

BC Timber Sales
Okanagan-Columbia Business Area
2501 – 14th Avenue
Vernon, B.C., V1T 8Z1.

October 15, 2026

Russel Smith, PhD, RPF, Senior Hydrologist
WaterSmith
450 Cadder Avenue
Kelowna, B.C., V1Y 5N3



Summary of Hill Environmental responses to BCTS and the Hydrological Risk Assessment for Rose Swanson Watershed (WaterSmith, 2025)

Page No.	Text	Hill Comment/Question	BCTS/ Watersmith Response	Hill Comments
1	“[WaterSmith was retained by BCTS to] complete a hydrological risk assessment for catchments draining northward from Mount Rose and Mount Swanson”	This excludes the other areas on Rose Swanson and the streams that drain south and east.	BCTS limited the scope to the northward draining catchments. The condition of other areas was not assessed.	Author confirms the limited scope to the AOI (40ha) and other areas were not assessed.
1	“BCTS has operating area in the upper elevations (hereafter referred to as the <i>area of interest [AOI]</i>). BCTS aims to develop ~40 ha of harvest area (commercial thin and/or group retention) within the AOI.”	Are there any other BCTS AOIs? Is this the only AOI proposed and why only this area of Rose Swanson was assessed in this study? Block layout was not identified at the time of this report.	No answer	BCTS states that they currently have no plans to log but would not confirm they wouldn't log at RS in the future.
1	“This assessment was completed to identify hydrologic	The goal of this study was to identify risks at a catchment scale, not a watershed scale.	In the assessment, the terms <i>catchment</i> , <i>watershed</i> , and <i>basin</i> were used interchangeably as	The terms catchment, watershed and basin have very different definitions. I do not

	risks at the catchment scale based on the current watershed condition and provide guidance to BCTS on how to minimize the potential for hydrologic impacts from their operations.”	What are the hydrological impacts to adjacent watercourses such as Deep Creek and the Salmon River, which have low flows which are impacting agricultural water use.	synonyms. No distinction in scale is implied. The potential for the proposed development to impact much larger watersheds (e.g., Deep Creek, Salmon River) and associated elements at risk is negligible for these reasons: 1. The recommended ECA limits (Table 7 in the assessment) were designed to substantially limit potential impacts of forest harvesting on runoff volume within the study catchments. 2. The Deep Creek and Salmon River Watersheds are multiple orders of magnitude larger in drainage area than the study catchments, which severely limits any potential influence of the study catchments on these larger watersheds. 3. There is no established surface connection (e.g., channelized stream) between the study catchments and the downstream creeks or rivers, which further limits any potential influence of the study catchments on these larger watersheds.	agree that the Deep Creek and Salmon River watershed risk is negligible. The study notes impacts are limited to forest harvesting within the 40ha AOI however the impacts of the clearcuts have a reach well outside of the narrow scope of the risk assessment. With Drought conditions in the Deep Creek and Salmon River Watershed and the lack of water for agriculture and fisheries, it is important to consider adjacent effects on flow for agricultural and fisheries.
--	---	---	--	--

1	“In total, six small catchments were delineated for assessment purposes (<i>Basins A through F</i>) (all catchments hereafter referred to as the <i>study watersheds</i> or <i>study area</i>)”	Terms change between “catchment”, “basin” and “watershed”. If the focus is groundwater, how does the definition of a Watershed Unit (surface drainage area) fit into the study? How are the A-F Basins decided if there is no surface water drainage?	The focus included both groundwater and surface water (sensitivity of structures and natural water courses, peak flows, low flows, surface erosion, landslides, and riparian function). The terms <i>catchment</i>, <i>watershed</i>, and <i>basin</i> were used interchangeably as synonyms. No distinction in scale is implied. It is acknowledged that this mix of language could generate confusion. Catchments were delineated based on surface topography and inferred drainage pathways. The distribution of the regional aquifers does not correspond to the catchment boundaries (see Appendix 7 in the assessment). It was assumed in the assessment that any location in the study area could contribute to aquifer recharge (Section 9 in the assessment). Thus, the approach followed in the assessment, and the corresponding guidance to BCTS, was to manage risks of impacting runoff rates (increasing peak flows,	The mix of language does create confusion as you have stated. Importantly is your statement that catchments were delineated on surface drainage and inferred drainage pathways and do not correspond with regional aquifers.
---	--	--	--	---

			decreasing low flows) for all locations in the study area, to ensure that aquifer recharge would not be materially impacted by the BCTS operations.	
1	“The points of interest (POI) for Basins A through E are located at the interface between the upslope forested areas and the downslope residential/rural development areas bordering Salmon River Road (Figure 2). For Basin F, the POI is at the intersection with Chamberlaine Road.”	Are the POIs arbitrarily decided. What is the rationale behind locating the POI’s at the edge of the existing trees/residential use boundary?	POIs were located appropriately for assessing risks to existing development (i.e., structures). For the development, the upper edge of the residential use area would be the first point of contact for surface runoff flowing downstream from the BCTS area of interest.	The risk is based on the existing structures and is restricted to the upper edge of the residential use area.
3	Figure 2	The image is vague; no satellite imagery or clear way to understand its location in relation to the rest of Rose Swanson or the BCTS AOI.	These points are acknowledged. Appendix 5 (Current condition map for the study area) provides some of these details.	

Page No.	Text	Comment/Question	BCTS/ Watersmith Response	Hill Comments
3	“The study area drains into the Slack Creek Watershed, which drains into the Salmon River. Slack Creek is mapped in government data as passing through the valley bottom north of the study area; however, the drainage is unchannelized. There also is no channelized surface connection between the study area and the valley bottom. Nonetheless, there are channelized sections of stream within the study area”	This definition fits the FRPA definition of a "stream". If a stream is not connected for a minimal distance of 100m, then it is not considered a stream under FRPA. The FRPA definition of a stream is the basis for stream classification which determines the size of the riparian buffers for logging. Unchannelized = no buffer Under the Water Sustainability Act, there is no minimum length to define a stream.	We agree on these definitions.	Confirmed that there will be no riparian buffers on the non fish and unchannelized streams.
4	“[The assessment] does not incorporate vulnerability or consequence ratings for societal values (e.g., the value of water quality in the watershed).”	Important to note that water quality values are not addressed in this report.	Correct. See responses to ASTS Concern #1 and ASTS Question #1 above. <u>Specific details for proposed logging (e.g., road routing, cutblock boundaries) were not assessed because BCTS was seeking my guidance in advance of their forest planning process.</u> Following their request, concrete guidance was provided to assist BCTS with mitigating risks in	Water quality values were not assessed. Where is the guidance that WS provided in terms of road routing, cutblock boundaries when they were not assessed?

			the study area. Providing this input in advance allowed BCTS to be more proactive, rather than reactive, with developing plans upfront that are consistent with the assessment results.	
4	“For the purposes of the project, a hydrologic risk assessment is a professional analysis of existing and potential forest development, related effects on water and water related resources, conducted at the catchment scale.”	The scope of this assessment is only related to existing area (40ha) and potential forest development related effects on water and water related resources. Nothing further than the catchment scale and does not address ecosystem function, hydraulic effects of canopy removal on downstream areas, changes to snow melt rates and surface flows, or effects of climate change other than those listed 25 years ago. The potential forest development was limited to an area of potential logging (40ha) and not specific to roads and block layout areas within the 40ha area. Earlier in the report (p4) author notes the project is for “analysis of existing and future forest development related effects on water...” and that a project component is “recommendations	Hydraulic effects of canopy removal on downstream areas and changes to surface flows were explicitly considered in many parts of the assessment. <u>For instance, it was considered in relation to the sensitivity of structures and natural watercourses</u> (e.g., Sections 5-7 of the assessment). Impacts to snow accumulation and timing were considered extensively (e.g., Sections 4.2.2 and 6). Impacts on snowmelt rates were not explicitly discussed but were considered. <u>As the study area is dominantly northward facing, impacts of forest cover removal on snowmelt rates would be limited.</u>	Hydraulic effects were considered specifically for structures and natural watercourses in relation to the AOI. Snowmelt was assessed for the AOI which is on the north side.

		for risk mitigation related to forest development”, and that the assessment addresses “the potential impacts of forest development on the quantity of groundwater...”. How could these be achieved if there was no risk analysis completed for the future forest development proposed by BCTS? Wouldn't a risk analysis for the planned harvesting be beneficial to know how the planned harvesting blocks and roads are going impact the area?		
Page No.	Text	Comment/Question	BCTS/ Watersmith Response	Hill Comments
4	“...the assessment addressed the potential impacts of forest development on the quantity of groundwater supply (within the limits of the author’s area of professional practice).”	Russel Smith has PhD and Masters in hydrology and bachelor’s in forestry. Russell Smith, Hydrologist and CEO of WaterSmith. Are the potential impacts of forest development without specific block and road layout, within the limits of the author’s area of professional practice? Would the outcome of the study be more informative if the block and road layout were provided by BCTS?	See response to ASTS Concern #1 above. With my educational background and almost three decades of practice in forest hydrology (including over 150 hydrologic assessments), the assessment was well within my area of training and professional practice.	Did not answer my question regarding block and road layout knowledge prior to the assessment. Where is the document that pertains to the road routing and cut block boundaries

5	The following aquifers are mapped within or in close proximity to the study area (material composition and vulnerability ratings indicated) [<i>iMapBC</i> , 2025]	The aquifers listed in the report have high/moderate vulnerability. This data is from iMap which is the government mapping program for everything. This is the data the government has loaded into this database however in my experience, missing data doesn't mean there isn't info out there. It's a 5-minute search on the platform. Was there further analysis beyond iMap data?	Data were reviewed on iMapBC, but also downloaded from the BC Data Catalogue. See Appendix 7 in the assessment (Map of local aquifers & water supplies).	No analysis beyond a desktop data search.
5	“Numerous water licences are located within or in close proximity to the study area for multiple uses, including domestic consumption, private irrigation, and livestock and animal watering [<i>iMapBC</i> , 2025]. Numerous groundwater wells are also located within or in close proximity to the study area.”	This is another iMap desktop search. Are there any effects of the proposed harvesting on the existing water licences?	Data were reviewed on iMapBC, but also downloaded from the BC Data Catalogue. See Appendix 7 in the assessment (Map of local aquifers & water supplies). Potential effects were considered extensively in the assessment. In particular, the assessment of peak flow risk, low flow risk, and surface erosion all relate directly to potential effects on existing water licences.	Did not answer question.
6	“Mean annual precipitation is ~488 mm in Armstrong, BC (Environment Canada station #1160485, 373 m elevation, 1971-	Period of record ended in 2000 which was 25 years ago from the date of the report. How are these conclusions justified when they are based on climate	<u>It is acknowledged that the climate has changed in the region somewhat since these climate data were measured at the station, because of climate</u>	The data is 25 years old and the climate has definitely changed in the past 25years in terms of rainfall/ snowfall.

	2000 period of record, located ~9 km east of the study watershed). Monthly precipitation is highest in June and December, and lowest in March and April. Approximately 26% of the precipitation at the climate station falls as snow. Annual precipitation at the highest elevations in the study area is likely 25-50% greater than that recorded at the climate station, with a much larger portion falling as snow.”	station data that is 25 years old. If the Env Canada site didn't have more recent data, then field investigation should have been conducted/ “Annual precipitation at the highest elevations in the study area are "likely" 25-50% greater than that recorded at the climate station”. What are these percentages based on? Our climate has changed in the last 25 years, and our current data shows drought conditions with significantly less rainfall and snowfall. None of the weather stations around RS are active. I do not know why they used this station specifically (it also appears inactive, with data ending in 1993)?	<u>change</u>. Section 3.5 of the report was provided to characterize the overall climate in the study area for the reader. The goal was to broadly categorize the hydrological system (e.g., snowmelt dominated vs. rainfall dominated) and, in approximate terms, the amount of water involved in the system. While the historical data would not perfectly represent the current system at a detailed level, this information did not play a detailed role in the assessment. The statement about the approximate increase in precipitation with increasing elevation is based on my experience in the region with analyzing climate data, measuring snowpacks, and modelling hydrology. It is a general statement that is intended to characterize the hydrological system.	
Page No.	Text	Comment/Question	BCTS/ Watersmith Response	Hill Comments
6	“The mean annual maximum surface flow was estimated to vary from 0.004 to	The BCTS AOI overlaps all the basins. But do not know where blocks/roads will be within the AOI.	No answer	

	0.074 m ³ /s for Basins A through F based on a drainage area adjustment of flows from the Deep Creek at Armstrong hydrometric station (Water Survey of Canada station #08NM119; 15-year record), located ~5 km east-southeast of the study area.”			
6	“Russell Smith (WaterSmith) completed an overview level ground-based field review on October 28, 2024.”	Would freshet conditions have given a better idea of how surface water specifically moves in the study area?	Good question. That suggestion seems intuitive; however, I typically prefer to do field investigations for hydrological assessments outside of spring freshet. Elevated flows can limit the ability to observe channel morphology and the condition of drainage structures, and their associated sensitivities. Moreover, I can interpret flow pathways and levels of surface flows based on field evidence (e.g., surface topography, channel scour, erosion, orientation of vegetation and debris).	
11	“5.1 Sensitivity of natural watercourses”	The inherent risk in this report is limited in scope to the sensitivity of the mobilization of sediment based on the likelihood of peak flows. How are the	Many factors are considered including peak flows, low flows, surface erosion, landslides, and riparian function (Sections 6, 7.1, and	Did not answer the question of other impacts to groundwater. Defaulted to narrow scope of the

		other impacts to groundwater and surface flow resulting from forest cover removal assessed in this report?	7.2 in the assessment), and groundwater (Section 9).	hydrological risk in the AOI.
12	“Very few defined stream channels (i.e., contiguous channel of recurrently mobilized alluvium) were identified in the field within or immediately downstream from the study watersheds.”	This study is focused on the downstream risk to streams that are disconnected and only flow to the north. Are there foreseeable impacts on streams to the east and south as a result of tree removal, changes to the hydrology of Rose Swanson Mountain. Also, the cumulative impacts, soils drying out and loss of the duff layer by wind erosion which increases moisture loss in the soil.	BCTS limited the scope to the northward draining catchments. The condition of other areas was not assessed. Loss of the duff layer by wind erosion after forest cover removal is not known to be a significant hydrological issue in the region.	Blaming BCTS for the narrow scope of the AOR. The study is restricted to hydrological issues
13	“Increased surface runoff from forest development could generate substantial scour and sediment transport, particularly in the middle and upper reaches.”	Increased surface runoff is the result of the forest cover (trees and shrubs being removed) and if the channel gradients are 20 to 25% and then down to 10% in the lower reaches, will the downstream landowners be affected?	Scour is more likely at higher channel gradients, but could still occur at a 10% gradient, depending on the runoff rates and surface substrates. The recommendations in the assessment were provided to limit potential peak flow increases and the associated potential for scour.	Does not answer question of downstream landowners affected.
13	“The overall sensitivity to potential mobilization of substrates along the natural watercourse is considered	Can you explain how you resulted in a moderate rating after your previous sentence regarding “increased surface runoff from forest development	The moderate sensitivity rating aligns with the potential for increased surface runoff to generate scour. This rating is	Speaks to the moderate potential for increased surface runoff to generate scour which is based on peak flows.

	moderate for Basin E...”	could generate substantial scour and sediment transport, particularly in the middle and upper reaches”?	based on the peak flow needed to initiate scour—lower sensitivity requires a larger increase in runoff to trigger erosion, while higher sensitivity requires much less runoff. This moderate rating directly informed the ECA limits established in Table 7 of the assessment.	
Page No.	Text	Comment/Question	BCTS/ Watersmith Response	Hill Comments
13	“It is assumed that extreme peak flows could mobilize coarse sediment and debris; however, the sensitivity ratings do not account for potential impacts from terrain instability (e.g., direct impact from a debris flow). A terrain risk assessment would need to be completed by a terrain specialist to evaluate the capacity for structures to accommodate terrain instability.”	Will there be a terrain stability assessment completed? Is there a risk to downstream infrastructure?	No answer	I understand that this was now completed.
21	“BCTS did not provide specific proposed cutblocks or roads for review (e.g., mapping shapefiles); thus, it was not possible to complete a risk analysis for	Earlier in the report (p4) author says the project is for “analysis of existing and future forest development related effects on water...” and that a project component is “recommendations for	See response to ASTS Concern #1 above.	BCTS states that they currently have no plans to log but would not confirm they wouldn’t log at RS in the future.

	planned forest development” (Hill emphasis).	risk mitigation related to forest development”, and that the assessment addresses “the potential impacts of forest development on the quantity of groundwater...”. How can these be achieved if there was no risk analysis completed for the future forest development proposed by BCTS? Wouldn't a risk analysis for the planned harvesting be beneficial to know how the planned harvesting blocks and roads are going impact the area?		
21	“...the sections below provide a discussion of risk factors to consider for forest development planning in the study watersheds...”	The rest of Rose Swanson is not a part of this study; therefore, the risk factors for any BCTS blocks elsewhere cannot be determined, and the mitigations cannot be incorporated. Will this type of assessment be completed again where blocks are proposed elsewhere?	No answer	BCTS states that they currently have no plans to log but would not confirm they wouldn't log at RS in the future.

Page No.	Text	Comment/Question	BCTS/ Watersmith Response	Hill Comments
21	“The potential consequences of peak flow impacts require careful consideration with forest development planning.”	Then why wasn’t a risk analysis completed using the proposed blocks and roads?	No answer	
22	“The potential for future forest development to exacerbate seasonal low flows requires careful consideration with respect to any dependence of local residents on surface water supply (e.g., livestock watering in Basin E) or on runoff contributions to groundwater supply.”			
23	“The potential for sediment delivery to the drainage network is increased substantially for development (roads, trails, cutblocks) in close proximity to a watercourse...”			
24	“The extent of defined stream channels in the study area is limited (Sections 1 and 5.1). In this respect, the potential for	Conclusion cannot be said for the rest of the BCTS operating area in Rose Swanson, which does have mapped streams. Will another assessment be done for other BCTS	No answer	BCTS states that they currently have no plans to log but would not confirm they wouldn’t log at RS in the future.

	future BCTS development to impact stream channels is also limited.”	AOIs on the mountain? Assessments conducted in isolation.		
28	“Based on the slope gradients, an increase in surface runoff caused by forest development could generate excessive scouring of the ground surface, and transport eroded sediment downstream.”	Important to note that there could be increased runoff, scour, and transport of sediment downstream.	The <u>assessment explicitly evaluated the potential for increased scour and sediment transport, directly informing the risk management recommendations</u> provided to BCTS.	
28	“The sensitivity of structures is considered high for Basins A through E, related to insufficient cross-drains along Salmon River Road, as well as a residence being located in close proximity (<5 m) to the watercourse in Basin A.”	Important that there is high sensitivity for downstream structures. No mapped watercourse in Basin A. Would be beneficial to have taken tracks along water courses within the basins to see where /if they actually flow.	Seasonal surface flow variations are secondary to this assessment, as the evaluation and subsequent recommendations are designed to manage risks associated with extreme runoff scenarios, such as a 1-in-100-year event. Furthermore, surface flow routing can be reliably inferred based on local topography.	
29	BCTS did not provide specific proposed cutblocks or roads for review; thus, it was not possible to complete a risk analysis for planned forest development.	Why was this not supplied to the author?	No answer	
Appendix 5	Current condition map for the study area.	All field sites (apart from 8 & 9) are located on a roadway (either	The documented field sites represent the initial access	No additional site however author notes that the field

		FSR or paved road). Why no sites elsewhere within the basins?	points for localized investigations and do not reflect the spatial extent of the field traverses. To evaluate drainage conditions independent of immediate road influences, the field assessment routinely involved traversing upstream and downstream from the road prism, guided by localized disturbance indicators.	assessment routinely involves traversing upstream and downstream of each of the points. The author does not confirm he did this on this assessment.
--	--	---	---	---