how they will safely negotiate the specific grade/difficult microsites.

B. OPERATING ON SLOPES:
- Ensure machine log book is up to data and that mandatory or critical repairs have been completed.
- Only operate on steep slopes during daylight.
- Continuously assess ground and soil condition; expose, and tree size to ensure stability, and amend the plan as required.
- Modify machine for better traction. Do not operate on slopes where wheels are spinning.
- Do not operate the equipment on terrain where the equipment cannot maintain traction or stability to get up and down the slope.
- A constructed skid trail may be an option. If potential hazards on terrain is greater than 30% grade, then equipment should be provided to construct a trail to ensure that it is not a hazard on terrain. Ensure the equipment can safely stop under any conditions. Do not operate without assistance from the boom or blade (if applicable). The boom and blade is not part of the machine braking system and must be used only when necessary.
- Ensure that prior to climbing or descending grade, the operator must be selected to allow the operator to control the machine speed and to reduce the risk of losing control due to excessive equipment speed.
- Adjust the machine speed to the prevailing conditions and the route. Always maintain control of the machine.
C. ADDITIONAL SITE SPECIFIC SAFE WORK PROCEDURES

DO NOT OPERATE AREAS: SEE MAP FOR AREAS SHOWN BLUE
- ONO's, cutlines
- unwrapped rock ridges, ledges, outcrops
- areas with > 45% slope: (too rocky to spread machine safely)

SAFE WORK PROCEDURE AREAS: SEE MAP FOR AREA SHOWN ORANGE

These areas are > 45% slope but are covered by sod
- work together with foreman in these areas to sign off