



Wet Weather Safety Shutdown Guidelines (WWSSG) (Rainfall & Snowmelt)

CHINOOK BUSINESS AREA

Important : These shutdown guidelines **are focused on safety**; but may also contribute, in part, to maintaining water quality as these guidelines can reduce the likelihood of worker caused landslide initiation during operations. In most cases operations may have ceased prior to reaching these shutdown guideline limits due to the requirements of other operational controls.

The primary control mechanism to protect water quality is through the operational controls of the EMS. The EMS plays a significant role in water quality as it requires the licensees and contractors to manage erosion and sediment delivery into water bodies appropriately and as required; if the operational controls cannot adequately maintain water quality, operations would be required to cease.

The Chinook BA has been divided into 3 broad precipitation zones each with its maximum water inputs (operational limits) for fixed time periods; "Shift end", 24, 48, and 72 hours. The Chinook BA Staff will indicate which zone you are operating in and the applicable shutdown limits.

The licensee or contractor may use their operational procedures in conjunction with the Chinook BA precipitation zone maps which sets the operational limits for the zone they are working in. If the licensee or contractor does not have their own WWSSG they may consider using the guidelines developed for the Chinook BA. The Business Area Staff representative can review the Chinook BA guidelines with the licensee or contractor at their request.

Excavation Caveat

WorksafeBC Section 20.78 (Excavations) requires written instructions by a qualified professional that specifies the influence of changing weather conditions on the stability of the excavation. This procedure does not waive or take precedence over the requirements of WorksafeBC Section 20.78

A. Environmental signs that require immediate work shutdown and evacuation of the work site

A. Shutdown when these conditions exist.

- a. Sudden muddy water in creek (especially in gullies)
- b. Sudden lack of flow in streams during wet weather
- c. Cracks appearing in the soil
- d. Small (anything $\geq 1\text{m} \times 1\text{m}$) sloughs of soil occurring
- e. Anchor stumps pulling out in wet soil
- f. Landslides occurring in the general area, or sounds of landslides occurring
- g. Sloughs in road cuts, especially during road construction or deactivation.

B. Operational Conditions where Wet Weather Shutdown Guidelines Should Be Utilized

- a. Worksite on or below landslide-prone terrain
 - i. Definition of "landslide-prone terrain": Areas mapped **U** or **P** on reconnaissance terrain mapping, or mapped **Class V**, **Class IV**, or **Class III** on detailed terrain mapping, or, if no terrain mapping available, any area with slopes **>60%** (**>50%** in Haida Gwaii District), or areas that show signs of instability, or any areas that are defined as having a high or moderate failure potential in Tables A1 or A2 of the Gully Assessment Procedure Guidebook (GAP).



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- ii. Definition of areas “below landslide-prone terrain”: Areas with smooth open slopes or flat ground (no gullies, incised streams, or draws) are considered to be below landslide-prone terrain unless there is >300 m of terrain with a slope gradient <30% between the landslide prone terrain and the work site or travel route. Any confined area in a gully, or incised stream or draw area, or alluvial fan below a gully, is below landslide prone terrain if there is any upslope landslide prone terrain.
- b. Use the “Unstable upslope road conditions” operational limits in Table 1 if there is a road(s) upslope of worksite that is on, or above, landslide-prone terrain and the road(s) has any of the following conditions.
 - i. Uncontrolled drainage
 - ii. Blocked culverts
 - iii. Tension cracks
 - iv. Other signs of instability
- c. **Note:** Under sunny conditions resulting in snow melt if there is snow on or upslope of work site and road networks exist upslope that have not been assessed for factors listed in Sec. B subsection b. above, do not work unless measurements of snowmelt, and subsequent conversion to water equivalents (mm), are taken and compared to Table C below.

C. Chinook Precipitation Zones: Operational Limits

Table #1: Operational Limits for this worksite are shaded in gray:

(Ops Tech to highlight the appropriate precipitation zone and operational limits for the specific worksite i.e. licence or contract)

Zone	Shift end	24 hour	48 hour	72 hour
Very Wet Zone	50mm	100mm	150mm	200mm
Wet Zone	45mm	80mm	130mm	170mm
Drier Zone	30mm	50mm	80mm	110mm
Unstable upslope road conditions	10mm	20mm	30mm	40mm

D. Recommencement of Operations

If any of the water input operational limits for the work site are exceeded via addition of precipitation as measured in a rain gauge added to input levels from snowmelt for tables #2 and/or #3 or #4 (where applicable) then shut down operations as soon as possible

Shutdown for a minimum of one day, and stay shutdown if water inputs continue to exceed any of the operational limits. Maintaining a base station for measuring rainfall and snow melt, and using weather forecasts will help avoid travelling to the work site during shutdown conditions. Restart operations when all of the water inputs are below the operations limits



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Snow Melt Soil Moisture Input

Snow melt is an important factor in determining the total soil moisture input. The following tables provide guidance as to the amount of snow melt **that must be added** to the precipitation recorded in a rain gauge at the worksite in applicable situations. Snow melt must be considered at or above the worksite; i.e., where the melt event is occurring.

Table #2: 24 Hour Snowmelt additions during rain-on-snow events

Average Temperature ¹	Open Area			Forested Area		
	WIND ²			WIND ²		
	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>
0.5-2.0°C	3mm	10mm	25mm	1mm	5mm	11mm
2.1 – 5.0°C	15mm	35mm	75mm	5mm	10mm	25mm
5.1-10.0°C	25mm	70mm	120mm	10mm	28mm	40mm
10.1-15°C	35mm	95mm	160mm	15mm	40mm	60mm

Table #3: Hourly snow melt during rain-on-snow events³

Average Temperature ¹	Open Area			Forested Area		
	WIND ²			WIND ²		
	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>
0.5-2.0°C	0.15mm	0.45mm	1.05mm	0.04mm	0.2mm	0.5mm
2.1 – 5.0°C	0.65mm	1.5mm	3.15mm	0.2mm	0.4mm	1.2mm
5.1-10.0°C	1.05mm	3.0mm	5.0mm	0.4mm	1.2mm	1.7mm
10.1-15°C	1.5mm	4.0mm	6.7mm	0.65mm	1.7mm	2.50mm

Table #4: Snow melt during sunny conditions

Average Temperature ¹	24 hr Melt		Hourly Melt ³	
	Open	Forested	Open	Forested
	0.5-2.0°C	8mm	2mm	0.3mm
2.1 – 5.0°C	24mm	4mm	1.0mm	0.17mm
5.1-10.0°C	43mm	17mm	1.8mm	0.7mm
10.1-15°C	53mm	21mm	2.2mm	0.9mm
>15°C	65mm	25mm	2.7mm	1.1mm

¹ **Average Temperature** is calculated by adding the maximum and minimum temperature for the time period and dividing by 2.

OPTIONAL: Temperature decreases at **0.5°C** for every **100m** increase in elevation for **rain-on-snow** and **1.0°C** for **sunny conditions**.

² **Low** (<10 km/hr): Leaves and small twigs in constant motion speed; wind extends light flag

Moderate (10-20km/hr, gusts >30km/hr): Small trees sway, maps/paper difficult to hold still.

High (>20km/hr, gusts >40km/hr): Whole trees in motion, clouds moving rapidly, rain blowing sideways.

³ Using hourly melt rates to calculate 24 hr melt rates will not equal values in Table 2 and Table 4 because numbers were rounded for ease of calculation.

IF WIND SPEED INDICATORS OVER UNSTABLE TERRAIN CANNOT BE SEEN, ASSUME WIND SPEED IS HIGH. WINDSPEED ALWAYS INCREASES WITH ELEVATION (MOUNTAIN TOP WINDS ARE HIGHER THAN VALLEY BOTTOM). IT IS RECOMMENDED THAT IF UNCERTAIN ABOUT ANY PARAMETER USE THE MOST CONSERVATIVE VALUES TO ENSURE WORKER SAFETY



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Sample WWSSG Data Sheet

Location: _____ Precipitation Zone: _____

Water Input Operational Limits:

Shift end: _____ 24-hr _____ 48-hr _____ 72-hr: _____

A	B	C	D		E			F	G	H	I	J	K
					Temperature (°C)								
Date	Time	Rainfall (mm)	Open or Forest ? (O or F)	Wind Speed Class (L, M, H)	Min	Max	Ave	Snow melt in (mm)	Water Input mm (Col C+D)	Shift end (mm)	24 hr total (mm)	48 hr (mm)	72 hr (mm)