February 26, 2019

Reference: 5295.13

Ministry of Transportation and Infrastructure
#231-447 Columbia Street
Kamloops, BC, V2C 2T3

Attn: Donna Olsen, R.P.Bio., Environmental Services Coordinator

Re: Fish and Fish Habitat – Dunn Lake Road

Dear Mrs. Olsen

Estsék' Environmental Services LLP (Estsék') was retained by the Ministry of Transportation and Infrastructure (MOTI) to complete a fish and fish habitat assessment for watercourses along a portion of Dunn Lake Road that will incur future widening and improvements (the "Project"). This assessment is aimed to provide supplemental information on fish and fish habitat until the complete environmental overview assessment of the Project is completed in 2019.

The purpose of this letter report is to summarize our findings in relation to fish and fish habitat and provide recommendations to avoid and/or mitigate potential impacts, where appropriate. Site photos are provided.

Fish and Fish Habitat

A desktop review was completed using Habitat Wizard map data (CDC 2018) which identified six watercourses occurring in the Projects footprint. One un-named tributary was identified in the field, giving a total of seven water courses throughout the Project (Table 1). A query was made for available stream reports from Fresh Water Atlas (FWA) and Ecocat. Specific fish distribution information was not found.

Biophysical channel measurements were taken upstream and downstream of Dunn Lake Road for each culvert crossing where a channel was present. Summarized information is presented in Tables 2 and 3. Fish sampling was not completed due to low stream water temperatures (<5°C). Simpcw First Nation (SFN) Natural Resource Department (NRD) provided anecdotal information on fish presence for Skowootum, Newhykulston and Chu-Chua creek.

Table 1. Desktop analysis of watercourses within the Project

ID	*Watershed Code*	*UTM (10U)*	*Description*	*Source*
1	129-227200 (Skowootum Creek)	698623 5684044	3rd order stream located off Dunn Lake Road. Low gradient through reach one, High gradient (>30%) above reach two. Limited Fish habitat throughout reaches.	Habitat Wizard, FWA, Ecocat, and Integrated Wood Services
2	129-241800 (Newhykulston Creek)	698752 5689098	2nd order stream located off Dunn Lake Road, with connectivity to North Thompson. Suspected to support anadromous fish below Dunn Lake Road crossing and resident non-anadromous above the Dunn Lake Road crossing.	Habitat Wizard, FWA, Ecocat, and Summit Environmental
3	N/A – Un-named tributary	698767 5689214	Ephemeral NCD – IMap shows potential historic connectivity to Newhykulston creek before it was dyked	Imap, Habitat wizard, and Field review
4	129-251100 (Kikwilli Creek)	698600 5690158	2nd order stream located off Dunn Lake Road.	Habitat Wizard/FWA
5	N/A – Un-named tributary	698606 5690463	Non-classified drainage (NCD) identified after field visits. No connectivity to the North Thompson.	Habitat Wizard/FWA
6	N/A – Un-named tributary	698567 5690734	Small drainage identified after field visits. No Connectivity to North Thompson.	Habitat Wizard/FWA
7	129-254600 (Chu-Chua Creek)	698196 5692314	2nd order stream. Connectivity to North Thompson.	Habitat Wizard/FWA

Table 2. Summary of channel morphologies

Watercourse	*UTM (Zone 10 NAD 83)*	*Mean Channel Width (m)*	*Mean Wetted Width (m)*	*Dominant Substrate*	*Subdominant Substrate*	*Mean bankfull Channel Depth (m)*
Skowootum Creek – ID 1	698623 5684044	4.2	2.4	Cobble	Boulder	0.9
Newhykulston Creek – ID 2	698752 5689098	7.0	3.1	Cobble	Boulder	0.8
Watercourse-ID 3	698767 5689214	N/A	N/A	N/A	N/A	N/A
Kikwilli Creek - ID 4	698600 5690158	0.9	0.7	Gravel	Cobble	0.7
Watercourse-ID 5	698606 5690463	1.3	0.8	Gravel	Fines	0.3
Watercourse-ID 6	698567 5690734	N/A	0.2	Fines	Gravel	0.1
Chu-Chua Creek – ID 7	698196 5692314	23	6.4	Boulder	Cobble/ Gravel	1.9

Table 3. Fish Sampling results and fish habitat potential

ID	*Stream Classification*	*Fish Sampling Results*	*Fish Habitat Potential*			*Connectivity to Fish Bearing*
			Rearing	*Spawning*	*Migration*	
1	S3	Not sampled	Poor	Nil	Poor	Intermittent
2	S2	Not Sampled	Poor	Poor	Good	Intermittent
3	NCD	Not Sampled	Nil	Nil	Nil	Nil
4	NCD below ROW – S6 Above ROW	Not sampled	Poor	Poor	Poor	No – goes sub-surface
5	S6	Not sampled	Poor	Poor	Poor	No - goes sub surface
6	NCD	Not sampled	Poor	Poor	Poor	No – goes sub surface
7	S1	Not sampled	Poor	Poor	Good	Intermittent

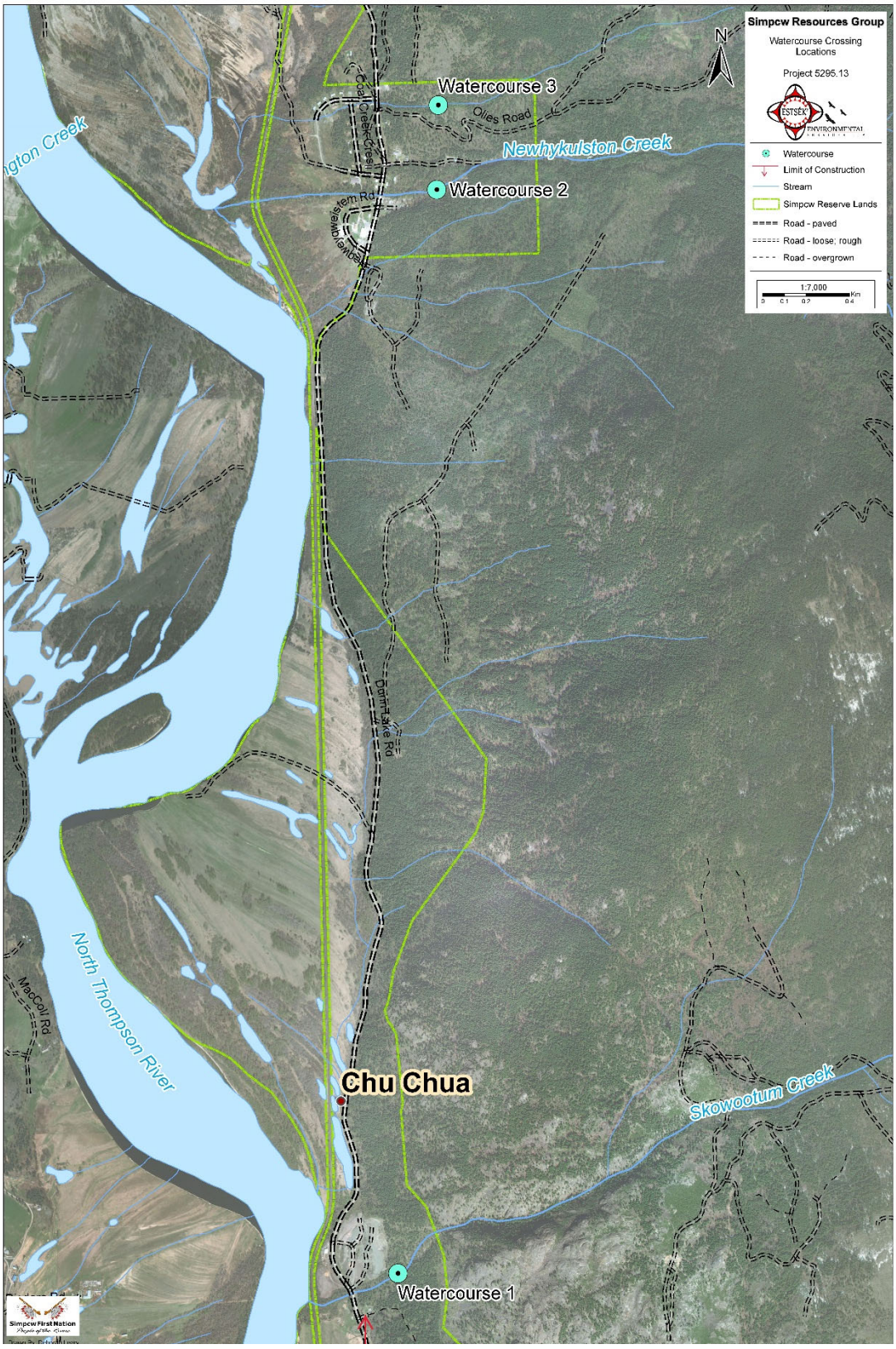

Figure 1. Watercourses intersecting Dunn Lake Road

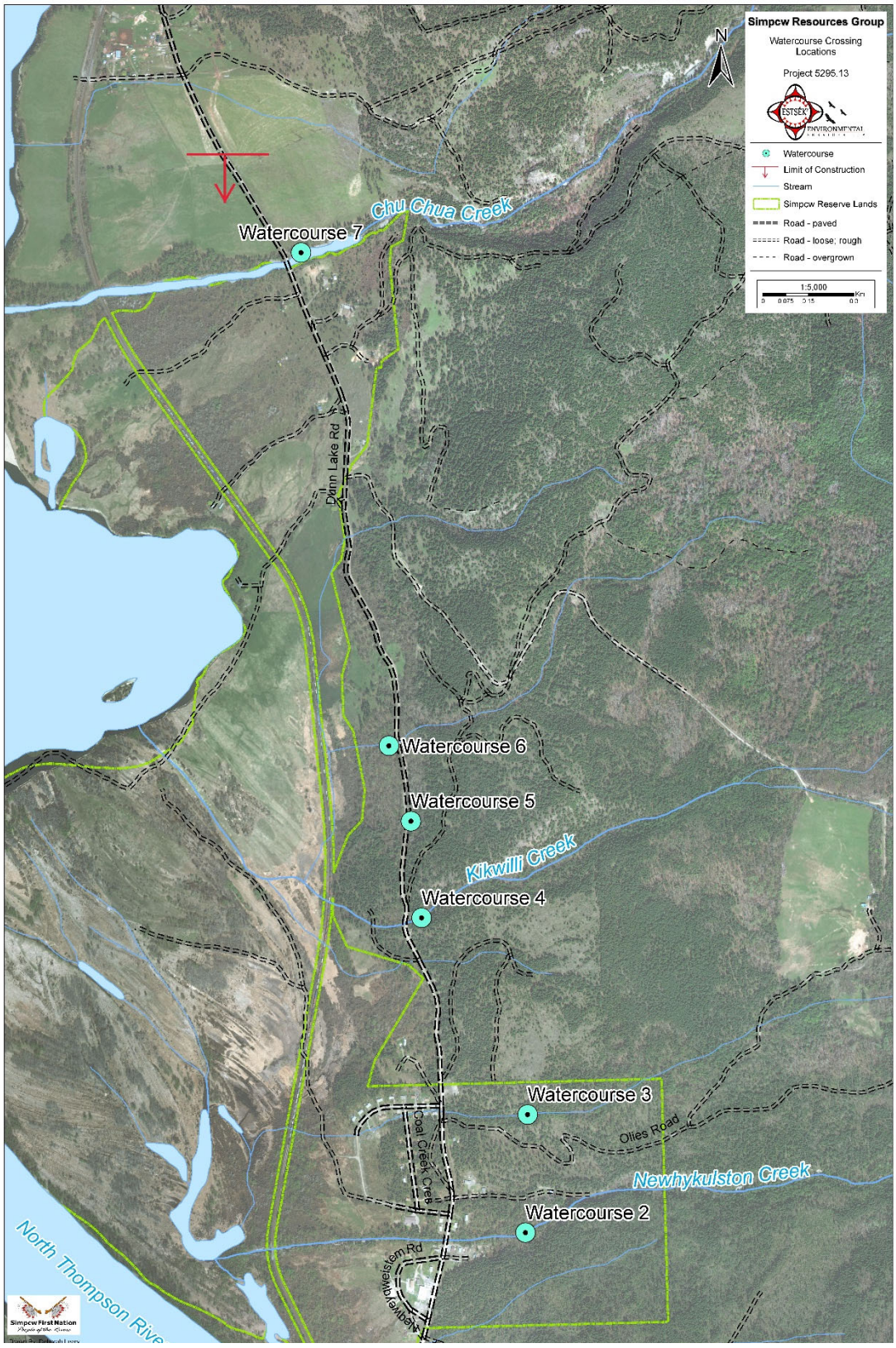

Figure 2. Watercourses intersecting Dunn Lake Road

Watercourse-ID 1 – Skowootum Creek

Watercourse-ID 1 was classified as a fish bearing S3 creek due to its connectivity to the North Thompson and lack of fish barriers. The creek has intermittent flows with signs of high velocity waterflow and bedload events. Mean channel and wetted widths were 4.2 m and 2.4 m during low to moderate flows mid November, with an average stream gradient of 17% above the Dunn Lake Road crossing. Below the Dunn Lake Road crossing the stream was un confined and fans out with an average gradient of 5%.

No Spawning habitat was present due to the lack of spawning substrate and the ephemeral nature of the watercourse. Rearing and migration values were rated as poor with no pools greater than 50 cm in depth, limited cover, and increasing stream gradient upstream of the Dunn Lake Road crossing. There is potential for fish presence during periods of flow due to the connectivity to the North Thompson river. Potential fish presence would be seasonal and opportunistic as rearing values were poor and no spawning habitat was present. Two 1200 mm corrugated steel pipes (CSP) are located at the road crossing.

Watercourse-ID 2 – Newhykulston Creek

Watercourse-ID 2 was classified as a fish bearing stream (S2) based on its connectivity to the North Thompson and lack of permanent fish barriers up until the current Dunn Lake Road crossing. Anecdotal information from Simpcw First Nation indicated the presence of Rainbow Trout upstream of the Dunn Lake Road crossing. At the crossing there is an 1800 mm CSP that has a vertical outlet drop of 1.2 m that prevents upstream migration of fish (Photo 3).

The average channel and wetted widths were 7.0 m and 3.1 m with an average gradient of 6%. Above the existing crossing spawning habitat was poor as there were limited pockets of suitable substrate. Rearing habitat was poor due to lake of deep pool development and significant instream cover. Cover consisted primarily of boulder riffles and some small woody debris (SWD). Dominant and sub-dominant bed materials were cobbles and boulders with small pockets of gravels. No overwintering habitat was observed throughout the assessment area. Suspected overwintering habitat upstream of the Project area likely supports resident Rainbow Trout.

Watercourse-ID 3

No stream was identified at the watercourse-ID 3 culvert location. This location is classified as a non-fish bearing non-classified drainage (NCD) which would have ephemeral flows from snow melt or major rain events. There was no evidence of continuous channel banks or scoured channel beds. Recent scour, alluvial deposits or evidence of recent fluvial processes were not observed upslope or downslope of the Dunn Lake Road crossing. This drainage may have experienced flow prior to the dyking and channel confinement of Newhykulston creek. The culvert was a 400 mm CSP.

Watercourse-ID 4 – Kikwilli Creek

Watercourse-ID 4 was classified as a non-fish bearing NCD below the Dunn Lake Road crossing and a non-fish bearing stream (S6) above the crossing. The creek is comprised of subsurface, overland and channelized water flow. Mean channel and wetted widths are 0.9 m and 0.7 m respectively, during low to moderate flows mid November. Below the Dunn Lake Road crossing the stream is an NCD that flows overland and subsurface with no verified channel (Photo 8). Above the Dunn Lake Road crossing, the stream forms a channel with dominant substrate of gravel (50%) and subdominant substrates of sand (40%) and small cobbles (10%). The mean bankfull channel depth throughout the assessed length was 0.7 m, respectively. Left and right banks have a sloped shape with no bank undercutting. A 600 mm non-corrugated steal pipe and corrugated steel pipe are combined as one culvert at the current crossing.

Watercourse-ID 5

This watercourse was described as a non-fish bearing stream (S6). The stream goes sub-surface approximately 100 m below the current crossing with no visible channel. Above the crossing the drainage flows into the ditch line and runs along the road for approximately 25 m before entering a 600 mm CSP. It appeared that this watercourse has intermittent/seasonal flows that are influenced by any water diverted to the ditch line.

Watercourse-ID 6

Field observations describe this watercourse as a non-fish bearing NCD. Intermittent ground seepage was observed above Dunn Lake Road, which fed into a 600 mm CSP drainage culvert. The culvert is suspected to convey seasonal run off from the east side of Dunn Lake Road. The outlet of the culvert acts as a barrier to fish migration upstream due to the outlet drop the culvert has. Below Dunn Lake Road water flows overland until it goes subsurface approximately 50 m down stream of the culvert outlet, acting as the primary barrier for fish migration.

Watercourse-ID 7 – Chu-Chua Creek

Watercourse-ID 7 was classified as a fish bearing stream (S1). Chu-Chua Creek is comprised of low gradient (4% to 8%) riffle habitat throughout its Assessed length. The mean channel and wetted widths are 23.0 m and 6.4 m respectively during low to moderate flows in mid November. Substrates are mainly boulders (60%), large cobbles (30%) and gravels (10%) (Photo 16). The mean bankfull channel depth throughout the assessed area was 1.9 m. Left and right banks are sloped with little to no bank undercutting. Riparian vegetation provides little to no cover along the margins of the

wetted area, with canopy cover being approximately 10%. There are few pieces of Large Woody Debris (LWD), leaving boulder riffles as the main sources of fish cover throughout the Assessed Area of the stream. A 25 m long concrete slab bridge currently crosses Chu-chua creek at the Dunn Lake Road ROW.

Recommendations

Fish and Fish Habitat

Fish and fish habitat concerns were limited to 3 locations, Watercourse 1,2 and 7, classified as S2, S2 and S1 streams. Within the Project footprint each of these watercourses offered poor fish habitat subject to seasonal low flow and potential dewatering or freezing during winter. Bedload was the limiting factor in Watercourse 1 and 7. Based on the field survey the following recommendations are provided below for the design phase of the Project:

1. The larger streams should be managed for fish passage, including Skowootum Creek, Newhykulston Creek and Chu Chua Creek.
2. All 3 contain active channels with bedload considerations.
3. The mean channel width of these streams is likely too large for the installation of single structure open bottom culverts that allow for long term maintenance free fish passage.
4. The remaining four streams within the Project area can be managed as non-fish bearing.
5. Construction should consider instream work window (July 22-September 30; Window of least risk for North Thompson.
6. An environmental monitor - QEP should be available throughout the construction phases of the project to facilitate implementation of a Construction Environmental Management Plan and develop or oversee site specific mitigation strategies addressing potential impacts to environmental aspects, as needed.

Should you require more information or additional services, please contact me at jcurtis@simpcwresourcesgroup.com

Yours truly,

Jay Curtis
Resource Technician
Estsék' Environmental Services LLP

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Site Photos

Photo 1. Skowootum creek 2 x 1200mm CSP

Photo 2. Skowootum creek - water flow above Dunn Lake Road ROW

Photo 3. Skowootum creek – 1000mm culvert inlet at CN ROW

Photo 4. Skowootum creek – 1000mm culvert outlet at CN ROW

Photo 5. Skowootum and North Thompson confluence

Photo 6. Skowootum and North Thompson confluence

Photo 7. Newhykulston creek - 1800mm CSP creating fish barrier to upstream fish migration

Photo 8. Newhykulston creek - dyked banks above Dunn Lake Road ROW

Photo 9. Kikwilli creek - 600mm NCSP at inlet

Photo 10. Kikwilli creek - small channel (S6) above ROW

Photo 11. Kikwilli creek - 600mm CSP at outlet

Photo 12. Kikwilli creek – Below Dunn Lake Road (NCD) roughly where creek seeps into ground and goes sub-surface

Photo 13. Watercourse-ID 5 - water flow above Dunn Lake Road ROW

Photo 14. Watercourse-ID 5 - point where stream goes sub-surface

Photo 15. Watercourse-ID 6 - Intermittent NCD above Dunn Lake Road ROW

Photo 11. Watercourse-ID 6 - NCD goes subsurface below Dunn Lake Road ROW

Photo 17. Chu-Chua creek - Dunn Lake Road bridge crossing

Photo 18. Chu-Chua creek - Upstream of ROW, dyked banks of creek

Photo 19. Downstream of ROW - creek fans out, dyked banks of creek

Photo 20. Chu-Chua creek - stream substrate

Photo 21. Watercourse-ID 4 – no sign of alluvial processes

Photo 22. Watercourse-ID 4 - no sign of alluvial processes

Photo 23. Watercourse-ID 4 - 500mm CSP at inlet, no sign of recent flows