Tree Farm Licence 38 – Squamish River

Fish Passage Survey Summary

FIA Project No. 6813-001-3

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Prepared for:

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Hedberg and Associates Consulting Ltd. (HAC) have conducted field assessment for fish passage determination for existing culverts on the Squamish River Forest Service Road (FSR) in Tree Farm Licence 38 (TFL 38).

This work was done under Forest Investment Account (FIA), Project Number 6813-001-3, and covered the mainline road adjacent to the Squamish River, from the southern boundary of TFL 38 to the northern end of the Squamish River FSR near the Squamish River and Elaho river confluence.

Culverts were inspected based on extensive local and historical knowledge and followed the methodology detailed in the BC Ministry of Environment Field assessment for *Fish Passage Determination of Closed Bottomed Structures*. Information for each culvert inspected was noted on *Closed Bottom Structure (CBS) Field Measurement Form*. These field forms are included as Appendix A to this report. All existing culverts were inspected visually, however only those that had existing or potential fish habitat upstream of the culvert were documented. Due to the steep valley sidewalls along much of the FSR, the "typical" cross stream culvert often only has a small catch basin on the upslope, east, side of the road, and therefore these were not considered likely candidates for fish passage improvement.

Survey Results

Seven metal culverts were assessed and documented, and are summarized in the following table. For additional detail see the field forms included in Appendix A.

Culvert ID	Location	Habitat Value	Passable to Fish	Remove ?	Comments	Est. Cost
SM-1	21.5 Mi.	Low	No	No	N/A	N/A
SM-2	21.9 Mi.	High	Yes	No	Monitor	N/A
SM-3	22.0 Mi.	High	At HW only	Yes	N/A	$12000
SM-4	22.6 Mi.	High	No	Yes	Enhance US	$12000
SM-5	23.8 Mi.	Mod	At HW only	Yes	Perched	See text
SM-6	26.9 Mi.	High	No	Yes	N/A	$12000
SM-7	35.1 Mi.	Mod	No	No	N/A	N/A

Three culverts were identified as candidates for removal and replacement with an appropriate structure to allow fish passage. Note that these recommendations are in the context of the portion of the drainage reviewed, not the watershed as a whole, the district, or the province.

Costs noted in the table are approximate and would require a final design to confirm. As the three culverts identified for replacement are all small channels, a similar structure could be

utilized for all, and a “generic” design would possibly be appropriate. This would likely be an embedded culvert installation, or an open bottomed arch, of approximately 1.5 meter width (span), and with an average length of 15 meters. With an allowance for design, approval from both Ministry of Environment and Department of Fisheries and Oceans for instream work, material for bedding and fill, excavator and gravel truck, and the pipe, a cost of $12,000 per installation has been used.

A brief description and upgrade prescription for the three culverts identified as candidates for replacement follows;

SM-3

This is an existing 600mm metal pipe that drains several small side hill streams that flow into the roadside ditch, both north and south of the culvert inlet. The culvert is undersized and installed at a slope of 5%, as well as having an outlet drop of 20 cm at mean water level. During high water fall rainfall events the culvert backwaters enough that adult Coho Salmon are able to negotiate the culvert to access the high value spawning and rearing habitat in the ditch/stream. If these conditions do not exist during the period that eligible Coho are waiting at the culvert outlet they obviously are not able to access the upstream habitat.

This would be a straightforward installation, although due to the proximity of the side hill adjacent to the inlet, space for an adequate catch basin would be limited.

SM-4

This is a very old existing 900mm metal pipe that drains a pond complex on the upslope side of the mainline. Some of this area was constructed as enhanced off channel habitat by the previous forest licensee. The culvert is backwatered by the adjacent reach of High Falls Creek and appears to be completely obstructed. As a result the pond is becoming choked with organic debris and is “shrinking”, as well as being inaccessible to fish. Should this structure be replaced it would logically be in conjunction with the clearing out and revitalization of the pond habitat.

The installation of a replacement structure would be relatively simple; however a maintenance plan would be required to prevent the structure from again becoming obstructed. As the existing road surface is only slightly higher than High Falls Creek and raising the roadbed and the culvert would be a major and expensive proposition, any new installation would have to be designed such that it could easily have flotsam and organic debris removed from the structure.

SM-6

This is another historic existing 600mm metal pipe that drains a side hill stream complex. This culvert also appears to be completely obstructed, likely by annual sediment deposition from the Squamish River, isolating access to the stream habitat on the east side of the main line.

This installation would be straightforward, however due to the immediate proximity to the Squamish River; periodic maintenance would be required to prevent obstruction from flotsam and sediment.

Although SM-5 also is indicated for removal and replacement it was not included based on habitat value and chronic maintenance issues, again related to immediate proximity to the Squamish River. This culvert was installed relatively recently, specifically to allow water from the Squamish to “supply” the large pond located on the east side of the road. The installation, however, was done without a survey of typical river level, and the culvert is too high, such that it only functions at very high water levels. If this pond had a stream feeding it, the current installation would be appropriate, as the level on the east would keep it filled to culvert level, depending on time of year. Unlike in the case of SM-6, for example, there appears to be little obvious source of water to continuously feed the SM-5 habitat. If the culvert was installed at an elevation that would permit river water to infill continuously, obstruction from sedimentation would be an ongoing issue, and the habitat would be filled with cold, turbid, water much of the year.

Conclusion

Hedberg and Associates Consulting Ltd. prepared this report for CRB Logging Co. Ltd. The material in it reflects the professional judgment of Hedberg and Associates in light of the information available to Hedberg and Associates at the time of report preparation. Any use, which a Third Party makes of this report, or any reliance on decisions based on it, is the responsibility of such Third Parties. Hedberg and Associates accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

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Yours sincerely,
Hedberg and Associates Consulting Ltd.

Dave Guilbride, RFT
Project Manager

Appendix A - *Closed Bottom Structure (CBS) Field Measurement Forms*

Closed Bottom Structure (CBS) Field Measurement Form

Location and Overview Information			Field Measurements		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	1.5
2.	Crossing ID No.	SM-1	14.	Outlet resid. Pool depth (cm)	NA - DROPS DIRECTLY INTO RIVER
3.	Crew Name	D. GILBRIDE	15.	D/S Slope (%)	NA - SLOPE ABOVE
4.	UTM/GPS (include grid number) eg. 10u	Grid 0478995 5529888	16.	Habitat Value	(Low) Mod. High.
5.	Stream Name?	TRIB TO SQUAMISH R	17.	Depth of Fill (m)	0.3
6.	Road Name and km	SQUAMISH FSR 21.5 Mi.	18.	Valley Fill	(DF) SF BR
7.	MoF District?	SQUAMISH	19	Beaver Activity	NO
8.	Crossing Type	RC PA EC EA other RC	20.	Inlet drop (cm)	NONE 0 cm
9.	Embedded? (circle)	Yes (No) (30 cm or 20%) 0 25 50 75 100 Yes No (resem. channel)	21.	Backwatered?	(0) 25 50 75 100
10.	Culvert Dimensions (nearest 100mm)x(m)	800 x 11 m (prim.) — — — (sec)	22.	Fish Sighted?	NO - AT OUTLET IN FALL.
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	6%	23.	Culvert Fix	RM OBS SS EM BW NONE
12.	Outlet Drop (cm)	50	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s - NA

25. Comments

SEASONAL STREAM. MINIMAL U/S HABITAT

Closed Bottom Structure (CBS) Field Measurement Form

Location and Overview Information			Field Measurements		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	5m + POND.
2.	Crossing ID No.	SM-2	14.	Outlet resid. Pool depth (cm)	40
3.	Crew Name	D. GUILBAUDE	15.	D/S Slope (%)	0%
4.	UTM/GPS (include grid number) eg. 10u	Grid 047923 5539739	16.	Habitat Value	Low Mod. (High.)
5.	Stream Name?	BR. 100 CREEK	17.	Depth of Fill (m)	0.40
6.	Road Name and km	SQ FSR 21.9 KM	18.	Valley Fill	(DF) SF BR
7.	MoF District?	SQUAMISH	19	Beaver Activity	YES
8.	Crossing Type	(RC) PA EC EA other ____	20.	Inlet drop (cm)	NA
9.	Embedded? (circle)	(Yes) No (30 cm or 20%) 0 (25) 50 75 100 (Yes) No (resem. channel)	21.	Backwatered?	0 25 50 (75) 100
10.	Culvert Dimensions (nearest 100mm)x(m)	900 x 12 (prim.) — ___ ___ (sec)	22.	Fish Sighted?	NOT TODAY OFTEN PREVIOUS
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	2.1%	23.	Culvert Fix	RM OBS SS EM BW OK ±13 PASSABLE
12.	Outlet Drop (cm)	NA.	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s - NA

25. Comments

EMBEDDED CULVERT INTO ENHANCED HABITAT @ BR. 100
ALL NOTES APPLY TO CULVERT > 50% PLUGGED
OUTLET U/S HABITAT < 30m THEN STEEP GRADIENT.

Closed Bottom Structure (CBS) Field Measurement Form					
Location and Overview Information			**Field Measurements**		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	2.5
2.	Crossing ID No.	SM-3	14.	Outlet resid. Pool depth (cm)	30
3.	Crew Name	D. GUILBRIDE	15.	D/S Slope (%)	5%
4.	UTM/GPS (include grid number) eg. 10u	Grid 09 479276 5530953	16.	Habitat Value	Low Mod. (High)
5.	Stream Name?	COHO DITCH	17.	Depth of Fill (m)	0.60
6.	Road Name and km	SQ FSR 22 MI.	18.	Valley Fill	(DF) SF BR
7.	MoF District?	SQUAMISH	19	Beaver Activity	NO
8.	Crossing Type	RC PA EC EA other RC	20.	Inlet drop (cm)	NA
9.	Embedded? (circle)	Yes (No) (30 cm or 20%) 0 25 50 75 100 Yes No (resem. channel)	21.	Backwatered?	(0) 25 50 75 100 NO
10.	Culvert Dimensions (nearest 100mm)x(m)	600 x 13 (prim.) NA (sec) CRUSHED / OBSTRUCTED.	22.	Fish Sighted?	NOT TODAY MANY HISTORICALLY
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	5%	23.	Culvert Fix	(RM) OBS SS EM BW
12.	Outlet Drop (cm)	20	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s - NA.
25. Comments PASSABLE ONLY @ FLOOD EVENT LEVELS - MANY ADULT COHO SPAWN U/S IN DITCH" WHEN LEVEL ALLOW.					

Closed Bottom Structure (CBS) Field Measurement Form

Location and Overview Information			Field Measurements		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	DIRECTLY INTO HIGH FALLS CR.
2.	Crossing ID No.	SM-4	14.	Outlet resid. Pool depth (cm)	" "
3.	Crew Name	D. GUILDFORD	15.	D/S Slope (%)	" "
4.	UTM/GPS (include grid number) eg. 10u	Grid 047 887 5531611	16.	Habitat Value	Low Mod. (High.)
5.	Stream Name?	TRIB TO HIGH FALLS	17.	Depth of Fill (m)	.20
6.	Road Name and km	SQ FSR 22.6 MI.	18.	Valley Fill	(DF) SF BR
7.	MoF District?	SQUAMISH	19	Beaver Activity	NO
8.	Crossing Type	(RC) PA EC EA other _____	20.	Inlet drop (cm)	NA
9.	Embedded? (circle)	Yes (No) (30 cm or 20%) 0 25 50 75 100 Yes No (resem. channel)	21.	Backwatered?	0 25 50 75 (100) OBSTRUCTED
10.	Culvert Dimensions (nearest 100mm)x(m)	900 x 9 (prim.) — (sec)	22.	Fish Sighted?	NOT TODAY. HISTORICALLY YES.
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	UNABLE TO DETERMINE DUE TO WATER DEPTH	23.	Culvert Fix	(RM) OBS SS EM BW
12.	Outlet Drop (cm)	NONE. BACKWATERED & OBSTRUCTED	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s - NA

25. Comments
THIS ONE USED TO PASS FISH & ACCESSED CONSTRUCTED HABITAT. SINCE OBSTRUCTED.

Closed Bottom Structure (CBS) Field Measurement Form					
Location and Overview Information			**Field Measurements**		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	DIRECTLY INTO SQUAMISH R
2.	Crossing ID No.	SM-5	14.	Outlet resid. Pool depth (cm)	" "
3.	Crew Name	D. GILBRIDE	15.	D/S Slope (%)	" "
4.	UTM/GPS (include grid number) eg. 10u	Grid 0478334 5533235	16.	Habitat Value	Low (Mod.) High.
5.	Stream Name?	NO STREAM	17.	Depth of Fill (m)	0.30
6.	Road Name and km	SQ FSR 23.8 Km	18.	Valley Fill	(DF) SF BR
7.	MoF District?	SQUAMISH	19	Beaver Activity	NO
8.	Crossing Type	(RC) PA EC EA other ____	20.	Inlet drop (cm)	PERCHED ↕50cm
9.	Embedded? (circle)	Yes (No) (30 cm or 20%) 0 25 50 75 100 Yes No (resem. channel)	21.	Backwatered?	0 25 50 75 100 NA.
10.	Culvert Dimensions (nearest 100mm)x(m)	800 x 14 (prim.) ___ — ___ (sec)	22.	Fish Sighted?	NO.
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	2%	23.	Culvert Fix	(RM) OBS SS EM BW
12.	Outlet Drop (cm)	50	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s - NA.
25. Comments INSTALLED TO ALLOW SQUAMISH RIVER TO "BACKFILL" WETLAND. REQUIRES OBS TO FUNCTION.					

Closed Bottom Structure (CBS) Field Measurement Form

Location and Overview Information			Field Measurements		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	DIRECTLY INTO SQ. R.
2.	Crossing ID No.	SM-6	14.	Outlet resid. Pool depth (cm)	" "
3.	Crew Name	D. GUILBRIDE	15.	D/S Slope (%)	" "
4.	UTM/GPS (include grid number) eg. 10u	Grid 047678 5537174	16.	Habitat Value	Low Mod. (High)
5.	Stream Name?	TRIB TO SQ. R.	17.	Depth of Fill (m)	0.25
6.	Road Name and km	SQ FSR 26.9 ML	18.	Valley Fill	(DF) SF BR
7.	MoF District?	SQUAMISH	19	Beaver Activity	No
8.	Crossing Type	(RC) PA EC EA other _____	20.	Inlet drop (cm)	BACKWATERED.
9.	Embedded? (circle)	Yes (No) (30 cm or 20%) 0 25 50 75 100 Yes No (resem. channel)	21.	Backwatered?	? 0 25 50 75 100 OBSTRUCTED.
10.	Culvert Dimensions (nearest 100mm)x(m)	600 x 15 (prim.) ___ — ___ (sec)	22.	Fish Sighted?	IN THE PAST ± 200 m UPSTREAM
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	UNABLE TO DETERMINE DUE TO OBSTRUCTION	23.	Culvert Fix	(RM) OBS SS EM BW
12.	Outlet Drop (cm)	BACKWATERED BY SQ. R.	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s - NA

25. Comments VERY OLD CMP THAT IS OBSTRUCTED. HIGH VALUE OFF-CHANNEL HABITAT UPSTREAM. OBS REQ'D.

Closed Bottom Structure (CBS) Field Measurement Form

Location and Overview Information			Field Measurements		
1.	Date	20/08/2008	13.	Downstream Width (nearest 0.1m)	1.3
2.	Crossing ID No.	SM-7	14.	Outlet resid. Pool depth (cm)	NA
3.	Crew Name	D. GILLBRIDE	15.	D/S Slope (%)	35% FOR 15m
4.	UTM/GPS (include grid number) eg. 10u	Grid 047007 5549099	16.	Habitat Value	Low (Mod.) High.
5.	Stream Name?	SLINKY CREEK.	17.	Depth of Fill (m)	40
6.	Road Name and km	SG FSR 35.1KM	18.	Valley Fill	(DF) SF BR
7.	MoF District?		19	Beaver Activity	NO
8.	Crossing Type	(RC) PA EC EA other ____	20.	Inlet drop (cm)	NA.
9.	Embedded? (circle)	(Yes) No (30 cm or 20%) 0 25 50 (75) 100 (Yes) No (resem. channel)	21.	Backwatered?	0 25 50 75 100 NA.
10.	Culvert Dimensions (nearest 100mm)x(m)	600 x 9 (prim.) ___ ___ ___ (sec)	22.	Fish Sighted?	NO. KNOWN TO BE RESIDENTS UPSTREAM.
11.	Culvert Slope (%) (less than 4% use level) (nearest 0.1%) (otherwise clino)	UNABLE TO DETERMINE DUE TO OBSTRUCTION	23.	Culvert Fix	RM OBS SS EM BW OK
12.	Outlet Drop (cm)	NA.	24.	Photo (Circle) Documentation	Outlet Barrel D/S #'s -

25. Comments
LEAVE AS IF. DUE TO "BARRIER" IMMEDIATELY DOWNSTREAM.