Forest Practices Board

Impacts of Harvesting and Road Construction on Water Quality in McClure Creek

Complaint Investigation #16041

FPB/IRC/211

October 2017

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Introduction

The Complaint

On May 2, 2016, the Forest Practices Board received a complaint from two water users on McClure Creek, north of Kamloops, about increased sediment loading in the McClure Creek drainage following harvesting and road construction by International Forest Products Ltd. (Interfor).

The complainants are concerned that harvesting and road construction over the past few years have led to increased sedimentation in McClure Creek, resulting in a buildup of sediment at their domestic water system's dam and water intake.

The complainants would like Interfor to develop and implement a long-term maintenance and monitoring strategy for water quality, and help with the remediation of their water system.

The investigation considered the following questions in order to address the complainants' concerns:

1. Did Interfor meet its legal obligations under the *Forest and Range Practices Act* (FRPA)?
2. Were the risks to water quality adequately managed?

Background

The McClure Creek watershed is about 1000 hectares in size. It drains into Louis Creek, about 30 kilometres northeast of Kamloops, along the Heffley-Louis Creek Road. Private residences and properties are located on the McClure Creek fan below the complainants' water intake.

Within the drainage there are tenures for timber harvesting, cattle grazing, and domestic water use.

A single water intake, shared by the complainants and two other licensed water users, diverts water from McClure Creek to five residences. The water users initially constructed an earthen dam to pond water at the intake but replaced it with a concrete dam in 2012 (Figure 1).

Figure 1. Intake dam and pond on McClure Creek that supplies the water to the licenced water users.

Harvesting has occurred in the McClure drainage for several decades. In 2009, Interfor took over the operating area and in 2011 began development of roads and cutblocks. In August 2012, Interfor started road construction into cutblock HEF028. In May 2013, one of the complainants told Interfor that increased sediment in McClure Creek had plugged the water intake. The same individual contacted Interfor again in June 2013 with another concern over siltation in McClure Creek. In September 2013, Interfor began harvesting HEF028 and in May 2014 it received another notification that the intake was full of sediment. Following each notification, Interfor completed field inspections, developed a deactivation plan and contracted one of the complainants to implement the deactivation plan. In November 2014, Interfor completed harvesting of HEF028 and in December 2014 hired the same complainant to fully deactivate and grass seed the roads for erosion control (Figure 2).

In the fall of 2015, Interfor and the complainants agreed to conduct a field trip in the spring of 2016 to review cutblock HEF028. Interfor was not aware, but a complaint was filed with the Board in early May 2016, before the field trip had taken place. During the field trip, the complainants showed Interfor two streams within HEF028 that were introducing sediment into McClure Creek. Interfor and the complainants also identified several other areas of concern in HEF028 that required attention. During the field trip, the complainants asked Interfor to:

Figure 2. Deactivated roads in HEF028

1. defer further harvesting in the watershed until HEF028 had stabilized,
2. help them clean out the intake pond, which had again filled with sediment,
3. employ a hydrologist to review HEF028, and
4. prepare a plan to correct concerns identified during the field review of HEF028.

Interfor considered the requests and developed strategies to address the concerns. Interfor agreed to defer harvesting on one additional cutblock for three years, and to provide financial support for a pumper truck to clean out the intake pond. Interfor committed to using a geotechnical engineer to review HEF028 if it felt that further professional assistance was required. Interfor prepared a sediment control plan[1] to address the concerns identified during the field trip. Heavy equipment was not brought in to implement the plan because Interfor had deactivated the roads, grass was starting to establish itself and the area appeared to be stabilizing.

Board investigators conducted three field reviews, and reviewed Interfor's plans and activities at the cutblock and watershed level. Field reviews also involved a hydrologist hired by the Board. During the field reviews, the investigators evaluated harvesting and road construction, maintenance and deactivation completed by Interfor, and the condition of non-status roads and trails. The main tributary of McClure Creek from its upper reaches to the water supply intake was also walked.

[1] The sediment control plan identified strategies to mitigate the amount of sediment from harvesting and road construction in HEF028 entering McClure Creek. The plan included silt fencing, grass seeding and ditching.

Discussion

1. Did Interfor meet its legal obligations?

Section 60 of the *Forest Planning and Practices Regulation* (FPPR) requires licensees to ensure that the primary forest activity does not damage a licensed waterworks. Damage is defined as "harm or injury impairing the value or usefulness of something."[2] If sediment affected the licensed waterworks' ability to function, then the waterworks could be considered damaged.

The intake pond collects sediment and its maintenance is an ongoing responsibility of the water licensees. The complainants periodically cleaned the intake pond prior to 2013. However, the complainants said the intake pond has filled with sediment in the spring for three out of four years since 2012 when the new concrete dam was installed and road construction and harvesting had started. According to the complainants, the volume of sediment is greater than they experienced prior to 2013.

The Board investigators did not observe any physical damage to the water intake. However, when the intake pond is filled with sediment, the ability of the waterworks to function is impeded and it may be considered damaged.

Field reviews identified numerous sediment sources, some of which are attributed to Interfor's forestry activities while others are not. In addition, the design of the dam may have contributed to the buildup of sediment at the intake. The investigators were not able to quantify the contribution of the various sediment sources, nor the impact of the new dam, to the sediment buildup at the water intake.

Finding

Interfor complied with section 60 of the FPPR. The amount of sediment at the intake during spring could be damaging to the waterworks because the ability of the system to deliver water is restricted. However, field reviews identified numerous sediment sources and the new dam may also have contributed to the buildup of sediment at the intake. The investigators were not able to quantify the contribution of Interfor's activities, relative to these various sediment sources, nor the impact of the new dam, on the sediment buildup.

2. Were the risks to water quality adequately managed?

There are no legal obligations to conduct hydrological or terrain assessments, and no practice requirements when working in domestic watersheds[3], even though forestry activities can affect the hydrological processes in a watershed.

However, there is a general expectation in BC that forest licensees will adequately manage the risk that proposed harvesting and road construction activities may have on other resource users and values within and outside a cutblock. Forest licensees, in turn, rely on forest professionals to manage

[2] *Canadian Oxford Dictionary*, Oxford University Press.

[3] A domestic watershed includes only those non-community watersheds licensed for human consumption.

the forestry operations, commonly called professional reliance.[4]

Forestry activities and biophysical characteristics[5] of the watershed affect the amount of exposed soil and snow accumulation, the rate of snowmelt and the infiltration of rainfall. Together these factors affect the quality, quantity and timing of water flow in a watershed. Harvesting and road construction expose soil, which is susceptible to erosion from snowmelt and rainfall. Sediment moves down ditch lines into established watercourses and may eventually make its way to a main channel. Forestry activities may also cause landslides that directly, or indirectly, introduce sediment into watercourses.

Risk is the likelihood of specified adverse consequences arising from an event, circumstance or action within a stated period and area. Risk combines the probability of some hazard and the adverse consequences of that hazard to things that human value (in this case water quality).

Risk management is directed at uncertainty related to future events and outcomes, consequently, risk can be minimized but not eliminated. Therefore, assessments must accurately describe risk to enable licensee staff to evaluate proposed development.

Wilford, D.J., M.E. Sakals, W.W. Grainger, T.H. Millard, and T.R. Giles. 2009. *Managing forested watersheds for hydrogeomorphic risks on fans.* B.C. Min. For. Range, For. Sci. Prog., Victoria, B.C. Land Manag. Handb. 61.risk *www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh61.htm*

Watershed level

Harvesting, especially at higher elevations, impacts the hydrology at the watershed level by advancing the timing and magnitude of spring stream flows, which results in more rapid streamflow response to rain storms.[6] The effect is that the energy of the stream increases, which may result in scouring of the stream channel, increasing the sediment carried by the stream and depositing it downstream. Therefore, it is important to use the best available information when determining if a watershed-level assessment is required.

Interfor did not prepare a watershed-level assessment when planning its development in the watershed and had no legal obligation to do so. However, the investigation considered whether a watershed assessment was warranted in this situation.

One source of information to help determine if a detailed watershed-level assessment is warranted is the *Watershed Assessment Procedure Guidebook*.[7] It states that the purpose of a watershed assessment is to provide watershed-level recommendations for forest development, based on an assessment of the potential for cumulative hydrological effects from past natural and man-made disturbances, and proposed forest harvesting and road building.

The guidebook recognizes that watershed assessments carried out in domestic watersheds are discretionary and should be based on the likelihood of hydrological problems occurring, as

[4] Professional reliance is the practice of accepting and relying upon the decisions and advice of resource professionals who accept responsibility, and can be held accountable for, the decisions they make and the advice they give. (*Applying Professional Reliance Under FRPA*, Professional Reliance Working Group, April 2008) http://www.abcfp.ca/publications_forms/publications/documents/report_PR_Workgroup.pdf

[5] Biophysical characteristics include slope, aspect, forest cover, climate, bedrock geology, surficial material, natural disturbance, channel gradient and channel alterations.

[6] Schnorbus, M. and Y. Alila. 2004. Forest harvesting impacts on the peak flow regime in the Columbia Mountains of southeastern British Columbia: An investigation using long-term numerical modeling. Water Resources Research 40(5):1–16.

[7] B.C. Ministry of Forests. 2001. Watershed assessment procedure guidebook. 2nd ed., Version 2.1. For. Prac. Br., Min. For., Victoria, B.C. Forest Practices Code of British Columbia Guidebook. https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/wap/WAPGdbk-Web.pdf

determined by the watershed sensitivity. For example, a watershed with a history of landslide, erosion or channel stability problems, and where at least 20 percent of the watershed area has been logged during the past 20 years, would be a good candidate. In the case of McClure Creek, there are two additional risk factors—domestic water use and private property.

Board investigators considered impacts to the watershed through office and field reviews. The office review included a calculation of the equivalent clearcut area (ECA)[8] for the watershed. Although ECA provides a relative indication of the potential hydrologic response to forest disturbance and regrowth, it should never be used as a stand-alone metric for watershed analysis, nor as a substitute for professional analysis and field assessment.[9]

The Board's ECA calculation showed that approximately 30 percent[10] of the watershed was harvested over the past 12 years and had not hydrologically recovered. Interfor calculated the ECA for the watershed at 29 percent.[11] Both of these ECAs are greater than the 20 percent identified in the *Watershed Assessment Procedure Guidebook*. Most of the harvesting occurred in the upper half of the watershed where most of the runoff at peak flow is generated. However, an ECA by itself does not confirm whether a watershed assessment is required. Additional fieldwork by a qualified professional is required to make that determination.

Equivalent clearcut area is the area harvested, cleared or burned, with consideration given to the silvicultural system, regeneration growth, and location within the watershed.

Hydrological recovery is the process by which regeneration restores the hydrology of an area to pre-logging conditions. In British Columbia, the most important component of the hydrological recovery involves snow accumulation and melt characteristics (snowmelt recovery) because peak flows in both interior and coastal areas tend to be generated by conditions of radiation snowmelt and rain-on-snow. Therefore, snowpack recovery is used as an index of true hydrological recovery.

B.C. Ministry of Forests. 2001. Watershed assessment procedure guidebook. 2nd ed.

The Board hired a qualified professional to conduct a preliminary review of the watershed condition to determine if other factors would warrant a detailed watershed-level assessment (Figure 3). The preliminary review found several legacy issues, including water management on non-status roads, historic selective logging access trails, an old skid trail downstream of HEF028 that runs adjacent to McClure Creek and crosses the creek in several locations, and both historic and recent landslides that deposited material directly into McClure Creek (Figures 4 and 5). These landslides are significant point sources of sediment, but are not active all of the time.

[8] An ECA shows the level of disturbance in a watershed and helps determine the potential for past harvesting related effects on runoff and streamflow.

[9] Winkler R. and S. Boon. 2017. *Equivalent clearcut area as an indicator of hydrologic change in snow-dominated watersheds of southern British Columbia.* Prov. B.C., Victoria, B.C. Exten. Note 118. www.for.gov.bc.ca/hfd/pubs/Docs/En/En118.htm

[10] The method used to calculate ECA was updated from the Watershed Assessment Procedure Guidebook to use more conservative estimates of hydrologic recovery.

[11] The licensee calculated the ECA at the request of the complainants after the cutting permit had been issued and harvesting had commenced.

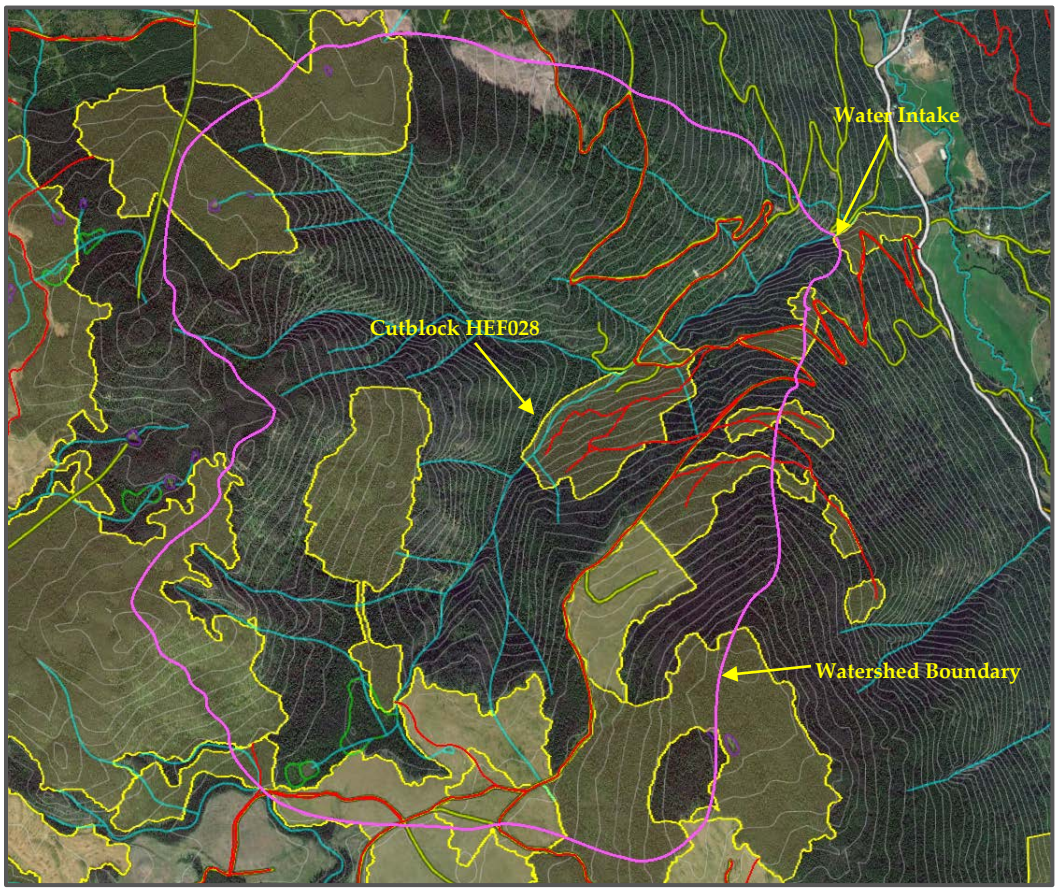

Figure 3. McClure Creek drainage and recent harvesting. All cutblocks outlined in yellow have been harvested, roads under permit to the licensee are in red.

Figures 4 & 5. Sediment source from a slide just above the water intake on McClure Creek. This slide was not related to Interfor's forestry activities.

Forest licensees are not responsible for non-status roads and trails, or natural events. However, licensees should take reasonable measures to identify and understand the cumulative impacts of factors on other resource users. In the Board's opinion, the factors outside the responsibility of Interfor, combined with the high ECA, justified a more detailed watershed-level assessment. However, there is no certainty that the sedimentation would not have occurred even if a watershed-level assessment has been completed.

Cutblock level

In 2011, Interfor began its development in the drainage. A former licensee had completed a terrain stability assessment (TSA)[12] and site plan for cutblock HEF028, but had not logged the block (Figure 6). Interfor used the TSA and the site plan prepared by the previous licensee. Interfor reviewed the TSA and, based on the review, adjusted the road locations and block boundary, revised the classification of two watercourses and increased a timber reserve adjacent to McClure Creek.

Interfor has prepared and implemented several deactivation plans since 2013. Deactivation usually involves removing culverts and stabilizing the road prism. In this case, the deactivation also included pulling back some of the road surface and fill slope and placing it in the ditch and cut slope, which exposed more soil and increased erosion potential. Interfor grass seeded the exposed soil following the deactivation and the grass is establishing itself, which will help to reduce erosion over time.

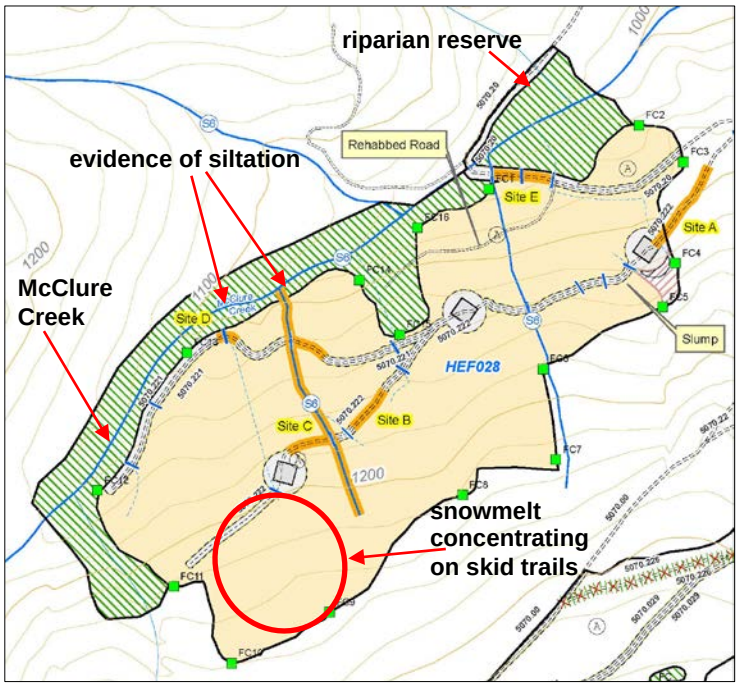

Figure 6. Site plan map for block HEF028 indicating potential sources of sediment

In May 2016, Interfor prepared a sediment control plan in response to the complainant's request. However, Interfor did not use a qualified professional with specialized knowledge of soils or hydrology when preparing the plan. In early June 2016, Interfor sent a crew into HEF028 to implement the plan, which included installing additional silt fences and constructing additional waterbars by hand.

When Board investigators visited the site, they saw evidence of fine sediment from HEF028 entering McClure Creek (Figure 7), but did not observe any significant sources, such as landslides, resulting from the cutblock. The investigators also looked at the implementation of the sediment-control plan and considered that it was poorly implemented and ineffective, primarily because no machinery had been used. (This was due to Interfor and the complainants' previous agreement to not bring machinery back on site.)

[12] A TSA evaluates the likely effect of timber harvesting or road construction on terrain stability, and may include recommendations for site-specific actions to reduce the likelihood of post-harvesting or road-related landslides.

After the investigation field work had been completed, Interfor engaged a hydrologist familiar with the McClure Creek drainage and a geotechnical engineer to review HEF028. The hydrologist developed a remediation plan to address the future risk of sediment entering McClure Creek from HEF028. Interfor reviewed the plan with the complainants and committed to implementing the plan.

The measures recommended in the remediation plan may introduce sediment into McClure Creek, so Interfor has also agreed to clean out the water intake for the next two years. In addition, Interfor said it has conducted water management training for its staff and road contractors.

Figure 7. Seasonal stream in HEF028 showing the fine particles washed out, some were transported to McClure Creek.

Findings

Interfor adequately planned its activities at the cutblock level. However, professionals with expertise in soils or hydrology should have been engaged during the preparation of the deactivation plans.

Interfor did not assess the potential risk of its activities at the watershed level, and in the Board's opinion, there were enough factors present to warrant a more detailed watershed-level assessment.

Conclusions

This investigation examined a complaint from two water users on McClure Creek about damage to their water intake due to increased sediment loading following harvesting and road construction by Interfor. To address the complainants' concerns the investigation considered the following questions:

1. Did Interfor meet its legal obligations under the *Forest and Range Practices Act* (FRPA)?
2. Were the risks to water quality adequately managed?

1. Did Interfor meet its legal obligations?

The Board concludes that Interfor complied with section 60 of the *Forest Planning and Practices Regulation* under FRPA.

The Board considers that the licensed waterworks may be considered damaged when sediment fills the dam and the usefulness and normal function of the waterworks is impaired. Interfor's activities at the cutblock and watershed level contributed to the sedimentation in McClure Creek. However, other sediment sources, including legacy disturbances attributed to previous harvesting and natural events, also contributed. In addition, the new intake dam may be a factor in the sediment buildup. The Board could not quantify the contribution from Interfor's activities nor from the other sources.

2. Were the risks to water quality adequately managed?

The Board recognizes that Interfor responded appropriately to the complainants' concerns. It has conducted field trips, worked with the complainants to identify the issue, and prepared and implemented plans in consultation with the complainants. During the course of this investigation, Interfor engaged a hydrologist and geotechnical engineer to review HEF028. The hydrologist developed a remediation plan and Interfor committed to implementing it, including cleaning out the water intake for the next two years. Interfor also said it has conducted water management training for its staff and road contractors.

There is a professional and public expectation that licensees will plan forestry activities to mitigate their impact on other resource users. This entails assessing the impact of forestry activities at the appropriate scale, and engaging qualified professionals to advise on appropriate forestry management actions.

Interfor did not assess the potential impact of its activities at the watershed level. In the Board's opinion, the high ECA combined with other factors suggest it would have been appropriate for Interfor to use a qualified professional to conduct a preliminary watershed assessment to determine if a more detailed assessment was required.

Interfor updated and then implemented the TSA for cutblock HEF028. Interfor, in consultation with the complainants, prepared and implemented several plans to address the potential impact of its activities on sediment entering McClure Creek. Interfor has also engaged qualified professionals to evaluate and recommend additional remediation work on HEF028, and has committed to following the recommendations in the report.

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