

# Elk River Watershed Group Fish Passage Restoration Planning

true

2020-12-16



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# **Executive Summary**



# **Chapter 1**

## **Introduction**

Nupqua Limited Partnership and New Graph Environment were retained by the Canadian Wildlife Federation in the fall of 2020 to conduct fish passage assessments of stream crossings within the Elk River watershed upstream of the Elko Dam near Elko, BC. The work was carried out in accordance with the BC Ministry of Environment: Field Assessment for Determining Fish Passage at Closed Bottom Structures, 4th Edition (BC Ministry of Environment, 2011) and Fish Passage Strategic Approach: Protocol for Prioritizing Sites for Fish Passage Remediation: 4th Edition (Fish Passage Technical Working Group, 2014).

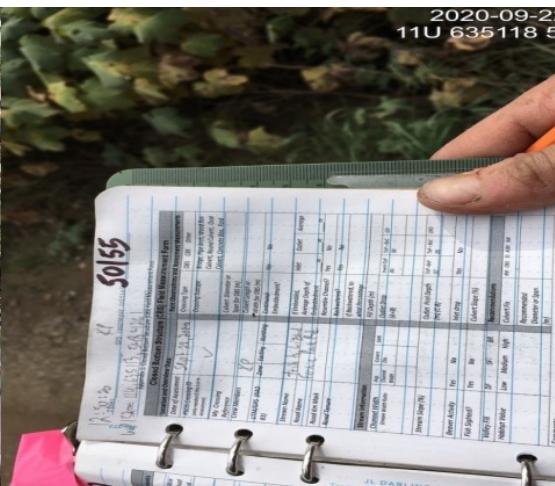
The health and viability of freshwater fish populations can depend on access to tributary and off channel areas which provide refuge during high flows, opportunities for foraging, overwintering habitat, spawning habitat and summer rearing habitat (Bramblett et al., 2002; Swales and Levings, 1989). Culverts can present barriers to fish migration due to increased water velocity, turbulence, a vertical drop at the culvert outlet and/or maintenance issues (Slaney et al., 1997). Reconnection of fragmented habitats is a management action that can generate some of the highest ecological returns on economic investments relative to other habitat restoration techniques (Saldi-Caromile et al., 2004).





## Chapter 2

# Background



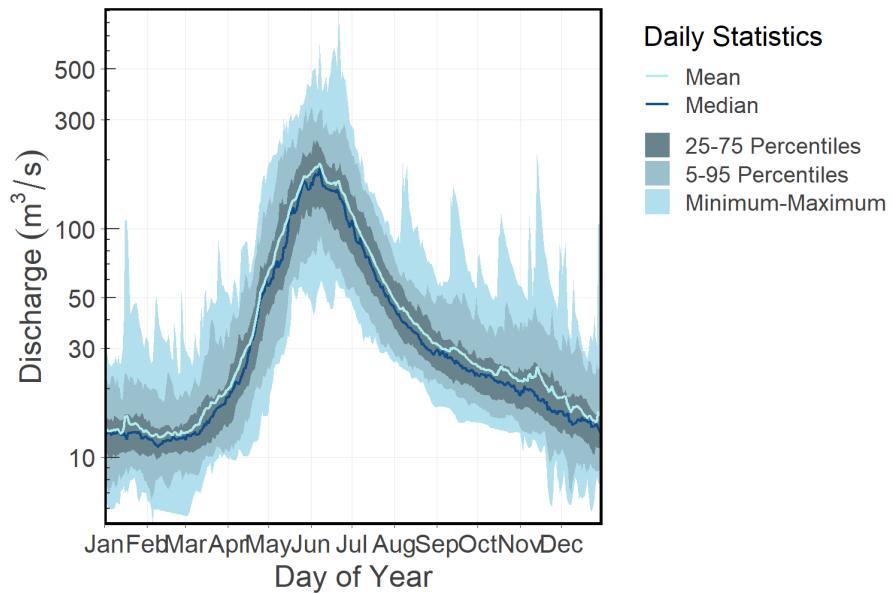
As a result of high-level direction from the provincial government, a Fish Passage Strategic Approach protocol has been developed for British Columbia to ensure that the greatest opportunities for restoration of fish passage are pursued. A Fish Passage Technical Working Group has been formed to coordinate the protocol and data is continuously amalgamated within the Provincial Stream Crossing Inventory System (PSCIS). The strategic approach protocol involves a four-phase process as described in Fish Passage Technical Working Group (2014) :

- Phase 1: Fish Passage Assessment – Fish stream crossings within watersheds with high fish values are assessed to determine barrier status of structures and document a general assessment of adjacent habitat quality and quantity.
- Phase 2: Habitat Confirmation – Assessments of crossings prioritized for follow up in Phase 1 studies are conducted to confirm quality and quantity of habitat upstream and down as well as to scope for other potential nearby barriers that could affect the practicality of remediation.
- Phase 3: Design – Site plans and designs are drawn for priority crossings where high value fish habitat has been confirmed.
- Phase 4: Remediation – Reconnection of isolated habitats through replacement, rehabilitation or removal of prioritized crossing structure barriers.

The scope of 2020/2021 project activities reported on in this document includes planning for and implementation of the first phase of fish passage assessment in the Elk River watershed upstream of the Elko Dam.

## 2.1 Project Location

The project was focused within the upper Elk River watershed upstream of the Elko Dam located at Elko, BC.



## 2.2 Fisheries

# **Chapter 3**

## **Methods**

### **3.1 Planning**

We produced detailed maps of the project area identifying all locations where 1:20,000 scale TRIM map streams where intersected with roads. To determine target field sites we reviewed background habitat confirmation reports from (Masse Environmental Consultants Ltd., 2015)

which crossings on fish habitat with significant quantities of fish habitat upstream had not yet been assessed, we used the Fish Habitat Model to estimate the quantity and quality of fish habitat potentially upstream of crossings. Using the criteria below we screen previously cross reference modelled crossing locations with sites already within the Provincial Stream Crossing Summary System. Target crossings were identified as previously unassessed crossings on streams with likely significant quantities of fish habitat upstream.

### **3.2 Fish Passage Assessments**

In the field, crossings surveyed included closed bottom structures (CBS), open bottom structures (OBS) and crossings considered “other” (fords, weirs, etc.). Six digit numerical crossing identifiers were generated for each crossings modeled. Crossings identified in the field that had no corresponding GIS generated ID were given unique identifiers beginning with the date in YYYYMMDD format appended with an identifier between 1 and 10 (ex. 2020091601). Photos were taken at surveyed crossings and when possible included images of the road, crossing inlet, crossing outlet, crossing barrel, channel downstream and channel upstream of the crossing and any relevant features. Additionally, the following information was recorded for all surveyed crossings: date of inspection, crossing

Table 3.1: Habitat value criteria (Fish Passage Technical Working Group, 2011).

Habitat Value	Fish Habitat Criteria
High	The presence of high value spawning or rearing habitat (e.g., locations with abundance of suitably sized gravels, deep pools, undercut banks, or stable debris) which are critical to the fish population.
Medium	Important migration corridor. Presence of suitable spawning habitat. Habitat with moderate rearing potential for the fish species present.
Low	No suitable spawning habitat, and habitat with low rearing potential (e.g., locations without deep pools, undercut banks, or stable debris, and with little or no suitably sized spawning gravels for the fish species present).

reference, crew member initials, Universal Transverse Mercator (UTM) coordinates, stream name, road name and kilometer, road tenure information, crossing type, crossing subtype, culvert diameter or span for OBS, culvert length or width for OBS. A more detailed “full assessment” was completed for all closed bottom structures.

Full assessments also included the following parameters: presence/absence of continuous culvert embedment (yes/no), average depth of embedment, whether or not the culvert bed resembled the native stream bed, presence of and percentage backwatering, fill depth, outlet drop, outlet pool depth, inlet drop, culvert slope, average downstream channel width, stream slope, presence/absence of beaver activity, presence/absence of fish at time of survey, type of valley fill, and a habitat value rating. Habitat value ratings were based on channel morphology, flow characteristics (perennial, intermittent, ephemeral), fish migration patterns, the presence/absence of deep pools, un-embedded boulders, substrate, woody debris, undercut banks, aquatic vegetation and overhanging riparian vegetation (Table 3.1). For crossings determined to be potential barriers or barriers based on the data (see section 2.3.2), a culvert fix and recommended diameter/span was proposed.

All field data collected including photos were uploaded to the Provincial Stream Crossing Inventory System (PSCIS).

### 3.3 Barrier Scoring

Fish passage potential was determined for each stream crossing identified as a closed bottom structure on fish bearing and potentially fish bearing stream reaches. The combined scores from five criteria: depth and degree to which the structure is embedded, outlet drop, stream width ratio, culvert slope, and culvert length were used to screen whether each culvert was a likely barrier

Table 3.2: Fish Barrier Scoring (Fish Passage Technical Working Group 2011).

Risk	Embedded	Value	Outlet Drop (cm)	Value	SWR	Value	Slope (%)	Value	Length (m)	Value
LOW	>30cm or >20% of diameter and continuous	0	<15	0	<1.0	0	<1	0	<15	0
MOD	<30cm or 20% of diameter but continuous	5	15-30	5	1.0-1.3	3	1-3	5	15-30	3
HIGH	No embedment or discontinuous	10	>30	10	>1.3	6	>3	10	>30	6

Table 3.3: Fish Barrier Scoring Results (Fish Passage Technical Working Group 2011).

Cumulative Score	Result
0-14	passable
15-19	potential barrier
>20	barrier

to some fish species and life stages (Table 3.2, Table 3.3. These criteria were developed based on data obtained from various studies and reflect an estimation for the passage of a juvenile salmon or small resident rainbow trout (Clarkin et al., 2005, ; Bell, 1991; Thompson, 2013).

### 3.4 Cost Benefit Analysis

A cost benefit analysis was conducted for each crossing considered a barrier based on the amount of potential habitat to be made available by remediating fish passage at the site and an estimate of associated costs.

### 3.5 Habitat Gain Index

The habitat gain index is the quantity of modelled habitat upstream of the subject crossing and represents an estimate of habitat gained with remediation of fish passage at the crossing. For this project we set the threshold between fish and non-fish habitat at a gradient of 20% representing the gradient limit accessible to downstream populations. A “net” value for the index used meaning that if there is a documented PSCIS barrier crossing upstream of the subject crossing or a modelled unassessed crossing the amount of habitat is totaled to that point.

Potential options to remediate fish passage included: removal of the structure, backwatering

Cost estimates for structure replacement were generated based on the channel width, slope of the culvert, depth of fill and the road type. Base costs for installation of bridges and embedded culverts were estimated based on interviews with Phil MacDonald, Engineering Specialist FLNR - Kootenay and Steve Page,

Area Engineer - FLNR - Northern Engineering Group. Costs for installation of bridges on forest service roads was estimated at \$12.5K/m and assumes that the road can be closed during construction. For streams with channel widths <2m embedded culverts can be effective with installation costs estimated at \$25k

# **Chapter 4**

# **Results**

## **4.1 Phase 1**

A total of XXX assessments were conducted between xxx and xxxxxxxxxxxx. Site details and photos are presented in

The analysis phase is summarized in Table ?? [test][test]

## **4.2 Phase 2**

Raw results are included in digital format as Attachment 2 and summarized in Tables 4.2 - 4.5

Table 4.1: Modelled upstream habitat estimate and cost benefit for Phase 1 assessments.

PSCIS ID	Stream Road	Priority	Fix	Cost Est	Habitat Up-stream	Cost Ben-fit	Cost Ben-fit
		Width (m)		(\\$K)	(m)	(m / \\$K)	(m <sup>2</sup> / \\$K)
197520	Tributary Elk to River Elk FSR River	2.50	low	OBS	125	2233	17.9 / 22.3
197521	Tributary Elk to River Elk FSR River	2.00	low	OBS	125	762	6.1 / 6.1
197522	Tributary Elk to River Elk FSR River	1.00	low	SS-CBS	50	NA	NA / NA
197523	Tributary Elk to River Lowe FSR Creek	1.10	low	SS-CBS	25	1348	53.9 / 29.7
197524	Tributary Spur to from Elk Elk River River FSR	1.00	low	SS-CBS	25	0	0.0 / 0.0
197525	Tributary Spur to from Elk Elk River River FSR	1.00	low	RM	NA	940	NA / NA
197526	Tributary Elk to River Elk FSR River	3.10	low	OBS	125	2865	22.9 / 35.5
197527	Crossing Creek River FSR	2.50	low	OBS	125	1481	11.8 / 14.8
197528	Tributary Lower to Elk Whit-ing Val-ley Creek Road	0.50	low	SS-CBS	500	273	0.5 / 0.1
197529	Littlem Creek Lower Elk Val-ley Road	1.00	low	SS-CBS	500	145	0.3 / 0.1
197531	Dalzell Driveway Creek	2.50	low	OBS	2500	264	0.1 / 0.1
197532	Dalzell Driveway Creek	2.20	low	SS-CBS	500	1294	2.6 / 1.6

Table 4.2: Overview of habitat confirmation sites.

Site	Stream	Road	Tenure	UTM	Fish	Habitat	Habitat	Priority	Comments
				(11U)	Species	Gain	Value		
								(km)	
50155	Tributary	Island	MoTi	635113	EB, 548426	1.8	Medium	moder	NA
	to	Lake	recre-		WCT				
	Lizard	Lodge	ation						
	Creek	Road							
50159	Tributary	Island	MoTi	633320	NA	0.3	Medium	high	NA
	to	Lake	recre-	5484601					
	Lizard	Lodge	ation						
	Creek	Road							
50185	Tributary	River	FLNR	645683	EB, 5466	4.5	High	moder	NA
	to	Rd		5466	WCT				
	Mor-								
	risey								
	Creek								
62423	Tributary	Grave	Unknown	660508	NA	NA	Low	low	NA
	to	Creek		5524239					
	Grave	FSR							
	Creek								
62425	Grave	Spur	Canfor	661486	NA	NA	Medium	moder	NA
	Creek			R083625524426					
62426	Grave	Spur	Canfor	661611	NA	NA	Medium	moder	NA
	Creek			R083625524460					
62516	Tributary	Island	MoTi	636123	NA	0.5	Medium	moder	Fry
	to	Lake	recre-	5484087					ob-
	Lizard	Lodge	ation						served
	Creek	Road							up-
									stream
									and
									down-
									stream
197533	Brule	Busato	MoTi	651626	NA	0.1	High	high	Deactivate
	Creek	Rd	local	5528888					
197555	Tributary	Elk	FLNR	646735	BT	6.0	High	moder	NA
	to	River	0103	5554534					
	Elk	FSR							
	River								
197559	Brule	Highway	MoTi	651516	BT,	NA	Medium	moder	NA
	Creek	43	high-	5528829	WCT				
			way						

Table 4.3: Summary of Phase 2 fish passage reassessments.

PSCIS ID	Embedded	Outlet Drop (m)	Diameter (m)	SWR	Slope (%)	Length (m)	Score	Result
50155	No	0.22	0.9	2.5	2.6	11	26	Barrier
50159	No	1.60	0.8	3.1	8.0	12	36	Barrier
50185	No	0.00	2.2	2.0	3.4	17	29	Barrier
62423	No	0.18	0.9	1.6	0.5	12	21	Barrier
62425	No	0.47	1.2	3.1	7.5	12	36	Barrier
62426	No	0.25	1.2	2.9	5.0	12	31	Barrier
62516	No	0.49	1.2	2.1	5.0	11	36	Barrier
197533	No	0.70	3.3	2.2	4.0	20	39	Barrier
197555	No	1.48	1.5	2.3	3.5	49	42	Barrier
197559	Yes	0.00	2.5	2.4	2.5	35	22	Barrier

Table 4.4: Cost benefit analysis for Phase 2 assessments.

pscis_crating_id	name	downstream_crossing_id	first_certi	end_certi	100m_start	100m_end	2st_area	net
50155	Tributary Island to Lake Lizard Lodge Creek Road	2.25	OBS	125	1081	8.7	9.7	
50159	Tributary Island to Lake Lizard Lodge Creek Road	2.45	OBS	125	0	0.0	0.0	
50185	Tributary River to Rd Morrisey Creek	4.30	OBS	125	1796	14.4	30.9	
62423	Tributary Grave to Creek Grave Creek	1.44	SS-CBS FSR	25	1578	63.1	45.5	
62425	Grave Spur Creek	3.70	OBS	125	1684	13.5	24.9	
62426	Grave Spur Creek	3.50	OBS	125	509	4.1	7.1	
62516	Tributary Island to Lake Lizard Lodge Creek Road	2.47	OBS	125	619	5.0	6.1	
197533	Brule Busato Creek Rd	7.10	OBS	178	128	0.7	2.6	
197555	Tributary Elk to River Elk River	3.50	OBS	312	6845	21.9	38.4	
197559	Brule Highway 43 Creek	6.10	OBS	3050	763	0.3	0.8	

Table 4.5: Summary of Phase 2 habitat confirmation details.

Site	Length Sur- veyed	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value



## **Chapter 5**

## **Conclusion**



## Appendix - Site Assessment Data and Photos

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.65
External ID	4600008	Length (m)	11
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.1
Easting	640268	Resemble Channel	Yes
Northing	5481377	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Robinson Road	Fill Depth (m)	1.2
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	1.2	Outlet Pool Depth (m)	0
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry mostly vegetated channel. Not likely fish habitat.

Photos: 4600008

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4600026	Length (m)	22
Crew	AI, MF, DN	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	642911	Resemble Channel	No
Northing	5490630	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Dicken Rd	Fill Depth (m)	2
Road Tenure	MoTi collector	Outlet Drop (m)	1.3
Channel Width (m)	2.2	Outlet Pool Depth (m)	0.3
Stream Slope (%)	3	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream dry at time of survey. Children's fort in upstream channel indicating that flows are likely very minimal year round.

Photos: 4600026

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.95
External ID	4600028	Length (m)	14
Crew	AI, MF, DN	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	642559	Resemble Channel	No
Northing	5490377	Backwatered	No
Stream	Bean Creek	Percent Backwatered	NA
Road	Dicken Rd	Fill Depth (m)	1.2
Road Tenure	MoTi collector	Outlet Drop (m)	0.57
Channel Width (m)	2	Outlet Pool Depth (m)	0.22
Stream Slope (%)	5	Inlet Drop	No
Beaver Activity	No	Slope (%)	5.5
Habitat Value	High	Valley Fill	Deep Fill

Comments: Multiple fish observed in outlet pool (~190mm). Some gravels suitable for spawning located upstream.

Photos: 4600028

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.75
External ID	4600037	Length (m)	6
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.1
Easting	651867	Resemble Channel	Yes
Northing	5522741	Backwatered	No
Stream	Dalzell Creek	Percent Backwatered	NA
Road	Driveway	Fill Depth (m)	0.3
Road Tenure	private	Outlet Drop (m)	0
Channel Width (m)	2.5	Outlet Pool Depth (m)	0
Stream Slope (%)	1.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	2
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Embedded culvert on private driveway. EB known upstream. Culvert does not appear likely to be significantly impacting upstream fish passage for juvenile or adult WCT at time of survey.

Photos: 4600037

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.75
External ID	4600038	Length (m)	12
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.18
Easting	651917	Resemble Channel	Yes
Northing	5522888	Backwatered	No
Stream	Dalzell Creek	Percent Backwatered	NA
Road	Driveway	Fill Depth (m)	0.3
Road Tenure	private	Outlet Drop (m)	0
Channel Width (m)	1.2	Outlet Pool Depth (m)	0
Stream Slope (%)	1.5	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	2
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Culvert collapsing in the middle. Private residence driveway. Wetland type habitat upstream. Culvert does not appear likely to be significantly impacting upstream fish passage for juvenile or adult WCT at time of survey.

Photos: 4600038

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.45
External ID	4600039	Length (m)	16
Crew	KP, AI	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.07
Easting	651833	Resemble Channel	Yes
Northing	5522544	Backwatered	No
Stream	Dalzell Creek	Percent Backwatered	NA
Road	Lower Elk Valley Road	Fill Depth (m)	1
Road Tenure	MoTi arterial	Outlet Drop (m)	0
Channel Width (m)	3.8	Outlet Pool Depth (m)	0.07
Stream Slope (%)	1	Inlet Drop	No
Beaver Activity	No	Slope (%)	3.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Three barrels (.45m each). Two of the three have water flowing through them. Upstream and downstream channel widens out, slow flow through vegetated channel. Highly manipulated banks. Deep fine substrate on both sides of crossing. Upstream resembles a wetland. Crossing does not appear likely to be significantly impacting upstream fish passage for juvenile or adult WCT at time of survey.

Photos: 4600039

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4600040	Length (m)	22
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.3
Easting	652004	Resemble Channel	Yes
Northing	5522330	Backwatered	No
Stream	Dalzell Creek	Percent Backwatered	NA
Road	Airport Road	Fill Depth (m)	0.5
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	5	Outlet Pool Depth (m)	0
Stream Slope (%)	0	Inlet Drop	No
Beaver Activity	No	Slope (%)	2.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Fenced private land upstream and downstream. Wetland area downstream. Culvert does not appear likely to be significantly impacting upstream fish passage for juvenile or adult WCT at time of survey.

Photos: 4600040

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	3.2
External ID	4600069	Length (m)	18
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	650144	Resemble Channel	No
Northing	5532055	Backwatered	No
Stream	Weigart Creek	Percent Backwatered	NA
Road	Highway 43	Fill Depth (m)	1.3
Road Tenure	MoTi highway	Outlet Drop (m)	0.15
Channel Width (m)	4.3	Outlet Pool Depth (m)	0.6
Stream Slope (%)	2	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	3.4
Habitat Value	High	Valley Fill	Deep Fill

Comments: Large stream with good flow. Flows currently mostly through south culvert which has slightly higher outlet drop.  
 Similar elevation outlets so added together for width. Lazer level used for culvert slope. Cobble/boulder substrate. Boulder cover.

Photos: 4600069

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	2.5
External ID	4600070	Length (m)	35
Crew	KP, AI	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.05
Easting	651516	Resemble Channel	Yes
Northing	5528829	Backwatered	No
Stream	Brule Creek	Percent Backwatered	NA
Road	Highway 43	Fill Depth (m)	3
Road Tenure	MoTi highway	Outlet Drop (m)	0
Channel Width (m)	6.1	Outlet Pool Depth (m)	1.7
Stream Slope (%)	1.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	2.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Dewatered upstream of highway for 600m. Deep pool present downstream fed subsurface from northside of culvert.  
 Approximately 9 WCT in outlet pool. Four fish ~300mm and 5 fish ~200 mm. High confidence that the larger fish were WCT as easy to recognize spotted backs from bank.

Photos: 4600070

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.75
External ID	4600077	Length (m)	20
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.1
Easting	639864	Resemble Channel	Yes
Northing	5483627	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Mt Mclean Road	Fill Depth (m)	4
Road Tenure	Fernie local	Outlet Drop (m)	0
Channel Width (m)	2.7	Outlet Pool Depth (m)	0
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry channel. Culvert is embedded.

Photos: 4600077

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.1
External ID	4600080	Length (m)	43
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	640568	Resemble Channel	No
Northing	5481516	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Cokato Road	Fill Depth (m)	2
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	2.1	Outlet Pool Depth (m)	0
Stream Slope (%)	3.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	4
Habitat Value	Low	Valley Fill	Deep Fill

Comments: 2 barrels, 0.90 and 1.1m. Debris rack on inlet. Stream dry at time of survey.

Photos: 4600080

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4600084	Length (m)	22
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651532	Resemble Channel	No
Northing	5521052	Backwatered	No
Stream	Littlemoor Creek	Percent Backwatered	NA
Road	Lower Elk Valley Road	Fill Depth (m)	0.8
Road Tenure	MoTi arterial	Outlet Drop (m)	0.2
Channel Width (m)	1	Outlet Pool Depth (m)	0.15
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	3
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Flows through fenced private land upstream and downstream. Inlet has quite a bit of debris on it. Upstream is much steeper than downstream with gradient estimated at 12%.

Small stream with good flow.

Photos: 4600084

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.45
External ID	4600090	Length (m)	18
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651814	Resemble Channel	No
Northing	5519652	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Lower Elk Valley Road	Fill Depth (m)	1
Road Tenure	MoTi arterial	Outlet Drop (m)	0
Channel Width (m)	0	Outlet Pool Depth (m)	0
Stream Slope (%)	0	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: No visible channel. Not likely fish habitat.

Agricultural area.

Photos: 4600090

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.8
External ID	4600092	Length (m)	18
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651701	Resemble Channel	No
Northing	5521881	Backwatered	No
Stream	North Littlemoor Creek	Percent Backwatered	NA
Road	Lower Elk Valley Road	Fill Depth (m)	0.6
Road Tenure	MoTi arterial	Outlet Drop (m)	0
Channel Width (m)	1.5	Outlet Pool Depth (m)	0
Stream Slope (%)	2.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	3
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream slope estimated due to fenced private land.

Photos: 4600092

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.5
External ID	4600102	Length (m)	16
Crew	AI, Kp	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	640306	Resemble Channel	No
Northing	5481672	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	McGiverin Road	Fill Depth (m)	1
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	0.5	Outlet Pool Depth (m)	0
Stream Slope (%)	0	Inlet Drop	No
Beaver Activity	No	Slope (%)	1
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Vegetated channel. Not likely fish habitat.

Photos: 4600102

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4600130	Length (m)	22
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	640037	Resemble Channel	No
Northing	5483655	Backwatered	Yes
Stream	Tributary to Elk River	Percent Backwatered	20
Road	Cokato Road	Fill Depth (m)	8
Road Tenure	Fernie collector	Outlet Drop (m)	0
Channel Width (m)	0.65	Outlet Pool Depth (m)	0
Stream Slope (%)	9	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	9
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Very low flow at time of survey and 0.5m inlet drop from debris. Very steep culvert, possibly 2 sections with further upstream section being much steeper.

Photos: 4600130

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4600134	Length (m)	48
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	638639	Resemble Channel	No
Northing	5480681	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Fernie ski hill	Fill Depth (m)	3
Road Tenure	unclassified	Outlet Drop (m)	0.09
Channel Width (m)	1.4	Outlet Pool Depth (m)	0.22
Stream Slope (%)	5	Inlet Drop	No
Beaver Activity	No	Slope (%)	9
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Debris guard on inlet. Unable to see through the culvert to other end. Highly manipulated banks, drains large parking area and ski hill. Steep with placed rocks (rip rap) in spots upstream. Stream goes under large turn around, paved area. Culvert likely >1 piece with slight angle. Armoured banks downstream, lots of sediment (sand) form pavement and parking area.

Photos: 4600134

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4600140	Length (m)	22
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651110	Resemble Channel	No
Northing	5515356	Backwatered	No
Stream	Whiting Creek	Percent Backwatered	NA
Road	Highway 43	Fill Depth (m)	3
Road Tenure	MoTi arterial	Outlet Drop (m)	0.18
Channel Width (m)	0.6	Outlet Pool Depth (m)	0
Stream Slope (%)	2	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: No access up or downstream due to fenced private land.

Stream slope estimated. Water pipe intake at the outlet.

Photos: 4600140

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Pipe Arch
PSCIS ID	NA	Diameter (m)	4
External ID	4600157	Length (m)	44
Crew	AI, MF, DN	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	643565	Resemble Channel	NA
Northing	5490325	Backwatered	NA
Stream	Hartley Creek	Percent Backwatered	NA
Road	Highway 3	Fill Depth (m)	NA
Road Tenure	MoTi highway	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: This crossing is very full of debris and has been recently dredges. Less than 30cm freeboard from top of aggraded gravels at inlet and top of pipe arch. Newly installed overflow pipe (0.55 diameter) on left bank.

Photos: 4600157

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.8
External ID	4600158	Length (m)	30
Crew	AI, MF, DN	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	642739	Resemble Channel	No
Northing	5489444	Backwatered	No
Stream	Bean Creek	Percent Backwatered	NA
Road	Highway 3	Fill Depth (m)	1.5
Road Tenure	MoTi highway	Outlet Drop (m)	0.17
Channel Width (m)	3.2	Outlet Pool Depth (m)	0.24
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	1
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Fish observed at upstream crossing on Bean Rd. Grate on inlet may prevent passage off adult fish. Fill depth estimated from photos.

Photos: 4600158

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1
External ID	4600169	Length (m)	36
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	638850	Resemble Channel	No
Northing	5480833	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Highline Drive (Fernie ski hill)	Fill Depth (m)	6
Road Tenure	MoTi local	Outlet Drop (m)	0.2
Channel Width (m)	2.3	Outlet Pool Depth (m)	0.25
Stream Slope (%)	11.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	13
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Very recent heavy rains, 2 side channels for ski hill drainage infrastructure giving significant flow contributions just upstream of crossing, one of which is especially turbid (from large parking lot). Culvert not baffled, very steep. A lot of fill on paved access to condos. Old metal collar of culvert ripped off and in outlet pool.

Photos: 4600169

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4600181	Length (m)	73
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	652322	Resemble Channel	No
Northing	5527529	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Line creek mine road	Fill Depth (m)	3.5
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	0.5	Outlet Pool Depth (m)	0
Stream Slope (%)	2	Inlet Drop	No
Beaver Activity	No	Slope (%)	2
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry at time of survey, no channel present, area vegetated grassland. Two culverts, 0.60m in diameter. Top culvert 0.5m higher than the lower.

Photos: 4600181

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Oval Culvert
PSCIS ID	NA	Diameter (m)	3.3
External ID	4600183	Length (m)	20
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651626	Resemble Channel	No
Northing	5528888	Backwatered	No
Stream	Brule Creek	Percent Backwatered	NA
Road	Busato Road	Fill Depth (m)	1
Road Tenure	MoTi local	Outlet Drop (m)	0.7
Channel Width (m)	7.1	Outlet Pool Depth (m)	1.5
Stream Slope (%)	2	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	4
Habitat Value	High	Valley Fill	Deep Fill

Comments: Large stream with good flow at this crossing. Culvert inlet is damaged and there is a large outlet drop. Upstream of highway the stream is subsurface for ~600m.

Photos: 4600183

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4600184	Length (m)	30
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	650954	Resemble Channel	No
Northing	5522199	Backwatered	No
Stream	North Littlemoor Creek	Percent Backwatered	NA
Road	Highway 43	Fill Depth (m)	4
Road Tenure	MoTi highway	Outlet Drop (m)	0.65
Channel Width (m)	1.6	Outlet Pool Depth (m)	0.55
Stream Slope (%)	5	Inlet Drop	No
Beaver Activity	No	Slope (%)	8
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Small stream with good flow, EB known upstream. Fenced private land upstream and downstream. Stream measurements estimated due to fenced private land. Large outlet drop.

Photos: 4600184

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4600185	Length (m)	40
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651002	Resemble Channel	No
Northing	5521022	Backwatered	No
Stream	Littlemoor Creek	Percent Backwatered	NA
Road	Highway 43	Fill Depth (m)	5
Road Tenure	MoTi highway	Outlet Drop (m)	0.3
Channel Width (m)	1.2	Outlet Pool Depth (m)	0.55
Stream Slope (%)	3.5	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Culvert has extension with corner, small stream with good flow. WCT and EB documented upstream. Gravels present suitable for WCT and EB spawning.

Photos: 4600185

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.8
External ID	4600186	Length (m)	22
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	651051	Resemble Channel	No
Northing	5519343	Backwatered	No
Stream	Hollow Creek	Percent Backwatered	NA
Road	Highway 43	Fill Depth (m)	0.8
Road Tenure	MoTi highway	Outlet Drop (m)	0.46
Channel Width (m)	1.1	Outlet Pool Depth (m)	0.36
Stream Slope (%)	2	Inlet Drop	No
Beaver Activity	No	Slope (%)	4
Habitat Value	Low	Valley Fill	Deep Fill

Comments: No access up or downstream due to fenced private land.

Stream slope estimated.

Photos: 4600186

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4600316	Length (m)	12
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	641167	Resemble Channel	No
Northing	5479429	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Cokato Road	Fill Depth (m)	0.5
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	4.1	Outlet Pool Depth (m)	0
Stream Slope (%)	4	Inlet Drop	No
Beaver Activity	No	Slope (%)	2.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream dry at time of survey. Three barrels, 1.2m in diameter. All three very similar elevation, all perched .2-.50m above substrate.

Photos: 4600316

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-17	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4600329	Length (m)	12
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	652325	Resemble Channel	Yes
Northing	5515789	Backwatered	No
Stream	Tributary to Whiting Creek	Percent Backwatered	NA
Road	Lower Elk Valley Road	Fill Depth (m)	1
Road Tenure	MoTi arterial	Outlet Drop (m)	0
Channel Width (m)	0.5	Outlet Pool Depth (m)	0
Stream Slope (%)	0	Inlet Drop	No
Beaver Activity	No	Slope (%)	1
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Whiting creek appeared to not be present through agricultural field downstream. This appeared to be only channel present for Whiting crossing this road although the main Whiting channel is present upstream. Dry, heavily vegetated channel downstream. Defined channel upstream but seems unlikely to be fish bearing.

Photos: 4600329

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4600332	Length (m)	25
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	639511	Resemble Channel	No
Northing	5481114	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Highway 3	Fill Depth (m)	2.3
Road Tenure	MoTi highway	Outlet Drop (m)	0
Channel Width (m)	3.3	Outlet Pool Depth (m)	0.5
Stream Slope (%)	4	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Fry observed at outlet pool. Inlet of active pipe mostly plugged with debris. Overflow pipe is 0.8m outlet drop with fry/juveniles stranded in outlet pool. Flows out of Fernie Ski Hill Road development area.

Photos: 4600332

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Oval Culvert
PSCIS ID	NA	Diameter (m)	2.6
External ID	4600367	Length (m)	20
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	643534	Resemble Channel	No
Northing	5490723	Backwatered	No
Stream	Hartley Creek	Percent Backwatered	NA
Road	Dicken Road	Fill Depth (m)	0.4
Road Tenure	MoTi collector	Outlet Drop (m)	0.4
Channel Width (m)	3.5	Outlet Pool Depth (m)	0.8
Stream Slope (%)	1	Inlet Drop	No
Beaver Activity	No	Slope (%)	2
Habitat Value	High	Valley Fill	Deep Fill

Comments: Laser level used for culvert slope. WCT spawning system. See Management Plan for the Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) in British Columbia 2014  
<http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=9781>  
Photos: 4600367

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-20	Crossing Sub Type	Ford
PSCIS ID	NA	Diameter (m)	NA
External ID	4601129	Length (m)	NA
Crew	KP, AI	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	661062	Resemble Channel	NA
Northing	5524446	Backwatered	NA
Stream	Grave Creek	Percent Backwatered	NA
Road	NA	Fill Depth (m)	NA
Road Tenure	unclassified	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Deactivated road. Ford.  
Photos: 4601129

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Ford
PSCIS ID	NA	Diameter (m)	NA
External ID	4601205	Length (m)	NA
Crew	AI, KP	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	650917	Resemble Channel	NA
Northing	5528513	Backwatered	NA
Stream	Brule Creek	Percent Backwatered	NA
Road	Private	Fill Depth (m)	NA
Road Tenure	private	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Pulled crossing, no issues, is now a ford.

Photos: 4601205

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4601556	Length (m)	14
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	638522	Resemble Channel	No
Northing	5480616	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Fernie ski hill	Fill Depth (m)	1.2
Road Tenure	unclassified	Outlet Drop (m)	0
Channel Width (m)	1.3	Outlet Pool Depth (m)	0.2
Stream Slope (%)	8	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	9
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream gradient immediately upstream of crossing is near 20%. Crossing is last of a series within close proximity to each other. The crossing downstream of this one is near 100m long. Likely more crossings upstream on ski hill infrastructure and access roads. Recent heavy rains.

Photos: 4601556

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.5
External ID	4601594	Length (m)	22
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	641090	Resemble Channel	No
Northing	5479392	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Railway	Fill Depth (m)	2
Road Tenure	Canadian Pacific	Outlet Drop (m)	0
Channel Width (m)	2.7	Outlet Pool Depth (m)	0
Stream Slope (%)	2.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream dry at time of survey. 2 barrels (0.80 and 1.5m in diameter), similar heights but 1.5m slightly lower. Smaller barrel inlet damaged.

Photos: 4601594

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4601639	Length (m)	99
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	638630	Resemble Channel	No
Northing	5480655	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Fernie ski hill	Fill Depth (m)	2.5
Road Tenure	unclassified	Outlet Drop (m)	0.73
Channel Width (m)	1.5	Outlet Pool Depth (m)	0.65
Stream Slope (%)	6	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	11
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Huge crossing through the ski hill parking lot and lodge area. Large outlet drop and pool, extremely long culvert (close to 100m) tied in with other drainage infrastructure at the base of the Fernie ski hill. Inlet drop about .15m.

Photos: 4601639

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-20	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4602270	Length (m)	14
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	655441	Resemble Channel	No
Northing	5524175	Backwatered	No
Stream	Tributary to Grave Creek	Percent Backwatered	NA
Road	NA	Fill Depth (m)	2
Road Tenure	unclassified	Outlet Drop (m)	0
Channel Width (m)	1.5	Outlet Pool Depth (m)	0
Stream Slope (%)	3	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	4
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Inlet clogged with debris 3/4 of way up. Upstream area is wetland/pond.

Photos: 4602270

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Ford
PSCIS ID	NA	Diameter (m)	NA
External ID	4602276	Length (m)	NA
Crew	AI	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	649758	Resemble Channel	NA
Northing	5527935	Backwatered	NA
Stream	Brule Creek	Percent Backwatered	NA
Road	Spur	Fill Depth (m)	NA
Road Tenure	unclassified	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Deactivated. Ford. no issues.

Photos: 4602276

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4602349	Length (m)	10
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	638525	Resemble Channel	No
Northing	5481496	Backwatered	Yes
Stream	Tributary to Elk River	Percent Backwatered	20
Road	Fernie Nordic Trail	Fill Depth (m)	1.5
Road Tenure	unclassified	Outlet Drop (m)	0
Channel Width (m)	2	Outlet Pool Depth (m)	2
Stream Slope (%)	7	Inlet Drop	No
Beaver Activity	No	Slope (%)	3.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Outlet pool appears dredged, very deep, approximately 2m and 7-8m long. Nice stream, good flow.

Photos: 4602349

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-20	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4602533	Length (m)	8
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	661172	Resemble Channel	No
Northing	5524451	Backwatered	No
Stream	Grave Creek	Percent Backwatered	NA
Road	NA	Fill Depth (m)	0.35
Road Tenure	unclassified	Outlet Drop (m)	0
Channel Width (m)	0.1	Outlet Pool Depth (m)	0
Stream Slope (%)	1	Inlet Drop	No
Beaver Activity	No	Slope (%)	4
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream dry at time of survey, channel not visible for about 40 downstream. Water and channel appear about 65m downstream of crossing. Upstream side of crossing inlet not visible, covered by road fill or deep organic debris. Channel upstream non-existent and dry. This system (labelled as Grave creek on the map) must be a side channel or remnant channel.

Photos: 4602533

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4603265	Length (m)	13
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	640287	Resemble Channel	No
Northing	5481650	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Railway	Fill Depth (m)	3
Road Tenure	Canadian Pacific	Outlet Drop (m)	0
Channel Width (m)	0.5	Outlet Pool Depth (m)	0
Stream Slope (%)	0	Inlet Drop	No
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry vegetated channel. Not likely fish habitat.

Photos: 4603265

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4603291	Length (m)	13
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	640891	Resemble Channel	No
Northing	5480517	Backwatered	No
Stream	Cokato Creek	Percent Backwatered	NA
Road	Cokato Road	Fill Depth (m)	0.5
Road Tenure	MoTi local	Outlet Drop (m)	0
Channel Width (m)	4.5	Outlet Pool Depth (m)	0
Stream Slope (%)	4	Inlet Drop	No
Beaver Activity	No	Slope (%)	4
Habitat Value	Low	Valley Fill	Deep Fill

Comments: 3 large barrels (all 1.2m), very perched 0.7-1.3m above substrate. Stream dry at time of survey. Debris rack on upstream side of culvert. Note there is a slope change at the inlet of structure, much steeper short section possibly from damage.

Photos: 4603291

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.8
External ID	4604198	Length (m)	9
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	647819	Resemble Channel	No
Northing	5498551	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Hadner FSR	Fill Depth (m)	1
Road Tenure	FLNR 6946	Outlet Drop (m)	0.6
Channel Width (m)	2.9	Outlet Pool Depth (m)	0.3
Stream Slope (%)	19	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	6
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Steep stream with good flow. FISS sample site 2593 near crossing location. Suspect too steep to be fish bearing.

Photos: 4604198

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-24	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4604455	Length (m)	16
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	638669	Resemble Channel	No
Northing	5480601	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Fernie ski hill	Fill Depth (m)	2
Road Tenure	unclassified	Outlet Drop (m)	0.15
Channel Width (m)	1.5	Outlet Pool Depth (m)	0.2
Stream Slope (%)	9	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	7
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Inlet drop about .40m, significant and looks like increased barrier. Crossing is Fernie ski hill gravel road. Currently high and turbid due to heavy rain.

Photos: 4604455

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Pipe Arch
PSCIS ID	NA	Diameter (m)	2.5
External ID	4605636	Length (m)	14
Crew	KP, AI	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	644148	Resemble Channel	NA
Northing	5564425	Backwatered	NA
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	NA
Road Tenure	FLNR 0103	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Appears passable.

Photos: 4605636

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4605649	Length (m)	17
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	645873	Resemble Channel	No
Northing	5556758	Backwatered	Yes
Stream	Tributary to Elk River	Percent Backwatered	100
Road	Elk River FSR	Fill Depth (m)	1.5
Road Tenure	FLNR 0103	Outlet Drop (m)	0
Channel Width (m)	1	Outlet Pool Depth (m)	0.6
Stream Slope (%)	2.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Low, slow flow. Culvert completely backwatered.

Photos: 4605649

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.9
External ID	4605653	Length (m)	11
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	644666	Resemble Channel	No
Northing	5564940	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	0.4
Road Tenure	FLNR 0103	Outlet Drop (m)	0
Channel Width (m)	2.5	Outlet Pool Depth (m)	0.2
Stream Slope (%)	2	Inlet Drop	No
Beaver Activity	No	Slope (%)	3.2
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Good habitat, habitat assessment (FHAP) conducted in 2016 (Massey Environmental Consultants Ltd.) for proposed coal mine EA (Bingay). Electrofished U/S and D/S, see provincial records and data submission file at

<http://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=52717>

. Culvert does not appear to be barrier to any species at any life stage at time of survey. Could be barrier to small fish at high flows. EB and WCT recorded upstream.

Photos: 4605653

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4605675	Length (m)	10
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	645225	Resemble Channel	No
Northing	5567096	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	0.5
Road Tenure	NA	Outlet Drop (m)	0
Channel Width (m)	2	Outlet Pool Depth (m)	0.05
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	2.5
Habitat Value	Medium	Valley Fill	Deep Fill

Comments: Culvert slope estimate. Stream dredged upstream to remove sediments. Flows are slow through culvert and unlikely barrier for fry/parr for much of year. Crossing 4606244 is on deactivated spur upstream so very likely a ford, about 300m upstream same thing for 4604099.

Photos: 4605675

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.5
External ID	4605697	Length (m)	2
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	648722	Resemble Channel	No
Northing	5548198	Backwatered	No
Stream	Crossing Creek	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	1
Road Tenure	FLNR 0103	Outlet Drop (m)	0
Channel Width (m)	2.5	Outlet Pool Depth (m)	0
Stream Slope (%)	3.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry channel at time of survey, channel transitions to grass flats about 60 meters downstream.

Photos: 4605697

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.35
External ID	4605705	Length (m)	15
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	643733	Resemble Channel	No
Northing	5560586	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	1.2
Road Tenure	Unknown	Outlet Drop (m)	2.15
Channel Width (m)	1	Outlet Pool Depth (m)	0.4
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	2.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream not located where mapped. Unlikely fish bearing.

Flows into forest floor downstream of culvert.

Photos: 4605705

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4605707	Length (m)	11
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	643981	Resemble Channel	No
Northing	5561132	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	0.4
Road Tenure	FLNR 0103	Outlet Drop (m)	0
Channel Width (m)	2.3	Outlet Pool Depth (m)	0
Stream Slope (%)	1	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Stream dry at time of survey. Vegetated channel, loaded with sediment. Inlet of culvert damaged, partly bent. Inlet and outlet area dredged. Not likely fish habitat.

Photos: 4605707

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	4605708	Length (m)	10
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.1
Easting	643611	Resemble Channel	Yes
Northing	5559835	Backwatered	No
Stream	Tributary to Lowe Creek	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	0.5
Road Tenure	FLNR 0103	Outlet Drop (m)	0
Channel Width (m)	1.1	Outlet Pool Depth (m)	0
Stream Slope (%)	3.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Channelized downstream due to dredging for about 30m.

Small stream, substrate primarily fines but some gravel present.

Photos: 4605708

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.5
External ID	4605732	Length (m)	49
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	646735	Resemble Channel	No
Northing	5554534	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	8
Road Tenure	FLNR 0103	Outlet Drop (m)	1.48
Channel Width (m)	3.5	Outlet Pool Depth (m)	1.3
Stream Slope (%)	1.5	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	3.5
Habitat Value	High	Valley Fill	Deep Fill

Comments: Large perched culvert. High value habitat. Habitat confirmation and sampling conducted.

Photos: 4605732

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.2
External ID	4605733	Length (m)	10
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	647191	Resemble Channel	No
Northing	5552693	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	1
Road Tenure	FLNR 0103	Outlet Drop (m)	0.3
Channel Width (m)	3.1	Outlet Pool Depth (m)	0.6
Stream Slope (%)	2	Inlet Drop	No
Beaver Activity	No	Slope (%)	1
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Freshly dredged. Dry, Dredging may extend well down channel. See photo from about 130m downstream.

Photos: 4605733

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	1.5
External ID	4605742	Length (m)	15
Crew	KP, AI	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.12
Easting	643578	Resemble Channel	Yes
Northing	5560087	Backwatered	No
Stream	Lowe Creek	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	0.3
Road Tenure	FLNR 0103	Outlet Drop (m)	0
Channel Width (m)	2.5	Outlet Pool Depth (m)	0.2
Stream Slope (%)	3.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	High	Valley Fill	Deep Fill

Comments: Upstream past dredging natural channel 2.5m wide. Downstream below dredging extremely braided, original channel difficult to track. Channel widths >10m at times with substrate on top of banks and in bases of trees. Channel dredged upstream and downstream approximately 75m on each. Habitat assessment (FHAP) conducted in 2016 (Masse Environmental Consultants Ltd.) for proposed coal mine EA (Bingay). Electrofished D/S, see provincial records and data submission file at <http://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=52717>

Photos: 4605742

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.4
External ID	4606669	Length (m)	10
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	646462	Resemble Channel	No
Northing	5554360	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Spur from Elk River FSR	Fill Depth (m)	1
Road Tenure	Canfor R08473	Outlet Drop (m)	0
Channel Width (m)	1	Outlet Pool Depth (m)	0
Stream Slope (%)	0.5	Inlet Drop	No
Beaver Activity	No	Slope (%)	2
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Plan in place to deactivate entire network here  
 (personal communication with local machinery operator). Dry,  
 vegetated channel. Likely non-fish bearing.

Photos: 4606669

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Concrete Box
PSCIS ID	NA	Diameter (m)	1.2
External ID	4606807	Length (m)	9
Crew	KP, AI	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.09
Easting	639952	Resemble Channel	No
Northing	5483636	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Railway	Fill Depth (m)	6
Road Tenure	Canadian Pacific	Outlet Drop (m)	0
Channel Width (m)	1.5	Outlet Pool Depth (m)	0
Stream Slope (%)	30	Inlet Drop	No
Beaver Activity	No	Slope (%)	1.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Concrete arch, >30% downstream of culvert for 10m  
 likely from railway fill. Dry downstream with stagnant pools  
 upstream.

Photos: 4606807

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.4
External ID	4606835	Length (m)	10
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	644829	Resemble Channel	No
Northing	5559116	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Spur from Elk River FSR	Fill Depth (m)	1
Road Tenure	Canfor R08370	Outlet Drop (m)	0.3
Channel Width (m)	1	Outlet Pool Depth (m)	0
Stream Slope (%)	3	Inlet Drop	No
Beaver Activity	No	Slope (%)	2.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Road is deactivated downstream so no crossings below (4607172, 4606929). Dry vegetated channel. Not likely fish bearing at this location.

Photos: 4606835

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Bridge
PSCIS ID	NA	Diameter (m)	4
External ID	4607023	Length (m)	18
Crew	AI, KP	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	648041	Resemble Channel	NA
Northing	5499983	Backwatered	NA
Stream	McCool Creek	Percent Backwatered	NA
Road	NA	Fill Depth (m)	NA
Road Tenure	Canfor R08477	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Bridge.

Photos: 4607023

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-18	Crossing Sub Type	Bridge
PSCIS ID	NA	Diameter (m)	4
External ID	2020091801	Length (m)	18
Crew	AI, KP	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	648381	Resemble Channel	NA
Northing	5499536	Backwatered	NA
Stream	McCool Creek	Percent Backwatered	NA
Road	Hadner FSR	Fill Depth (m)	NA
Road Tenure	FLNR 6946	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Bridge.

Photos: 2020091801

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-22	Crossing Sub Type	Bridge
PSCIS ID	NA	Diameter (m)	1.2
External ID	2020092201	Length (m)	12
Crew	AI, KP	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	634969	Resemble Channel	NA
Northing	5484828	Backwatered	NA
Stream	Tributary to Lizard Creek	Percent Backwatered	NA
Road	Lazy Lizard Lower	Fill Depth (m)	NA
Road Tenure	Unknown	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Bike trail.

Photos: 2020092201

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Bridge
PSCIS ID	NA	Diameter (m)	1.2
External ID	2020092301	Length (m)	8
Crew	AI, KP	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	636474	Resemble Channel	NA
Northing	5483873	Backwatered	NA
Stream	Tributary to Lizard Creek	Percent Backwatered	NA
Road	Trail	Fill Depth (m)	NA
Road Tenure	Unknown	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Trail. Stream has been diverted to beside the road.

Photos: 2020092301

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	2020092302	Length (m)	14
Crew	AI, KP	Embedded	Yes
UTM Zone	11	Depth Embedded (m)	0.03
Easting	640218	Resemble Channel	Yes
Northing	5481065	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Hill Road	Fill Depth (m)	1.2
Road Tenure	Unknown	Outlet Drop (m)	0
Channel Width (m)	1.5	Outlet Pool Depth (m)	0
Stream Slope (%)	0	Inlet Drop	No
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry vegetated channel. Not likely fish habitat.

Photos: 2020092302

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	NA	Diameter (m)	0.6
External ID	2020092303	Length (m)	15
Crew	AI, KP	Embedded	No
UTM Zone	11	Depth Embedded (m)	NA
Easting	640227	Resemble Channel	No
Northing	5481028	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Driveway	Fill Depth (m)	1
Road Tenure	Unknown	Outlet Drop (m)	0
Channel Width (m)	1.5	Outlet Pool Depth (m)	0
Stream Slope (%)	2	Inlet Drop	No
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Low	Valley Fill	Deep Fill

Comments: Dry, mostly vegetated channel. Not likely fish habitat.

Two pipes, one buried by fill. Inlet elevated resulting in small  
area of wetland vegetation upstream.

Photos: 2020092303

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Bridge
PSCIS ID	NA	Diameter (m)	1.2
External ID	2020092310	Length (m)	14
Crew	KP, AI	Embedded	NA
UTM Zone	11	Depth Embedded (m)	NA
Easting	636029	Resemble Channel	NA
Northing	5484419	Backwatered	NA
Stream	Tributary to Lizard Creek	Percent Backwatered	NA
Road	Lazy Lizard Lower	Fill Depth (m)	NA
Road Tenure	Unknown	Outlet Drop (m)	NA
Channel Width (m)	NA	Outlet Pool Depth (m)	NA
Stream Slope (%)	NA	Inlet Drop	NA
Beaver Activity	No	Slope (%)	NA
Habitat Value	NA	Valley Fill	NA

Comments: Nice wooden pedestrian/bike bridge for recreational use.

Photos: 2020092310



# Appendix - Crossing 50155

## **Island Lake Lodge Road - Tributary to Lizard Creek**

### **Site Location**

Crossing 50155 is located on a tributary to Lizard Creek, approximately 75m upstream from the confluence with Lizard Creek. The stream is located approximately 100m east of the location where it is mapped on the freshwater atlas stream layer. Island Lake Lodge Road is an extension of Mt.Fernie Park Road with access to Highway 3 located within Fernie city limits. The area is a popular recreational destination for hikers and mountain bikers. Island Lake Lodge is a year round tourist destination providing accommodations, guided hiking and backcountry catskiing for clients.

### **Background**

At the crossing location, the stream is 2nd order with a watershed area upstream of the road of approximately 1.8km<sup>2</sup>. The elevation of the watershed ranges from a maximum of 1945m to 1080m at the culvert. One 12m long bridge (PSCIS 197543) is located upstream of the subject crossing approximately 575m on the Lazy Lizard bike trail and another 7m long bridge structure is located downstream also on a recreational trail. A search of provincial records yielded no fisheries information for the stream (MoE, 2020b). Downstream, Lizard Creek supports westslope cutthroat trout, bull trout, mountain whitefish, brook trout, longnose sucker and longnose dace (MoE, 2020a).

PSCIS stream crossing 50155 was ranked as a high priority for follow up with habitat confirmation due to the large size of the stream relative to other tributary streams in the watershed, the previously rated high value habitat and because it was prioritized for follow up by VAST Resource Solutions Inc. (2013). The habitat confirmation was completed on September 22, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082G.113.

## Stream Characteristics at Crossing

At the time of the survey, the un-embedded and non-backwatered 0.9m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 11m, a culvert slope of 2.6%, a stream width ratio of 2.5 an outlet drop of 0.22m (Table 5.1). Water temperature was 9°C, pH was 7.7 and conductivity was 480uS/cm.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 100m to Lizard Creek. Overall, total cover amount was rated as moderate with undercut banks dominant. Cover was also present as small woody debris, large woody debris, and overhanging vegetation (Table 5.6, Figure 5.2). The average channel width was 2.2m, the average wetted width was 1.9m and the average gradient was 4.3%. Habitat value was rated as medium with good potential for fry/juvenile salmonid rearing but a lack of deep pools for adult overwintering and rearing.

## Stream Characteristics Upstream

The stream was surveyed upstream from the culvert for 700m. Overall, total cover amount was rated as abundant with deep pools dominant. Cover was also present as small woody debris, large woody debris, boulders, undercut banks, and overhanging vegetation (Table 5.6, Figure 5.3). The average channel width was 2.2m, the average wetted width was 1.6m and the average gradient was 10.5%. There were frequent areas of gravels suitable for resident westslope cutthroat trout spawning. Frequent pools to 40cm deep were present and associated with small and large woody debris. Habitat value was rated as high for fry and juvenile westslope cutthroat rearing.

## Fish Sampling

To assess potential impacts of the culvert on fish densities in the stream we electrofished upstream and downstream of the crossing. Three sites were sampled upstream and one site was sampled downstream. A total of 42 westslope cutthroat trout and 4 eastern brook trout were captured upstream with 28 westslope cutthroat trout and 2 eastern brook trout captured downstream. Raw results are included in digital format as Attachment 2 and summarized in Tables 5.3 - 5.4 and Figure 5.1.

## Structure Remediation and Cost Estimate

Structure replacement with an open bottomed culvert is recommended to provide unconstrained access to the habitat located upstream of PSCIS crossing 50155. The cost for work is estimated at \$125000 for a cost benefit of \$8700/linear m and \$9700/m<sup>2</sup>.

## Conclusion

There is an estimated 1.8km of mainstem habitat upstream of crossing 50155 with habitat in the areas surveyed upstream of the crossing rated as high value for fry and juvenile salmonid rearing. Although potentially attributable to the lower gradient habitat downstream and the proximity to the Lizard Creek mainstem, fish sampling results indicated that the crossing is potentially negatively impacting habitat capacity upstream of the crossing as higher densities of westslope cutthroat trout were captured downstream of the crossing than above. The road may be part of the Island Lake Recreational tenure or solely the responsibility of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a moderate priority for proceeding to design for replacement with an open bottomed structure.

Table 5.1: Summary of fish passage reassessment for PSCIS crossing 50155.

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-22	Crossing Sub Type	Round Culvert
PSCIS ID	50155	Diameter (m)	0.9
External ID	NA	Length (m)	11
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
		Embedded (m)	
Easting	635113	Resemble Channel	No
Northing	5484261	Backwatered	No
Stream	Tributary to Lizard Creek	Percent Backwatered	NA
Road	Island Lake Lodge Road	Fill Depth (m)	0.3
Road Tenure	MoTi recreation	Outlet Drop (m)	0.22
Channel Width	2.25 (m)	Outlet Pool Depth (m)	0.45
Stream Slope	4.3 (%)	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	2.6
Habitat Value	Medium	Valley Fill	Deep Fill

Photos: 

Table 5.2: Summary of habitat details for PSCIS crossing 50155.

Location	Length Surveyed (m)	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value
Upstream	700	2.2	1.6	0.3	10.5	abundant	high
Downstream	100	2.2	1.9	-	4.3	moderate	medium

Table 5.3: Electrofishing sites for PSCIS crossing 50155.

Site	Location	Width (m)	Length (m)	Area (m <sup>2</sup> )	Effort (s)	Effort (s/m <sup>2</sup> )
19	Downstream	1.7	40	68	200	2.9
18	Upstream	1.6	25	40	117	2.9
33	Upstream	1.6	13	21	61	2.9
34	Upstream	1.6	45	72	154	2.1

Table 5.4: Westslope cutthroat trout densities (fish/100m<sup>2</sup>) for PSCIS crossing 50155.

Site	Location	Fry	Parr	Adult	Juvenile
19	Downstream	35.3	4.4	1.5	-
18	Upstream	15	12.5	-	-
33	Upstream	23.8	9.5	-	9.5
34	Upstream	23.6	5.6	1.4	-

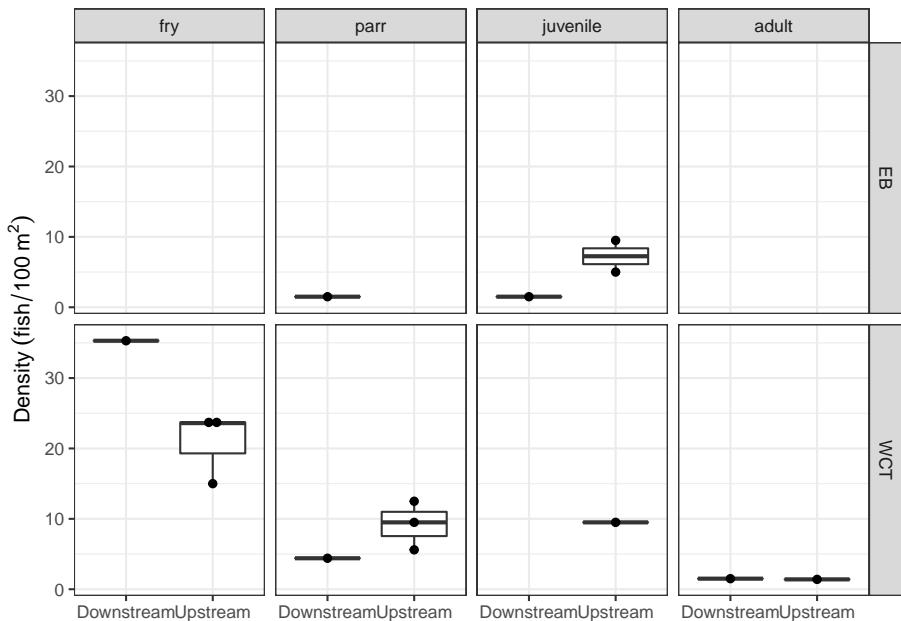


Figure 5.1: Fish densities (fish/100m<sup>2</sup>) for PSCIS crossing 50155.



Figure 5.2: Typical habitat downstream of PSCIS crossing 50155.



Figure 5.3: Typical habitat upstream of PSCIS crossing 50155.



# Appendix - Crossing 50159

## **Island Lake Lodge Road - Tributary to Lizard Creek**

### **Site Location**

Crossing 50159 is located on a tributary to Lizard Creek, approximately 150m upstream from the confluence with Lizard Creek. This crossing has also been recorded in PSCIS as crossing 62510. Island Lake Lodge Road is an extension of Mt.Fernie Park Road which is accessed from Highway 3 within Fernie city limits. The area is a popular recreational destination for hikers and mountain bikers. Island Lake Lodge is located at 1400m of elevation near Island Lake and is a year round tourist destination providing accommodations, guided hiking and backcountry catskiing for clients. The subject stream is not mapped in the freshwater atlas stream layer and may have been diverted as part of a micro-hydro facility for Island Lake Lodge. A small building that could be a generating station was observed on aerial imagery approximately 1500m upstream of the road.

### **Background**

At the crossing location, the stream had good flow and is located within an area of old growth cedar adjacent to a recreation trail. At the time of the survey the stream was the highest volume tributary to Lizard Creek located on the east side of the valley. No fisheries information was available for the stream (MoE, 2020b), however, Lizard Creek supports westslope cutthroat trout, bull trout, mountain whitefish, brook trout, longnose sucker and longnose dace (MoE, 2020a).

PSCIS stream crossing 50159 was ranked as a high priority for follow up with habitat confirmation due to the relatively large size of the stream recorded in PSCIS (channel width = 3.5m) relative to other tributary streams in the Lizard Creek watershed and because it was rated as containing high value habitat by VAST Resource Solutions Inc. (2013) and Grainger (2011). The habitat

confirmation was completed on September 22, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082G.113.

## Stream Characteristics at Crossing

At the time of the survey, the un-embedded and non-backwatered 0.8m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 12m, a culvert slope of 8%, a stream width ratio of 3.1 and an outlet drop of 1.6m (Table 5.5). Water temperature was 10°C, pH was 7.6 and conductivity was 729uS/cm.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 150m to Lizard Creek. Overall, total cover amount was rated as moderate with large woody debris dominant. Cover was also present as small woody debris, deep pools, and overhanging vegetation (Table 5.2, Figure 5.2). The average channel width was 2.5m, the average wetted width was 2.3m and the average gradient was 8.8%. The dominant substrate was gravels with cobbles subdominant. Some small pools and steps of 0.2 - 0.6m in height were present throughout the area surveyed. Large woody debris steps ranging from 0.4 - 0.8m high were spaced sporadically throughout area surveyed. The stream contained relatively flatter sections from 3 - 8% and steeper sections of 15 - 18% for first 350m above culvert (UTM: 11 U 632810 5484842) where the stream becomes too steep for upstream salmonid passage (35%). Habitat value was rated as moderate for salmonid fry/juvenile rearing and high value habitat for spawning.

## Stream Characteristics Upstream

The stream was surveyed upstream from the culvert for 400m. Overall, total cover amount was rated as moderate with undercut banks dominant. Cover was also present as small woody debris, large woody debris, and deep pools (Table 5.2, Figure 5.3). The average channel width was 3m, the average wetted width was 2.6m and the average gradient was 11.2%. There were frequent areas of gravels suitable for resident westslope cutthroat trout spawning. Frequent pools to 40cm deep were present and associated with small and large woody debris. Habitat value was rated as high for fry and juvenile westslope cutthroat rearing.

## Structure Remediation and Cost Estimate

Structure replacement with a bridge is recommended to provide access to the habitat located upstream of PSCIS crossing 50159. The cost for the work is estimated at \$125000 for a cost benefit of \$0/linear m and \$0/m<sup>2</sup>.

## Conclusion

There is 0.3km of mainstem habitat upstream of crossing 50159 with habitat in the areas surveyed upstream of the crossing rated as high value for fry and juvenile salmonid rearing. The road may be part of the Island Lake Recreational tenure or solely the responsibility of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a high priority for proceeding to design for replacement with an open bottomed structure.



Figure 5.4: Typical habitat downstream of PSCIS crossing 50159.

Table 5.5: Summary of fish passage reassessment for PSCIS crossing 50159.

Location and Stream Data		Crossing Characteristics	-
Date	2020-09-22	Crossing Sub Type	Round Culvert
PSCIS ID	50159	Diameter (m)	0.8
External ID	NA	Length (m)	12
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
		Embedded (m)	
Easting	633320	Resemble Channel	No
Northing	5484601	Backwatered	No
Stream	Tributary to Lizard Creek	Percent Backwatered	NA
Road	Island Lake Lodge Road	Fill Depth (m)	1
Road Tenure	MoTi recreation	Outlet Drop (m)	1.6
Channel Width (m)	2.45	Outlet Pool Depth (m)	0
Stream Slope (%)	9	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	8
Habitat Value	Medium	Valley Fill	Deep Fill
Photos:			

Table 5.6: Summary of habitat details for PSCIS crossing 50159.

Location	Length Surveyed (m)	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value
Upstream	400	3.0	2.6	0.4	11.2	moderate	high
Downstream	150	2.5	2.3	0.2	8.8	moderate	high



Figure 5.5: Typical habitat upstream of PSCIS crossing 50159.



# Appendix - Crossing 50185

**River Rd - Tributary to Morrissey Creek**

## Site Location

Crossing 50185 is located on a tributary to Morrissey Creek, approximately 255m upstream from the confluence with Morrissey Creek. The crossing is located on River Road just south of Morrissey approximately 15km south of Fernie. The road is accessed off of Lodgepole FSR via the Morrissey Bridge over the Elk River adjacent to Highway 3. River Road is a gravel forest tenure road (forest file id 5466 with active log hauling at the time of the survey).

## Background

At the crossing location, the stream is 4th order with a watershed area upstream of the road of approximately 12km<sup>2</sup>. The elevation of the watershed ranges from a maximum of 2000 to 970m at the culvert. Upstream of the crossing, there are no anthropogenic barriers on the mainstem however PSCIS crossing 50181 (also recorded as PSCIS 103033) is documented as a barrier located on a significantly sized tributary entering the stream from the north-east approximately 2.8km upstream of River Road. A wetland type area is mapped at the top of the watershed (area NAha). No fisheries information was available for the stream (MoE, 2020b) however westslope cutthroat trout, bull trout, mountain whitefish, brook trout, longnose sucker and longnose dace have been recorded downstream in Morrissey Creek (MoE, 2020a).

PSCIS stream crossing 50185 was ranked as a high priority for follow up with habitat confirmation due to the large size of the stream relative to other tributary streams in the watershed, the previously rated moderate value habitat as rated by VAST Resource Solutions Inc. (2013). The habitat confirmation was completed on September 21, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082G.108.

## Stream Characteristics at Crossing

At the time of the survey, the un-embedded and non-backwatered 2.2m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 17m, a culvert slope of 3.4%, a stream width ratio of 2 and an outlet drop of 0m (Table 5.7). Water temperature was 9°C, pH was 7.6 and conductivity was 378uS/cm. It appeared as though fish passage restoration works had taken place at the site historically as there were what appeared to be boulder riffle structures installed downstream of the crossing. The structures appeared to be effective at reducing the outlet drop size but had created a rock drop (0.4m) and were not resulting in backwatering of the culvert.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 255m to the confluence with Morrissey Creek. The mouth of the stream is located approximately 500m upstream from the confluence of Morrissey Creek and the Elk River. Overall, total cover amount was rated as moderate with small woody debris dominant. Cover was also present as large woody debris, undercut banks, deep pools, and overhanging vegetation (Table 5.8, Figure 5.7). The average channel width was 4.3m, the average wetted width was 2.7m and the average gradient was 4.2%. The dominant substrate was cobbles with gravels subdominant. There were frequent pools formed by small and large woody debris ranging from 0.3 - 0.75m in depth (average residual depth = 0.4m). Pockets of small gravels suitable for resident salmonid spawning were also present. Habitat value was rated as high with good potential for fry/juvenile salmonid rearing.

## Stream Characteristics Upstream

The stream was surveyed upstream from the culvert for 740m. Overall, total cover amount was rated as moderate with small woody debris dominant. Cover was also present as large woody debris, undercut banks, deep pools, and overhanging vegetation (Table 5.8, Figure 5.8). The average channel width was 4m, the average wetted width was 2.8m and the average gradient was 6.2%. The dominant substrate was cobbles with gravels subdominant. The stream had good flows with fry observed throughout the area surveyed. Pools to 0.6m deep (average residual depth = 0.4m) were present with pockets of gravel suitable for spawning throughout. Infrequent large woody debris jams to 0.5m high were also observed. There were frequent areas of gravels suitable for resident westslope cutthroat trout spawning. Habitat value was rated as high for fry and juvenile westslope cutthroat trout rearing.

## Fish Sampling

To assess potential impacts of the culvert on fish densities in the stream electrofishing was conducted upstream and downstream of the crossing. Four sites were sampled upstream and five sites were sampled downstream. A total of 29 westslope cutthroat trout and 22 eastern brook trout were captured upstream with 26 westslope cutthroat trout and 3 eastern brook trout captured downstream (Figure 5.9). Raw results are included in digital format as Attachment 2 and summarized in Tables 5.9 - 5.10 and Figure 5.6.

## Structure Remediation and Cost Estimate

Structure replacement with an open bottomed culvert is recommended to provide unconstrained access to the habitat located upstream of PSCIS crossing 50185. The cost for work is estimated at \$125000 for a cost benefit of \$14400/linear m and \$30900/m<sup>2</sup>.

## Conclusion

There is an estimated 4.5km of mainstem habitat upstream of crossing 50185 with habitat in the areas surveyed upstream of the crossing rated as high value for fry and juvenile salmonid rearing. Fish sampling results indicated that densities of westslope cutthroat trout fry and parr were similar upstream and downstream of the crossing with a general trend of higher densities below the crossing for both life stages. River Road is under tenure of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a moderate priority for proceeding to design for replacement with an open bottomed structure.

Table 5.7: Summary of fish passage reassessment for PSCIS crossing 50185.

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-21	Crossing Sub	Round Culvert
PSCIS ID	50185	Diameter (m)	2.2
External ID	NA	Length (m)	17
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
Easting	645683	Resemble Channel	No
Northing	5469025	Backwatered	No
Stream	Tributary to Morrisey Creek	Percent Backwatered	NA
Road	River Rd	Fill Depth (m)	1.4
Road Tenure	FLNR 5466	Outlet Drop (m)	0
Channel Width (m)	4.3	Outlet Pool Depth (m)	0
Stream Slope (%)	4.3	Inlet Drop	No
Beaver Activity	No	Slope (%)	3.4
Habitat Value	High	Valley Fill	Deep Fill

Photos: 

Table 5.8: Summary of habitat details for PSCIS crossing 50185.

Location	Length Sur- veyed (m)	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value
Upstream	740	4.0	2.8	0.4	6.2	moderate	high
Downstream	255	4.3	2.7	0.4	4.2	moderate	high

Table 5.9: Electrofishing sites for PSCIS crossing 50185.

Site	Location	Width (m)	Length (m)	Area (m <sup>2</sup> )	Effort (s)	Effort (s/m <sup>2</sup> )
24	Downstream	2.70	40	108	361	3.3
25	Downstream	2.25	7	16	70	4.4
26	Downstream	2.60	3	8	36	4.5
27	Downstream	2.60	3	8	57	7.1
28	Downstream	3.10	7	22	170	7.7
29	Upstream	2.90	40	116	361	3.1
30	Upstream	2.67	13	35	123	3.5
31	Upstream	2.80	13	36	63	1.8
32	Upstream	4.47	18	80	223	2.8

Table 5.10: Westslope cutthroat trout densities (fish/100m<sup>2</sup>) for PSCIS crossing 50185.

Site	Location	Fry	Parr	Juvenile
24	Downstream	0.9	2.8	-
25	Downstream	18.8	-	-
26	Downstream	12.5	37.5	-
27	Downstream	-	25	12.5
28	Downstream	50	4.5	-
29	Upstream	4.3	0.9	-
30	Upstream	-	5.7	-
31	Upstream	2.8	-	-
32	Upstream	22.5	2.5	-

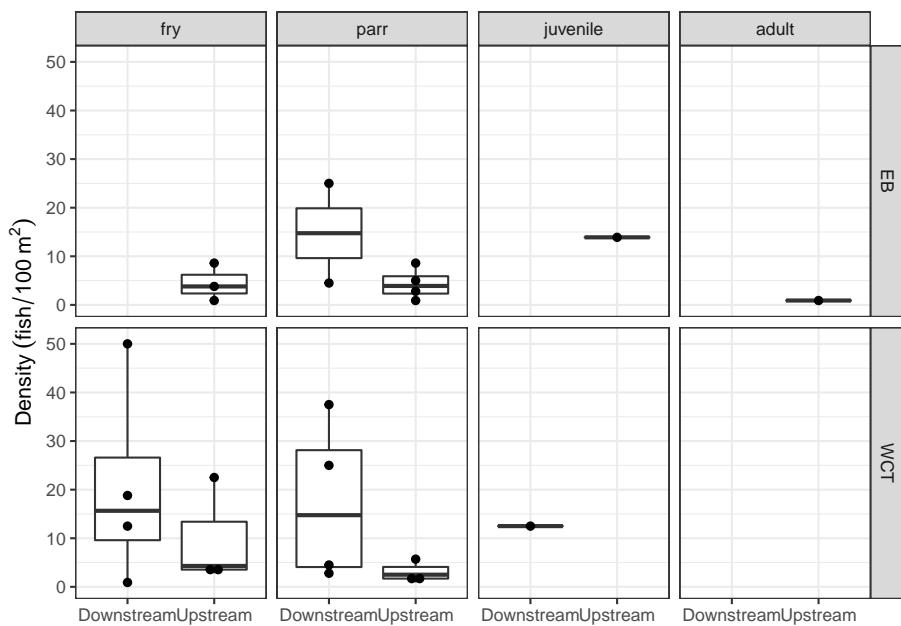


Figure 5.6: Fish densities (fish/100m<sup>2</sup>) for PSCIS crossing 50185.



Figure 5.7: Typical habitat downstream of PSCIS crossing 50185.



Figure 5.8: Typical habitat upstream of PSCIS crossing 50185.



Figure 5.9: Westslope cutthroat trout captured upstream of PSCIS crossing 50185.



# **Appendix - Crossings 62423 and 62424**

## **Grave Creek FSR - Tributary to Grave Creek**

### **Site Location**

PSCIS crossings 62423 and 62424 are located on tributary to Grave Creek, approximately 30m and 185m upstream from where Grave Creek splits into two channels with the majority of flow continuing up the valley in an east then south-east direction. Of note, although the subject stream is labelled as Grave Creek in the freshwater atlas the majority of stream flow is located in the other previously mentioned channel. Also of relevance, the confluence of Grave Creek and the other channel is located approximately 175 m to the west of where the confluence is mapped in the freshwater stream atlas due to the channel jumping its banks approximatley 375m upstream. Three PSCIS crossings (62427, 62428 and 62429) and one unassessed modelled crossing (modelled ID 4601159) are located upstream of 62424 however, there are very minimal quantities of potential habitat modelled upstream of their locations. Although mapped within the digital road atlas and not the forest tenure road layer it is suspected that the road on which both culverts are located is a Canfor Forest Products Ltd. forest tenure road as it is located immediately adjacent to another forest tenure road and is within an area that appears to be utilized for logging related activities.

### **Background**

Grave Creek is known to contain westslope cutthroat trout and bull trout downstream of the subject culverts and westslope cutthroat trout above (MoE, 2020a). Two habitat confirmation assessments were conducted downstream on the mainstem of Grave Creek in 2014 at PSCIS crossings 62421 and 62422

(Massee Environmental Consultants Ltd., 2015). Although Massee Environmental Consultants Ltd. (2015) recommended the culverts be left in place, based on consultation with Heather Lamson (MoE Fisheries Biologist), to prevent potential hybridization of westslope cutthroat trout upstream of the barrier with stocked rainbow trout reported in lower Grave Creek, both structures had been replaced with bridges at the time of the surveys. Designs and remediations of these crossings was not recorded in the PSCIS. Reassessments of these crossings was conducted by our team in 2020 and results will be loaded to PSCIS.

PSCIS stream crossings 62423 and 62424 were ranked as a moderate priorities for follow up with habitat confirmation due to the relatively large size of the stream network upstream (3.5km) and because they contained habitat rated as moderate value habitat by VAST Resource Solutions Inc. (2013). There is a bridge (PSCIS 197566) located on the Lazy Lizard recreation trail approximately 350m upstream of the crossing and an unassessed modelled crossing (modelled ID 4600929) approximately 950m upstream. Downstream approximately 400m there is a foot bridge (PSCIS 197544) on a recreational hiking/biking trail. The habitat confirmation was completed on September 20, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082G.124.

## Stream Characteristics at Crossing

The culvert located at PSCIS 62423 appeared to have been replaced in 2020 with fresh rock and road fill present. At the time of the survey, the un-embedded and non-backwatered 0.9m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 12m, a culvert slope of 0.5%, a stream width ratio of 1.6 and an outlet drop of 0.18m (Table ??). Water temperature was NA°C, pH was NA and conductivity was NAuS/cm.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 30m to Lizard Creek. Overall, total cover amount was rated as moderate with overhanging vegetation dominant. Cover was also present as small woody debris and boulders (Table ??, Figure ??). The average channel width was 1.3m, the average wetted width was NAm and the average gradient was 4%. The dominant substrate was cobbles with boulders subdominant. Adjacent to the historic road, on the right bank of stream, there was very limited shrub and tree riparian vegetation. Downstream of the crossing there were frequent sections of gravels suitable for salmonid spawning and no barriers or obstacles to fish passage. Habitat was rated as NA value for fry/juvenile salmonid rearing.

## **Stream Characteristics Upstream**

The stream was surveyed upstream from the culvert for 725m. Overall, total cover amount was rated as moderate with undercut banks dominant. Cover was also present as small woody debris, large woody debris, and boulders (Table 5.12, Figure ??). The average channel width was 1.2m, the average wetted width was 0.8m and the average gradient was 4.4%. There were abundant gravels suitable for resident westslope cutthroat trout spawning throughout (Figure ??). Fry were observed within the area surveyed to 540m upstream of the culvert where gradients increased to >20% for a distance of approximately 15m. Although no sampling was conducted, no fish were observed above this high gradient section. Habitat value was rated as NA for fry/juvenile salmonid rearing.

## **Structure Remediation and Cost Estimate**

Structure replacement with a bridge is recommended to provide access to the habitat located upstream of PSCIS crossing 62423. The cost for the work is estimated at \$25000 for a cost benefit of \$63100/linear m and \$45500/m<sup>2</sup>.

## **Conclusion**

There is NAkm of mainstem habitat upstream of crossing 62423 with habitat rated as high value for fry and juvenile salmonid rearing. The road may be part of the Island Lake Recreational tenure or solely the responsibility of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a low priority for proceeding to design for replacement.

Table 5.11: Summary of fish passage reassessment for PSCIS crossing 62423.

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-20	Crossing Sub	Round Culvert
		Type	
PSCIS ID	62423	Diameter (m)	0.9
External ID	NA	Length (m)	12
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
		Embedded (m)	
Easting	660508	Resemble	No
		Channel	
Northing	5524239	Backwatered	No
Stream	Tributary to	Percent	NA
	Grave Creek	Backwatered	
Road	Grave Creek	Fill Depth (m)	0.3
	FSR		
Road Tenure	Unknown	Outlet Drop	0.18
		(m)	
Channel Width	1.44	Outlet Pool	0.6
(m)		Depth (m)	
Stream Slope	4	Inlet Drop	Yes
(%)			
Beaver Activity	No	Slope (%)	0.5
Habitat Value	Low	Valley Fill	Deep Fill
Photos:			

Table 5.12: Summary of habitat details for PSCIS crossing 62423.

Location	Length	Channel	Wetted	Pool	Gradient	Total	Habitat
Sur-	Width	Width	Depth	(%)	Cover	Value	
veyed	(m)	(m)	(m)				
Downstream	30	1.3	-	-	4.0	moderate-	
Upstream	725	1.2	0.8	0.2	4.4	moderate-	

# **Appendix - Crossings 62425 and 62426**

## **Spur - Grave Creek**

### **Site Location**

PSCIS crossings 62425 and 62426 are located on Grave Creek, approximately 75m and 185m upstream from where Grave Creek splits into two channels with the majority of flow continuing up the valley in an east then south direction. Although the subject stream is labeled as Grave Creek in the freshwater atlas 1:20,000 stream layer, the majority of stream flow is located in the other channel. Also of relevance, the confluence of Grave Creek and the valley channel is located approximately 175 m to the west of where the confluence is mapped due to a channel redirection upstream approximately 375m upstream that appears to have occurred due to a large woody debris jam. Three PSCIS crossings (62427, 62428 and 62429) and one unassessed modelled crossing (modelled ID 4601159) are located upstream of 62426 however, there are very minimal quantities of potential habitat upstream of their locations. Although mapped within the digital road atlas it is suspected that the road on which both culverts are located is a forest tenure road (Canfor Forest Products Ltd. tenure) as it is located immediately adjacent to another forest tenure road and within an area utilized for forestry.

### **Background**

Grave Creek is known to contain westslope cutthroat trout and bull trout downstream of the subject culverts and westslope cutthroat trout above (MoE, 2020a). Two habitat confirmation assessments were conducted downstream on the mainstem of Grave Creek in 2014 at PSCIS crossings 62421 and 62422

(Massee Environmental Consultants Ltd., 2015). Although Massee Environmental Consultants Ltd. (2015) recommended the culverts be left in place, based on consultation with Heather Lamson (MoE Fisheries Biologist), to prevent potential hybridization of westslope cutthroat trout upstream of the barrier with stocked rainbow trout reported in lower Grave Creek, both structures had been replaced with bridges at the time of the surveys. Designs and remediations of these crossings was not recorded in the PSCIS. Reassessments of these crossings was conducted by our team in 2020 and results will be loaded to PSCIS. During survey, Lotic Environmental Ltd. field teams were encountered conducting two-pass closed site electrofishing.

PSCIS stream crossings 62425 and 62426 were ranked as a moderate priorities for follow up with habitat confirmation due to the relatively large size of the stream network upstream (3.5km) and because they contained habitat rated as moderate value habitat by VAST Resource Solutions Inc. (2013). There is a bridge (PSCIS 197566) located on the Lazy Lizard recreation trail approximately 350m upstream of the crossing and an unassessed modelled crossing (modelled ID 4600929) approximately 950m upstream. Downstream approximately 400m there is a foot bridge (PSCIS 197544) on a recreational hiking/biking trail. The habitat confirmation was completed on September 20, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082G.124.

## Stream Characteristics at Crossing

The culvert located at PSCIS 62425 appeared to have been replaced in 2020 with fresh rock and road fill present. At the time of the survey, the un-embedded and non-backwatered 1.2m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 12m, a culvert slope of 7.5%, a stream width ratio of 3.1 and an outlet drop of 0.47m (Table 5.13). Water temperature was 8°C, pH was 7.8 and conductivity was 370uS/cm.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 75m to Lizard Creek. Overall, total cover amount was rated as moderate with deep pools dominant. Cover was also present as small woody debris, large woody debris, boulders, undercut banks, and overhanging vegetation (Table 5.14, Figure 5.10). The average channel width was 3.7m, the average wetted width was 1.8m and the average gradient was 7.5%. The dominant substrate was cobbles with boulders subdominant. Adjacent to the historic road, on the right bank of stream, there was very limited shrub and tree riparian vegetation. Downstream of the crossing there were frequent sections of gravels suitable for salmonid spawning

and no barriers or obstacles to fish passage. Habitat was rated as NA value for fry/juvenile salmonid rearing.

## **Stream Characteristics Upstream**

The stream was surveyed upstream from the culvert for 170m. Overall, total cover amount was rated as moderate with deep pools dominant. Cover was also present as large woody debris and boulders (Table 5.14, Figure 5.11). The average channel width was 3.5m, the average wetted width was 2.1m and the average gradient was 5%. There were abundant gravels suitable for resident westslope cutthroat trout spawning throughout (Figure 5.12). Fry were observed within the area surveyed to 540m upstream of the culvert where gradients increased to >20% for a distance of approximately 15m. Although no sampling was conducted, no fish were observed above this high gradient section. Habitat value was rated as NA for fry/juvenile salmonid rearing.

## **Structure Remediation and Cost Estimate**

Structure replacement with a bridge is recommended to provide access to the habitat located upstream of PSCIS crossing 62425. The cost for the work is estimated at \$125000 for a cost benefit of \$13500/linear m and \$24900/m<sup>2</sup>.

## **Conclusion**

There is NAkm of mainstem habitat upstream of crossing 62425 with habitat rated as high value for fry and juvenile salmonid rearing. The road may be part of the Island Lake Recreational tenure or solely the responsibility of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a moderate priority for proceeding to design for replacement.

Table 5.13: Summary of fish passage reassessment for PSCIS crossing 62425.

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-20	Crossing Sub Type	Round Culvert
PSCIS ID	62425	Diameter (m)	1.2
External ID	NA	Length (m)	12
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
Easting	661486	Embedded (m)	
Northing	5524426	Resemble Channel	No
Stream	Grave Creek	Backwatered	No
Road	Spur	Percent Backwatered	NA
Road Tenure	Canfor R08362	Fill Depth (m)	1
Channel Width	3.7	Outlet Drop (m)	0.47
Stream Slope	7.5	Outlet Pool Depth (m)	0.38
Beaver Activity	No	Inlet Drop	Yes
Habitat Value	Medium	Slope (%)	7.5
Photos:			

Table 5.14: Summary of habitat details for PSCIS crossing 62425.

Location	Length Surveyed (m)	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value
Upstream	170	3.5	2.1	0.3	5.0	moderate-	
Downstream	75	3.7	1.8	0.3	7.5	moderate-	



Figure 5.10: Typical habitat downstream of PSCIS crossing 62425.



Figure 5.11: Typical habitat upstream of PSCIS crossing 62425 and downstream of PSCIS crossing 62426.



Figure 5.12: Grave Creek redirection out of historic channel located upstream of PSCIS crossing 62426.



# Appendix - Crossing 62516

## **Island Lake Lodge Road - Tributary to Lizard Creek**

### **Site Location**

Crossing 62516 is located on a tributary to Lizard Creek, approximately 630m upstream from the confluence with Lizard Creek. This culvert has also been recorded in PSCIS as crossing 50153. The stream has been diverted from its historic channel and runs adjacent to a historic road to Lizard Creek approximately 500 downstream of the location of the confluence in the freshwater atlas. Island Lake Lodge Road is an extension of Mt.Fernie Park Road which is accessed from Highway 3 within Fernie city limits. The Mt.Fernie Provincial Park is a popular recreational destination for hikers, sightseers and mountain bikers. Island Lake Lodge is located at 1400m of elevation near Island Lake and is a year round tourist destination providing accommodations, guided hiking and backcountry catskiing.

### **Background**

At the crossing location, the stream had good flow and is located within an area of old growth cedar adjacent to a recreation trail. At the time of the survey the stream was the highest volume tributary to Lizard Creek located on the east side of the valley. No fisheries information was available for the stream (MoE, 2020b). Downstream however, Lizard Creek supports westslope cutthroat trout, bull trout, mountain whitefish, brook trout, longnose sucker and longnose dace (MoE, 2020a).

PSCIS stream crossing 62516 was ranked as a high priority for follow up with habitat confirmation due to the relatively large size of the stream recorded in PSCIS (channel width = 3.5m) relative to other tributary streams in the Lizard Creek watershed and because it was rated as containing high value habitat by VAST Resource Solutions Inc. (2013) and Grainger (2011). There is a

bridge (PSCIS 197566) located on the Lazy Lizard recreation trail approximatley 350m upstream of the crossing and an unassessed modelled crossing (modelled ID 4600929) approximately 950m upstream. Downstream approximately 400m there is a foot bridge (PSCIS 197544) on a recreational hiking/biking trail. The habitat confirmation was completed on September 23, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082G.113.

## Stream Characteristics at Crossing

The culvert located at PSCIS 62516 appeared to have been replaced in 2020 with fresh rock and road fill present. At the time of the survey, the un-embedded and non-backwatered 1.2m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 11m, a culvert slope of 5%, a stream width ratio of 2.1 and an outlet drop of 0.49m (Table 5.15). Water temperature was 9°C, pH was 7.9 and conductivity was 333uS/cm.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 630m to Lizard Creek. Overall, total cover amount was rated as moderate with deep pools dominant. Cover was also present as small woody debris, large woody debris, undercut banks, and overhanging vegetation (Table 5.16, Figure 5.13). The average channel width was 2.5m, the average wetted width was 1.4m and the average gradient was 2.7%. The dominant substrate was gravels with cobbles subdominant. Adjacent to the historic road, on the right bank of stream, there was very limited shrub and tree riparian vegetation. Downstream of the crossing there were frequent sections of gravels suitable for salmonid spawning and no barriers or obstacles to fish passage. Habitat was rated as high value for fry/juvenile salmonid rearing.

## Stream Characteristics Upstream

The stream was surveyed upstream from the culvert for 730m. Overall, total cover amount was rated as moderate with undercut banks dominant. Cover was also present as small woody debris, large woody debris, deep pools, and overhanging vegetation (Table 5.16, Figure 5.13). The average channel width was 2m, the average wetted width was 1.3m and the average gradient was 7.6%. There were abundant gravels suitable for resident westslope cutthroat trout spawning throughout (Figure 5.13). Fry were observed within the area surveyed to 540m upstream of the culvert where gradients increased to >20% for a distance of approximately 15m. Although no sampling was conducted, no fish

were observed above this high gradient section. Habitat value was rated as high for fry/juvenile salmonid rearing.

## Structure Remediation and Cost Estimate

Structure replacement with a bridge is recommended to provide access to the habitat located upstream of PSCIS crossing 62516. The cost for the work is estimated at \$125000 for a cost benefit of \$5000/linear m and \$6100/m<sup>2</sup>.

## Conclusion

There is 0.5km of mainstem habitat upstream of crossing 62516 with habitat rated as high value for fry and juvenile salmonid rearing. The road may be part of the Island Lake Recreational tenure or solely the responsibility of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a moderate priority for proceeding to design for replacement.



Figure 5.13: Typical habitat downstream of PSCIS crossing 62516.

Table 5.15: Summary of fish passage reassessment for PSCIS crossing 62516.

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-23	Crossing Sub Type	Round Culvert
PSCIS ID	62516	Diameter (m)	1.2
External ID	NA	Length (m)	11
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
		Embedded (m)	
Easting	636123	Resemble Channel	No
Northing	5484087	Backwatered	No
Stream	Tributary to Lizard Creek	Percent Backwatered	NA
Road	Island Lake Lodge Road	Fill Depth (m)	1.3
Road Tenure	MoTi recreation	Outlet Drop (m)	0.49
Channel Width (m)	2.47	Outlet Pool Depth (m)	0.8
Stream Slope (%)	2.67	Inlet Drop	No
Beaver Activity	No	Slope (%)	5
Habitat Value	Medium	Valley Fill	Deep Fill
Photos:			

Table 5.16: Summary of habitat details for PSCIS crossing 62516.

Location	Length Surveyed (m)	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value
Upstream	730	2.0	1.3	0.3	7.6	moderate	high
Downstream	630	2.5	1.4	0.4	2.7	moderate	high



Figure 5.14: Typical habitat upstream of PSCIS crossing 62516.



Figure 5.15: Gravels suitable for spawning upstream of PSCIS crossing 62516.

# Appendix - Crossing 197555

## **Elk River FSR - Tributary to Elk River**

### **Site Location**

Crossing 197555 is located on a tributary to Elk River, approximately 900m upstream from the confluence with the Elk River. The crossing is located on the Elk River FSR approximately 10km north of Elkford, BC. The Elk River FSR is a gravel forest tenure road (forest file id 0103 with active log hauling at the time of the survey).

### **Background**

At the crossing location, the stream is 4th order with a watershed area upstream of the road of approximately 17km<sup>2</sup>. The elevation of the watershed ranges from a maximum of 2900 to 1400m at the culvert. Upstream of the crossing, there are no anthropogenic barriers on the mainstem. Although there are two modelled crossings on small tributaries that enter the stream approximately 1.5km upstream of the road, machinery operators encountered onsite indicated that they had been removed during road deactivation. No fisheries information was available for the stream (MoE, 2020b) however westslope cutthroat trout, bull trout, mountain whitefish, brook trout, longnose sucker and longnose dace (among other species) have been recorded downstream in the Elk River (MoE, 2020a).

PSCIS stream crossing 197555 was ranked as a high priority for follow up with habitat confirmation due to the large amount of habitat modelled upstream of the crossing. The habitat confirmation was completed on September 16, 2020. A map of the watershed including areas surveyed is provided in Attachment 1 – Map 082J.103.

## Stream Characteristics at Crossing

At the time of the survey, the un-embedded and non-backwatered 1.5m diameter crossing was considered a barrier to upstream fish passage with a pipe length of 49m, a culvert slope of 3.5%, a stream width ratio of 2.3 and an outlet drop of 1.48m (Table 5.17). Water temperature was 6°C, pH was 7.2 and conductivity was 378uS/cm.

## Stream Characteristics Downstream

The stream was surveyed downstream from the culvert for 700m. Overall, total cover amount was rated as moderate with deep pools dominant. Cover was also present as small woody debris, large woody debris, boulders, and overhanging vegetation (Table 5.18, Figure 5.16). The average channel width was 4.4m, the average wetted width was 3.1m and the average gradient was 3.6%. The dominant substrate was cobbles with gravels subdominant. There were frequent pools formed by small and large woody debris ranging from 0.3 - 0.75m in depth (average residual depth = 0.4m). Frequent pockets of gravels suitably sized for resident and fluvial salmonid spawning were also present. Habitat value was rated as high with good potential for fry/juvenile salmonid rearing.

## Stream Characteristics Upstream

The stream was surveyed upstream from the culvert for 675m. Overall, total cover amount was rated as abundant with boulders as the dominant type. Cover was also present as small woody debris, large woody debris, undercut banks, deep pools, and overhanging vegetation (Table 5.18, Figure 5.17). The average channel width was 5.9m, the average wetted width was 3.8m and the average gradient was 5.9%. The dominant substrate was cobbles with boulders subdominant. The stream had good flows with fry observed throughout the area surveyed. Pools to 0.6m deep (average residual depth = 0.4m) were present with pockets of gravel suitable for spawning throughout. Infrequent large woody debris jams to 0.5m high were also observed. Pockets of gravel suitable for resident and fluvial salmonid spawning were present throughout the area surveyed. Habitat value was rated as high for fry and juvenile westslope cutthroat trout and bull trout rearing.

## Fish Sampling

To assess potential impacts of the culvert on fish communities in the stream, electrofishing was conducted upstream and downstream of the crossing. One

150m site was sampled upstream and one 315m site was sampled downstream. One bull trout was captured downstream and no fish were captured upstream (Figure 5.18). Raw results are included in digital format as Attachment 2 and summarized in Table 5.19.

## Structure Remediation and Cost Estimate

Structure replacement with an open bottomed culvert is recommended to provide access to the habitat located upstream of PSCIS crossing 197555. Due to the large amount of fill on the road (8) the size of a replacement bridge was estimated at 25m. The cost for work is estimated at \$312000 for a cost benefit of \$21900/linear m and \$38400/m<sup>2</sup>.

## Conclusion

There is an estimated 6km of mainstem habitat upstream of crossing 197555 with habitat in the areas surveyed upstream of the crossing rated as high value for fry and juvenile salmonid rearing. However, fish sampling results indicate that westslope cutthroat trout are not currently utilizing the stream and densities of bull trout are very low. This could be the result of the cold water conditions due to the positioning of the watershed at high elevation in the generally cold Rocky Mountain setting. Elk River FSR is a forest tenure licensee road of the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. The crossing was ranked as a moderate priority for proceeding to design for replacement with an open bottomed structure.

Table 5.17: Summary of fish passage reassessment for PSCIS crossing 197555.

Location and Stream Data	-	Crossing Characteristics	-
Date	2020-09-16	Crossing Sub Type	Round Culvert
PSCIS ID	197555	Diameter (m)	1.5
External ID	NA	Length (m)	49
Crew	KP, AI	Embedded	No
UTM Zone	11	Depth	NA
		Embedded (m)	
Easting	646735	Resemble Channel	No
Northing	5554534	Backwatered	No
Stream	Tributary to Elk River	Percent Backwatered	NA
Road	Elk River FSR	Fill Depth (m)	8
Road Tenure	FLNR 0103	Outlet Drop (m)	1.48
Channel Width (m)	3.5	Outlet Pool Depth (m)	1.3
Stream Slope (%)	1.5	Inlet Drop	Yes
Beaver Activity	No	Slope (%)	3.5
Habitat Value	High	Valley Fill	Deep Fill

Photos: 

Table 5.18: Summary of habitat details for PSCIS crossing 197555.

Location	Length Surveyed (m)	Channel Width (m)	Wetted Width (m)	Pool Depth (m)	Gradient (%)	Total Cover	Habitat Value
Upstream	675	5.9	3.8	0.4	5.9	abundant	high
Downstream	700	4.4	3.1	0.4	3.6	moderate	high

Table 5.19: Electrofishing sites for PSCIS crossing 197555.

Site	Location	Width (m)	Length (m)	Area (m <sup>2</sup> )	Effort (s)	Effort (s/m <sup>2</sup> )
4	Downstream	3.1	315	976	550	0.6
3	Upstream	3.8	150	570	177	0.3



Figure 5.16: Typical habitat downstream of PSCIS crossing 197555.



Figure 5.17: Typical habitat upstream of PSCIS crossing 197555.



Figure 5.18: Bull trout captured downstream of PSCIS crossing 197555.



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