



Terrain Stability Professional Services and Products
Quick Guide

BC Timber Sales
 Skeena Business Area
 April 2014

Service/Assessment	Recommended Application	Level of Field Investigation	Support Materials or Info Required	Standard Report Content	Other Possible Report Adaptations	Relative Cost
Site Review	<ul style="list-style-type: none"> • As required based on BCTS TSA Decision & Documentation Tool • Consider as a preliminary step to identify if further TSA investigations are required • May be office and/or field based • The Site Review can focus the location of a TSA to those portions of the development area where necessary • Guidance on terrain stability considerations prior to layout • Can occur at various scales (i.e. broad overview to specific landform) 	<p>Low;</p> <ul style="list-style-type: none"> • Approximately 1 development/day • Usually involves a field review of proposed or existing layout • Coordinating Resource Professional (CRP) should be in attendance 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> • Scope • Known elements at risk • General development plans and maps • Air photos as required • Terrain Stability and Surface Erosion Mapping • Stream classifications • Related assessments (hydrological or prior geotechnical assessments) 	<p>If a Site Review investigation determines that a TSA is required or the investigation moves directly into a TSA, a Site Review Report is not prepared.</p> <p>Report content is generally very much simplified compared to TSA's. Results can typically be documented by means of a brief memo or email.</p> <ul style="list-style-type: none"> • Objectives • Scope • Observations • Recommendations; proceed, proceed with limitations, or more thorough assessments as warranted • Mapping as an option, could be as simple as scanned maps with hand drawn comments 		<p>Low - 1 to 2 days</p>



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<p align="center">Terrain Stability Assessment (TSA)</p>	<ul style="list-style-type: none"> As required based on BCTS TSA Decision & Documentation Tool and TSP recommendation Focus assessment on specific portions of the development where ever possible – this can come from CRP via assignment or (preferably) from recommendations contained in a Site Review Field layout is complete 	<p>High;</p> <ul style="list-style-type: none"> Approx. 30 to 60 ha/day for blocks, approx. 2 km to 4 km /day for roads; depends on conditions and extent of down slope work required Include time to assess elements at risk (i.e. site visit to P.O.D's, meet landowners, etc.) Professional field reviews of operations and/or conformance reviews of completed works may be required 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> Scope Findings and recommendations of prior Site Reviews Known elements at risk General development plans and maps Air photos as required Terrain Stability and Surface Erosion Mapping Stream classifications Related assessments (hydrological or prior geotechnical assessments) *.dgn and *.shp files as required for mapping 	<p>Must be consistent with <i>Guidelines for Professional Services in the Forest Sector - Terrain Stability Assessments (ABCFP/ APEGBC, 2010)</i>.</p> <ul style="list-style-type: none"> Introduction and objectives Scope and limitations Background information Methodology and extent of fieldwork Observations (detailed terrain descriptions) Conclusions (including detailed Partial Risk Analysis) Recommendations and options to manage hazards or risks Construction or Prescription Summary tables (for roads) Mapping; specific requirements (i.e. prescription details) are to be detailed in the Work Assignment Definitions of qualitative hazard & risk ratings used <p>Forest development upslope of residential developments can expect to have more detailed assessments, and may warrant quantitative risk analysis and professional peer reviews.</p>	<ul style="list-style-type: none"> Memos relating to site reviews or pre-layout assessments Memos relating to field reviews Abbreviated reports in areas with low consequences and/or few terrain stability concerns 	<p>Medium to High</p> <p>- depends on terrain complexity, identified hazard, and consequences</p>



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<p>Risk Analysis</p> <ol style="list-style-type: none"> 1. Detailed Quantitative Risk Analysis 2. Specific Risk Analysis 3. Specific Value of Risk Analysis 	<ul style="list-style-type: none"> • Where additional detailed or specific risk analysis is recommended by a Terrain Specialist • Where risks, consequences, values or elements at risk, and/or broader program implications are of major importance and will require Manager’s decision 	<p>Moderate;</p> <ul style="list-style-type: none"> • Depends on complexity of situation and information available 	<ul style="list-style-type: none"> • Similar to TSA, plus existing TSA reports, other specialists’ reports and/or specialized resource assessments, information on vulnerability of elements at risk, etc. 	<ul style="list-style-type: none"> • Introduction and Scope • Background information • Observations and extent of fieldwork • Definitions & Methodology • Risk Analysis Evaluation • Conclusions & Recommendations • References (as required) • Maps (as required) 		<p>Low to Medium</p>



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Drainage Review	<ul style="list-style-type: none"> Development located on “gentle over steep” terrain Often a subset of a TSA Where “gentle over steep” is the only issue, this may be the only component of a TSA 	Moderate; <ul style="list-style-type: none"> Depends on terrain complexity 	<ul style="list-style-type: none"> Similar to TSA’s 	<ul style="list-style-type: none"> Similar to TSA’s as terrain complexity warrants Recommendations specific to drainage control and management Maps showing prescription elements and notations specific to drainage control 		Low to Medium
Drainage Plan	<ul style="list-style-type: none"> Development located on terrain with complex drainage patterns and/or drainage related instabilities Development is upslope of domestic P.O.D’s Evidence of significant redirected runoff affecting proposed development Timing – best undertaken during spring runoff 	Very High; <ul style="list-style-type: none"> Approximately 1km/day if complex conditions 	<ul style="list-style-type: none"> Similar to TSA’s 	No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting. <ul style="list-style-type: none"> Introduction and objectives Scope and limitations Background information Methodology Conclusions (generalized Partial risk analysis) Recommendations; reduce the likelihood of redirected runoff and associated terrain stability concerns, and mitigate impact of development on water; timing, quantity, and quality. Prescription Summary Tables Maps to show prescription elements as detailed on the Summary Tables and proposed development, location of PODs, mapped location of streams, NCDs, landforms that may control subsurface flows Definitions of specific terms and rating system applied 	Drainage (upgrade) prescriptions: if down slope elements at risk and/or extent of problem areas on an existing or proposed road do not warrant a detailed drainage plan, then simplified drainage (upgrade) prescriptions can reduce time and cost of assessment while providing professional level recommendations	High - drainage plans tend to be very field intensive



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<p align="center">Soil Erosion Assessment (SEA)</p>	<ul style="list-style-type: none"> • Development in community watersheds • Development in close proximity to domestic water sources • Existing development with problematic erosion • Complete as a standalone assessment or in conjunction with TSA, as conditions warrant 	<p>Low to Moderate;</p> <ul style="list-style-type: none"> • Can often be completed without any additional field time if a TSA is also required. • If no TSA is required, then less field time is required for a SEA than would be for a TSA for a similar sized development 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> • Similar to TSA's if detailed in scope • Basics of mapping and down slope elements at risk if limited in scope • Surface Erosion Hazard mapping where available 	<p>No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting.</p> <ul style="list-style-type: none"> • A report may be as simple as a brief memo with recommendations to mitigate hazard, to a more detailed report similar to a TSA dependent on scope and elements at risk 	<p>Memos relating to field reviews of operations or completed works</p>	<p>Low - if completed in conjunction with TSA. (Low to Moderate if completed as a stand-alone assessment)</p>
<p align="center">Snow Avalanche Assessment</p>	<ul style="list-style-type: none"> • Moderate to steep slopes in high snowfall areas • Development is located in potential avalanche start zones • Proposed development may create or exacerbate avalanche hazard to down slope elements at risk 	<p>Moderate</p>	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> • Scope • Known elements at risk • General development plans and maps • Air photos as required • Terrain Stability Mapping • *.dgn and *.shp files as required for mapping 	<p>No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting.</p> <ul style="list-style-type: none"> • A report may be as simple as a brief memo with recommendations to mitigate hazard, to a more detailed report similar to a TSA dependent on scope and elements at risk 		<p>Moderate</p>



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<p align="center">Landslide Investigation</p>	<p>Landslide has occurred;</p> <ul style="list-style-type: none"> • Legal reporting obligations • Prescriptions are required to mitigate further impacts to down slope resources • Educational 	<p>High;</p> <ul style="list-style-type: none"> • Typically 1 to 2 days for investigation of 1 slide. May be significantly greater level of investigation if considerable elements at risk. 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> • Scope – reason for the investigation • Known elements at risk • Maps of existing development • Air photos as required • Terrain Stability and Surface Erosion Mapping • Stream classifications • Related assessments • *.dgn and *.shp files as required for mapping 	<p>No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting.</p> <ul style="list-style-type: none"> • Introduction and objectives • Scope and limitations • Background information • Methodology • Conclusions (Partial risk analysis) • Recommendations for mitigation • Mapping • Definitions of specific terms and rating system applied <p>Reports may vary from a brief memo to a detailed report dependent on the size and effect of the landslide on down slope elements at risk</p>		<p>Medium to High</p> <p>- variables include complexity, number of stakeholders, public involvement, C&E MFR issues, hearings, etc.</p>
<p align="center">Road Deactivation Prescriptions</p>	<ul style="list-style-type: none"> • Road to be deactivated is located on or above potentially unstable or unstable terrain • Road contains TSP prescribed design elements (i.e. full bench) • Road deactivation complexities fall outside the scope of practise of RFT or RPF 	<p>Moderate to Very High;</p> <ul style="list-style-type: none"> • Variable field time dependant on complexity of roads and terrain conditions; avg. 1 to 3 km per day 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> • Scope • Access level required • Known elements at risk • Existing development maps • Air photos as required • Terrain Stability Mapping • Stream classifications • Related assessments • *.dgn and *.shp files as required for mapping 	<p>No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting.</p> <ul style="list-style-type: none"> • Introduction and objectives • Scope and limitations • Background information • Methodology • detailed terrain descriptions • detailed Partial risk analysis with supporting rational • Recommendations for mitigation • Prescription Summary Tables • Prescription maps <p>Reports may vary from a brief memo to a detailed report dependent on the length and complexity of deactivation works, and down slope elements at risk</p>		<p>Medium</p> <p>- dependent on size and complexity</p>



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<p align="center">Road Upgrade Prescriptions</p>	<ul style="list-style-type: none"> Existing roads on or above potential unstable or unstable terrain where drainage and road prism improvements are required to improve stability or allow for industrial use Roads generally in fair shape but may have insufficient culverts or may require localized improvements. 	<p>Low to Moderate;</p> <ul style="list-style-type: none"> Variable field time dependant on the extent of upgrade works required Field progress between 3 km and 5 km per day can be expected 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> Scope Findings and recommendations of prior Site Reviews Known elements at risk General development plans and maps Air photos as required Terrain Stability Mapping Stream classifications Related assessments *.dgn and *.shp files as required 	<p>No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting.</p> <p>May be a brief memo with tables and map, or a more detailed report if down slope elements at risk warrant it.</p> <ul style="list-style-type: none"> Prescriptions to be detailed in Tables and included on maps at an appropriate scale 	<p>Brief memos relating to single location prescriptions.</p>	<p>Low to Medium - dependent on extent of work required</p>
<p align="center">Road Reconstruction Prescriptions</p>	<ul style="list-style-type: none"> Existing roads on or above potential unstable or unstable terrain where <u>significant</u> drainage and road prism improvements are required to improve stability or allow for industrial use Roads may or may not be drivable and likely require significant road prism reconstruction works to become suitable for industrial traffic 	<p>Moderate to High;</p> <ul style="list-style-type: none"> Variable field time dependant on the extent of upgrade/reconstruction works required Field progress between 1 km and 3 km per day can be expected 	<p>Work Assignment to detail:</p> <ul style="list-style-type: none"> Scope Findings and recommendations of prior Site Reviews Known elements at risk General development plans and maps Air photos as required Terrain Stability Mapping Stream classifications Related assessments *.dgn and *.shp files as required 	<p>No specific professional guidelines to follow; up to professional judgement for appropriate level of assessment and reporting.</p> <p>May be a brief memo with tables and map, or a more detailed report if down slope elements at risk warrant it.</p> <ul style="list-style-type: none"> Prescriptions to be detailed in Tables and included on maps at an appropriate scale 	<p>Brief memos relating to single location prescriptions or field reviews.</p>	<p>Medium to High - dependent on extent of work required</p>