


Upper Lillooet Hydro Project

Weekly Environmental Monitoring Report #89

Reporting Period: February 28 – March 12, 2016

Upper Lillooet River Hydroelectric Facility (Water File No. 2002561, Water licence No. C130613), Boulder Creek Hydroelectric Facility (Water File No. 2003049, Water licence No. C129969) & Transmission Line (TX Line)

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Owner Construction Permits and Approvals

Environmental Assessment Certificate No. E13-01 (Amendment 1, 2, 3, 4, 5, 6, 7)
 Fisheries Act Subsection 35(2)(b) Authorization No. 09-HPAC-PA2-000303 (Amendment 1, 2)
 Letter of Advice for the Transmission Line No. 09-HPAC0-PA2-000303
 Leave To Commence Construction (ULRHEF) File No. 2002561
 Leave To Commence Construction (BDRHEF) File No. 2002453
 Leave To Commence Construction (TX Line) File No. 2002561/2002453
 Conditional Water Licence (ULRHEF C130613) File No. 2002561
 Conditional Water Licence (BDRHEF C129969) File No. 2002453
 Conditional Water Licence (BDRHEF C131153) File No. 2003601
 Licence of Occupation (ULRHEF #232384) File No. 2409871
 Licence of Occupation (BDRHEF #232386) File No. 2409998
 Licence of Occupation (TX Line #2423386) File No. 2410654
 Occupant Licence to Cut (ULRHEF) No. L49717 (Amendments 1, 2, 3, 4, 5, 6, 7)
 Occupant Licence to Cut (BDRHEF – KM 38 laydown) No. L49698
 Occupant Licence to Cut (BDRHEF) No. L49816 (Amendments 1, 2, 3)
 Occupant Licence to Cut (TX Line) No. L49697 (Amendments 1, 2, 3, 4, 5, 6, 7, 8, 9)
 General Wildlife Measure Exemption Approval Letter (TX Line & BDRHEF) File No. 78700-35/06 UWR and 39585-20 WHA
 Heritage Conservation Act – Alteration Permit (ULRHEF) File No. 11200-03/2014-0033
 Road Use Permit No. 6123-13-02 (Lillooet River FSR); 5673-13-01 (Rutherford Creek FSR); 7977-13-01 (Lillooet South FSR); 8015-13-01 (Ryan River); 8188-13-01 (Pemberton Creek FSR); and 9717-13-01 (Miller Bench FSR)
 Junction Permit (ULRHEF & BDRHEF) File No. 11250-32/6123 (Amendment 1)
 Aeronautical Obstruction Approval (Tx Line - Lillooet River Crossing) File No. 2013-004
 Aeronautical Obstruction Approval (Tx Line - Ryan River) File No. 2013-005
 Aeronautical Obstruction Approval (Tx Line - North Miller) File No. 2013-006
 Aeronautical Obstruction Approval (Tx Line - South Miller) File No. 2013-007
 Aeronautical Obstruction Approval (Tx Line - Pemberton Creek) File No. 2013-008
 Aeronautical Obstruction Approval (Tx Line - Lillooet River near Pemberton) File No. 2013-009
 Aeronautical Obstruction Approval (Tx Line - Lillooet River near Meager Creek) File No. 2013-010
 Navigable Water Protection Act (ULRHEF) File No. 8200-2009-500434-001
 Navigable Water Protection Act (BDRHEF) File No. 8200-2012-501-032-001
 Navigable Water Protection Act (Tx Line – North Creek) File No. 8200-2013-500103-001
 Navigable Water Protection Act (Tx Line – Lillooet River) File No. 8200-2013-500101-001
 Navigable Water Protection Act (Tx Line – Lillooet River) File No. 8200-2013-500102-01
 Navigable Water Protection Act (Tx Line – Ryan River) File No. 8200-2013-500104-001
 Navigable Water Protection Act (Tx Line – South Miller River) File No. 8200-2013-500100-001
 Navigable Water Protection Act (Tx Line – Boulder Creek) File No. 8200-2013-500099-001
 Navigable Water Protection Act – Extension Approval (ULRHEF, BDRHEF, Tx Line)
 Navigable Water Protection Act (Bridge – Ryan River) File No. 8200-2013-500381
 Navigable Water Protection Act (Bridge – Upper Lillooet Side Channel; Extension Approval) File No. 8200-2013-500383
 Section 57 Authorization (ULRHEF) File No. 16660-20/REC202717
 SLRD Temporary Use Permit No. 34 – Boulder Creek HEF
 SLRD Temporary Use Permit No. 35 – Upper Lillooet River HEF
 SLRD Building Permit (10864) – Upper Lillooet River HEF Powerhouse
 SLRD Building Permit (10865) – Boulder Creek HEF Powerhouse
 Works Permit for Construction within FSR Right-of-Way No. 6123-14-01
 Works Permit for Construction within FSR Right-of-Way No. 7977-15-01
 Section 52(1)(b) FRPA Authorization for Ryan River Wet Crossing File No. FOR-19400-01/2014
 MOTI Permit to Construct, Use and Maintain Works Upon the Right-Of-Way of a Provincial Public Highway No. 2014-06099
 Magazine Licence File No. UL76018 (Renewal 1)
 Section 8 Approval – Short Term Use of Water File (Lillooet River and Tributaries) No. A2006123 (Amendment 1)
 Section 8 - Special Use Permit issued for the operation of an avalanche weather station on Crown land (File No. S25988)

Contractor Construction Permits and Approvals

Waste Discharge under the Code of Practice for the Concrete and Concrete Products Industry under the Environmental Management Act (Authorization No. 107204) Tracking No. 326969 (Renewal 1)
Wildlife Act Permits – Pacific Tailed Frog Salvage Permit # SU15-164805; Fish Salvage Permit # SU15-174722
Fisheries and Oceans Canada – Anadromous Fish Salvage Permit #XR 178 2015
BC Safety Authority – Temporary Construction Electrical Service Permit EL-140698-2014
Municipal Wastewater Regulation - Authorization # 107032
Water Supply System Construction Permits – VCH-14-613 for Main Camp
Water Supply System Permit to Operate Issued July 30th, 2014 for Main Camp
Section 6(3) and Schedule 3 Wildfire Regulations Fire Exemption for Ryan River Bridge File No. 14350-07
SLRD Building Inspection Report dated August 13, 2014 - Construction Camp Building Permit No. 10830
Lillooet River FSR Temporary Road Closures Approval File No. 11250-32/6123 (Amendment 1, 2)
Lillooet South FSR Temporary Road Closures Approval File No. 11250-32/7977
SLRD Building Permits for Mechanic Shop (10862) and Carpentry Shop (10836) March 18, 2015
SLRD Building Permit Stages 1 - 4 – Boulder Powerhouse Architectural, Electrical and Mechanical (10865) October 8, 2015
SLRD Building Permit Stages 1 - 4 – Upper Lillooet Powerhouse Architectural and Mechanical (10864) October 6, 2015

ACRONYMS:

AMBNS	Active Migratory Bird Nesting Survey	IE	Independent Engineer (True North Energy)
Andritz	Andritz Hydro Canada Inc.	IEM	Independent Environmental Monitor
ANFO	Ammonia nitrate fuel oil (industrial explosive)	INX	Innergex Renewable Energy Inc.
ASMP	Archaeological Sites Management Plan	ISW	Instream Works
ARD M/L	Acid Rock Drainage and Metal Leaching	ITM	Environmental Issue Tracking Matrix
BCEAO	British Columbia Environmental Assessment Office	JEM	JEM Energy Ltd. (Delegate Independent Engineer)
BCWQG	British Columbia Water Quality Guidelines	LTC	Leave to Construct
BDRHEF	Boulder Creek Hydroelectric Facility	MFLNRO	Ministry of Forests, Lands and Natural Resource Operations
BG	Background	MOE	Ministry of Environment
BKL	BKL Consultants Ltd.	MOTI	Ministry of Transportation and Infrastructure
CE	CRT-ebc Construction Inc.	OLTC	Occupational License to Cut
CEMP	Construction Environmental Management Plan	PAG	Potentially Acid Generating
CTF	Coastal Tailed Frog	ROW	Right of Way
DFO	Fisheries and Oceans Canada	RVMA	Riparian Vegetation Management Area
DS	Downstream	SES	Sartori Environmental Services
EAC	Environmental Assessment Certificate	SLRD	Squamish-Lillooet Regional District
EAO	Environmental Assessment Office	Stringer Line	Temporary Backfeed Transmission Line
Ecofish	Ecofish Research Ltd.	TX Line	Transmission Line
Ecologic	Ecologic Consulting	ULRHEF	Upper Lillooet Hydroelectric Facility
EIR	Environmental Incident Report	UWR	Ungulate Winter Range
ESC	Erosion and Sediment Control	VC	Valued Component
FAM	Field Advice Memorandum	WEL	Westpark Electric Ltd.
FSR	Forest Service Road	WEMR	Weekly Environmental Monitoring Report
Golder	Golder Associates	WHA	Wildlife Habitat Area
GWR	Mountain Goat Winter Range	WQ	Water Quality
Hedberg	Hedberg and Associates Ltd.		
HWM	High water mark		

1.0 Summary of Site Inspections for Reporting Period

The table presented below summarizes the IEM team site presence, weather and monitoring locations by component:

Date	IEM Team Personnel	Key Monitoring Locations & Activities
February 28 – March 5, 2016	SE, DA, ML, AS	<p>Construction Camp, Laydown Areas and the Lillooet River FSR</p> <ul style="list-style-type: none"> • Road maintenance on the Lillooet River FSR • Ditching along FSR from KM42.5 – 48 • Silt fence installation at KM43.5 culvert (Mar 5, 2016) <p>ULRHEF Intake & Upstream Tunnel</p> <ul style="list-style-type: none"> • Preparation for starting excavation in class 4CT material and installation of the umbrella support system • Kickoff meeting for excavation in class 4CT material. Work began on consolidation with canopy tube grouting (Mar 3, 2016) • Delivery and installation of bulk CO₂ system (Mar 2, 2016) <p>ULRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization (including shotcrete) • Ditching down access road and installation of T culvert into oil/water separator (Feb 28 – Mar 1, 2016) <p>ULRHEF Powerhouse</p> <ul style="list-style-type: none"> • Dewatering of clean ground water seepage to the Lillooet River • Construction activity is on hold <p>BDRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization <p>BDRHEF Powerhouse</p> <ul style="list-style-type: none"> • Electrical component installation <p>TX-Line</p> <ul style="list-style-type: none"> • No activity
March 6 – 12, 2016	SE, DA, AS	<p>Construction Camp, Laydown Areas and the Lillooet River FSR</p> <ul style="list-style-type: none"> • Ditching from KM41-46 (Mar 6-7, 2016) • Snowbank removal from KM45.5 -48 (Mar 6-11, 2016) • Road capping from KM41.5-42 and KM45 – 46.5 (Mar 8-11, 2016) • Testing of a new shotcrete wand at the Crusher Pad (Mar 12, 2016) <p>ULRHEF Intake & Upstream Tunnel</p> <ul style="list-style-type: none"> • Grouting of canopy tubes (Mar 9, 2016) • Drilling and blasting of first 3m class 4CT material (Mar 10, 2016) • Mucking and tunnel stabilization with umbrella support system <p>ULRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization (including shotcrete) <p>ULRHEF Powerhouse</p> <ul style="list-style-type: none"> • Dewatering of clean ground water seepage to the Lillooet River • Removal of formwork from around the manifold (Mar 8-12, 2016) <p>BDRHEF Downstream Tunnel Portal</p> <ul style="list-style-type: none"> • Drilling, blasting and tunnel stabilization <p>BDRHEF Powerhouse</p> <ul style="list-style-type: none"> • Electrical component installation <p>TX-Line</p> <ul style="list-style-type: none"> • No activity

IEM Team Personnel: TH – Tom Hicks; SS – Stephen Sims; DA – Danita Abraham; SE – Stephanie Ellis; AS – Anne Sutherland; ML – McKenzie Lee

2.0 Administrative Summary

Key communications and meetings the IEM team had with the licensees, contractors and/or environmental authorities:

Date	Communication Type	Participants	Issues Discussed	ITM ID No.
March 2	<i>Email</i>	SES, INX, FLNRO, JEM, Ecofish, CE	SES distributed mountain goat observation forms from January 18 – February 29, 2016. Poor visibility affected a large portion of the monitoring period. A mountain goat inventory flight conducted by MFLNRO triggered the noise monitoring equipment located in UL11 UWR at Keyhole Falls.	-
March 2 & 3	<i>Site communications & Email</i>	SES, CE, INX	On March 2, SES measured a temporary pH exceedance in the water discharging from the ULRHEF lower tunnel portal water treatment system. CE was advised of the exceedance and responded immediately returning water quality to within allowable limits within 2 hours of the initial observation (See Section 4.5 for detailed WQ sampling results). The cause of the failure was found to be the CO ₂ injection system, which had run-out of CO ₂ prematurely. SES followed-up by email on March 3, and CE confirmed that they would be more vigilant with the monitoring of CO ₂ levels to ensure the system has a constant supply of CO ₂ to allow for effective pH buffering.	-
March 3	<i>Pre-work meeting</i>	SES, INX, CE	A pre-work meeting was held to review the work plan and discuss water quality management during excavation and consolidation of class 4CT material in the ULRHEF upstream tunnel.	-
	<i>Email</i>	INX, SES	INX notified the IEM that Blackmount Logging began road construction and forestry operations (including falling) within the Ryan River drainage began March 3.	-
March 4	<i>Email</i>	CE, SES, INX	CE informed the IEM and INX that they had identified and addressed road drainage and erosion at the outlet of the culvert in the CTF stream located at KM43.5 of the Lillooet River FSR. The area is currently stable from the cross ditching installed; however some repairs are required that may require CTF salvage prior to performing the works. As the area is temporarily stabilized issue ULR#44 is considered closed and the future repair will be tracked in the upcoming works section	ULR#44
March 7	<i>Email</i>	SES, CE, INX, Snowline safety	Avalanche control work conducted on the morning of March 7 resulted in a short exceedance of the noise level threshold of 75dBA within the mountain goat migration corridor at the Upper Truckwash monitoring station. The blast charge weights were minimized to the extent possible and blasting occurred outside of the mountain goat migration corridor and UWRs. A slight noise level exceedance (Max = 76.1 dBA) was also caused by the helicopter involved in the avalanche control work. Snowline Safety was advised of the exceedance and will review the flight paths and flight minimum heights with the pilot prior to the next control mission.	-

Date	Communication Type	Participants	Issues Discussed	ITM ID No.
			The IEM feels that appropriate noise mitigation measures were employed during these avalanche control works.	
March 8 & 9	<i>Email</i>	INX, SES, CE	On March 9, CE responded to the Field Advice Memo #9 that SES issued on March 8. CE committed to keeping the garbage bins at KM48 (and all around site) free of domestic waste. Signage has been posted on the bins reminding workers to not dispose of domestic waste in construction bins. Superintendents and foremen were reminded of the importance of proper disposal of domestic waste, especially as the end of the grizzly and black bear hibernation period approaches.	ULR#45
March 12	<i>Email</i>	SES, INX, CE	CE informed the IEM and INX that a small slide of snow and material caused the failure of the outside wall of one of the sediment ponds located adjacent to the penstock alignment. The ponds were not in use at the time; however, they contained some water which flowed through the collapsed wall towards stream ASTR-03. It appears from initial inspection that the water did not reach the watercourse and no environmental damage was caused by the event.	-

3.0 Current Work Restrictions and Timing Windows

The table presented below outlines work restrictions applicable during the reporting period for each active Project component location:

Component	Location	Wildlife/Archeology Concern	Construction/Timing Restrictions & Mitigations
Lillooet River FSR & ULRHEF	Access roads above the lower limit of the 200m buffer Truckwash Creek Migration Corridor to the ULRHEF intake	Mountain Goat UWR & Migration Corridor	<p>Noise monitoring equipment is in place to monitor background noise levels and exceedances of the 75dba noise level maximum resulting from blasting activities. Adaptive drilling/blasting noise mitigation strategies will be developed and implemented should activities show persistent exceedances of the noise level threshold.</p> <p>Mountain Goat monitoring activities will occur daily throughout the winter and spring (November 1 – June 15) when construction activities are occurring at the ULRHEF lower tunnel portal and/or the ULRHEF intake.</p> <p>If a mountain goat is observed within 500m line of sight of construction operations, construction must cease for at least 48 hours. The IEM must record and submit all goat observations to FLNR within 48 hours.</p>

Component	Location	Wildlife/Archeology Concern	Construction/Timing Restrictions & Mitigations
BDRHEF intake	Portion of intake access road and crane pad within UWR	Mountain Goat UWR	<p>During winter months (November 1 – April 30), access to BDRHEF intake must be gated at least 500 m from UWR to restrict motorized use within the UWR, unless otherwise directed by MFLNRO.</p> <p>If a mountain goat is observed within a 500 m line of site of a construction activity within UWR u-2-002 UL 12, construction activities will cease for at least 48 hours. Approval from the IEM must be obtained prior to recommencing construction activities.</p>

4.0 Upper Lillooet River HEF – Monitoring Results

4.1 Construction Camp, KM38 Laydown, Access Roads & Lillooet River FSR

Activities:

- Routine maintenance of construction equipment within the mechanic shop and fuel management continued at the KM38 laydown. All hazardous substance materials (waste oil, contaminated soil, used oil/hydraulic fluid containers, etc.) were stored temporarily for off-site disposal in a designated area at the laydown. The materials were all well contained and protected from the weather.
- The electric fences surrounding the construction camp were maintained and operational throughout this reporting period (Photo 1).
- Road and ditch maintenance on the Lillooet River FSR from KM44 – KM48 was completed during this reporting period to address concerns outlined in ITM *ULR#43* (Photo 2).

Environmental Summary:

- On March 4, the IEM recorded a temporary exceedance of BCWQGs (42.9 NTU; when background was 11.7NTU) resulting from turbid road runoff entering the Lillooet River at KM49 of the Lillooet River FSR (See Section 4.5 for water quality data). Ditch armouring and drainage improvements at KM49 of the Lillooet River FSR are required to prevent turbid runoff from discharging to the Lillooet and causing temporary exceedance of BCWQGs (as outlined in ITM *ULR#43*).
- On March 5, CE addressed road drainage and erosion at the outlet of the culvert (CTF bearing stream) located at KM43.5 of the Lillooet River FSR. The area is currently stable from the cross ditching and silt fencing installed; however, some additional repairs are needed that may require CTF salvage prior to performing the works. As the area was temporarily stabilized to the satisfaction of the IEM, ITM issue *ULR#44* is considered closed and the future repair will be tracked in the upcoming works section.
- On March 5, the IEM identified drainage concerns at KM41 of the Lillooet River FSR, and communicated to CE that road runoff was causing erosion of the road shoulder and depositing turbid water to the Lillooet River (693 NTU point source, 14.9 NTU measured at the safest accessible downstream point). The IEM requested that CE repair the ditch line

and re-install the silt fence between KM40.9 and KM41.2 of the Lillooet River FSR. This road drainage problem will be tracked as ITM *ULR#47*.

Photos:



Photo 1 – Electric fence on Pad 1 (March 8, 2016).



Photo 2 – Snow removal and ditch maintenance near KM43 of the Lillooet River FSR (March 5, 2016).

4.2 Intake (North & South Sides), and Upstream Tunnel Portal

Construction Activities:

- Consolidation of class 4CT material began following the pre-work meeting conducted on March 3, 2016. Works included canopy tube drilling and grout injection operations, followed by the first round of drilling and blasting in class 4CT material on March 10, 2016.
- Delivery and setup of the bulk CO₂ system at the ULRHEF intake setting ponds occurred on March 3, 2016 (Photo 3).
- Dewatering to ULRHEF intake sediment basins (Photo 3 - Photo 5).
- Intake structure construction had not yet resumed as of March 12, 2016 (Photo 6).

Environmental Summary:

- During canopy tube installation, drilling, grout injection, and blasting all seepage water was directed to the ULRHEF intake sediment basins for treatment (Photo 3). CE's environmental management team ensured that the active treatment system was functioning as intended and stocked with required water treatment chemical.
- The IEM visited the ULRHEF intake daily to conduct water quality monitoring during grout injection. During works, the IEM conducted sampling in the cells downstream of the treatment system and at the outlet to the Lillooet River. The water treatment was successful and water quality remained within project guidelines (pH 6.5 – 9; and, <8NTU over background) throughout the monitoring period. Please see Section 4.5 Water Quality Results.

- On March 11, 2016 increased road runoff and traffic associated with tunnel mucking contributed turbid water to the clean water sump that pumps water directly to the Lillooet River. The IEM recorded a temporary exceedance of BCWQGs as a result of these works and notified CE of the problem (See Section 4.5 for water quality results). CE responded by working to better isolate the road runoff from the clean water sump (Photo 5).
- On March 8, 2016 the IEM discovered the improper management of food waste in the construction waste bin located at KM48.5 of the Lillooet River FSR. The food waste had attracted and trapped a number of pine martin in the construction waste bin. The IEM prepared FAM #9 (attached) to address this concern and outlined requested outcomes. On March 9, 2016 CE confirmed that all waste storage facilities onsite were inspected and any improperly stored waste was removed; signs were posted on all waste bins; and it was confirmed that the management of food waste and wildlife attractants was reviewed with all crews. The IEM acknowledged CE's response and closed ITM *ULR#45* as all conditions from FAM#9 were met.

Photos:



Photo 3 – Delivery of the bulk CO₂ system to support the water treatment system at the ULRHEF intake (March 3, 2016).



Photo 4 – Discharge from ULRHEF sediment basins to Lillooet River during canopy tube installation (drilling) in the tunnel (March 8, 2016).



Photo 5 – Working to isolate turbid road runoff from the clean water sump. The turbid runoff resulted in a temporary exceedance of BCWQGs in the Lillooet River (March 11, 2016).



Photo 6 – ULRHEF intake structure work remains on hold (Mach 12, 2016).

4.3 *Downstream Tunnel Portal*

Construction Activities:

- Drilling, blasting, mucking and stabilization works (shotcrete application) continue within the tunnel.

Environmental Summary:

- The active water treatment continued to discharge water to Truckwash Creek within BCWQGs during this reporting period (See Section 4.5 for water quality results).
- On March 4, 8, and 10, the IEM observed that the system was not treating all of the process water emanating from the lower tunnel, and that excess water was discharging from the ponds above BCWQGs (Photo 7; Photo 8; see section 4.5 for water quality results). CE should assess the capacity of the treatment system to prevent discharging water from the ponds. Water discharging from the ponds risks causing offsite erosion of the Lillooet River trail as previously outlined in FAM#8 distributed on January 18, 2016 prior to the installation of the water treatment system. This issue will be tracked as ITM *ULR#46*.
- On March 12, CE informed the IEM and INX that a small slide of snow and material caused the failure of the outside wall of one of the sediment ponds located adjacent to the penstock alignment (Photo 9). The ponds were not in use at the time; however, they contained some water, which flowed through the collapsed wall towards stream ASTR-03. It appears from initial inspection that the water did not reach the watercourse and no environmental damage was caused by the event.
- On March 6, CE installed a cross ditch across the downstream tunnel portal access road to convey road runoff to the ditch (Photo 10). The ditch line outlet should be examined to ensure it is infiltrating to ground and not causing offsite erosion within the Mountain Goat replacement area.

Photos:



Photo 7 – Active water treatment system at the downstream tunnel infiltration ponds (March 7, 2016).



Photo 8 – ULRHEF downstream tunnel infiltration ponds continue to outlet despite the treatment system being active (March 7, 2016).



Photo 9 – Failure of the outside wall of the sediment pond caused by a small snow and debris slide into the pond (March 12, 2016).



Photo 10 – Cross-ditching installed to direct road runoff to the ditch line (March 6, 2016).

4.4 *Powerhouse & Access Road*

Construction Activities:

- Construction activities resumed with snow and formwork removal at the ULRHEF powerhouse (Photo 11); dewatering to Lillooet River continues.

Environmental Summary:

- No environmental issues were observed or reported at the ULRHEF powerhouse during this reporting period.



Photo 11 – Current conditions at the ULRHEF powerhouse (March 8, 2016).

4.5 *Water Quality Results*

The following table presents the results of the routine WQ sampling program for the ULRHEF. The IEM is undertaking a weekly monitoring program according to the conditions outlined in the Surface Water Quality Protection Plan. The regular monitoring sites have been selected to quantify WQ conditions within the Lillooet River upstream and downstream of active construction

areas. The IEM acknowledges the natural variability of instream WQ conditions in the Lillooet River due to seasonal fluctuations in snowmelt. In the event that an exceedance of *in-situ* WQ (turbidity and/or pH) is deemed to be caused by project-related activities, the IEM will highlight the exceedance, discuss the cause, and outline measures undertaken by the Contractor to correct the issue. When an exceedance cannot be attributed to project related activities, the exceedance will be marked by an asterisk (*). The table also presents the results of WQ sampling collected at both the ULRHEF intake and downstream tunnel portal water treatment systems.

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
Routine Water Quality						
March 4, 2016	14:20	ULR Background – ULRHEF Intake	7.3	11.7	139	2.6
	14:45	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	7.5	42.9	131	2.1
	15:40	ULR # 1 – Upstream of ULRHEF Powerhouse	7.6	12.6	142	4.1
	16:30	ULR #2 – Downstream of ULRHEF Powerhouse between KM 40.5 and KM 41	7.3	14.9	132	3.5
	15:00	ULR #3 – Lillooet River FSR KM 38 Laydown – D/S of Boulder confluence	7.6	12.1	130	3.9
	11:00	ULR #4 – Lillooet River FSR KM 24 – D/S of all works and Meager confluence	7.2	15.0	75	4.2
March 9, 2016	12:10	ULR Background – ULRHEF Intake	7.4	2.8	133	3.8
	11:45	ULR #0.5 – Downstream of ULRHEF intake at Keyhole Bridge	7.2	3.1	136	3.7
	13:37	ULR # 1 – Upstream of ULRHEF Powerhouse	7.7	2.4	135	4.8
	13:53	ULR #2 – Downstream of ULRHEF Powerhouse between KM 40.5 and KM 41	7.5	3.8	134	4.7
	14:39	ULR #3 – Lillooet River FSR KM 38 Laydown – D/S of Boulder confluence	7.6	2.2	126	4.7
	9:10	ULR #4 – Lillooet River FSR KM 24 – D/S of all works and Meager confluence	7.1	2.4	95	4.5

Water Quality for Specific Works						
Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
ULRHEF Intake sediment basins and Lillooet River following grout injection at upstream tunnel						
February 29	10:33	Discharge to Lillooet River	7.49	-	-	-
	16:40	Pond 7 (lower basins)	7.45	-	-	-
March 1	13:48	Discharge to Lillooet River	7.48	10.5	-	-
March 4	15:20	Discharge to Lillooet River	7.17	30.9	-	-
March 5	17:00	Discharge to Lillooet River	7.13	13.7	-	-
March 6	16:30	Discharge to Lillooet River	6.99	7.34	-	-
March 7	10:28	Discharge to Lillooet River	7.07	8.79	-	-
March 8	11:20	Discharge to Lillooet River	7.64	5.74	-	-
March 9	12:15	Discharge to Lillooet River	7.34	-	-	-

Water Quality for Specific Works						
Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (µS)	Temp (°C)
March 10	9:10	Pond 7 (lower basins)	9.36	-	-	-
	10:20	Pond 7 (lower basins)	9.31	12.7	-	-
	10:35	Discharge to Lillooet River	8.99	-	-	-
	10:50	Discharge to Lillooet River	8.64	-	-	-
	17:15	Pond 7 (lower basins)	9.45	-	-	-
	17:50	Discharge to Lillooet River	8.94	5.6	-	-
March 11	8:46	Discharge to Lillooet River	6.96	-	-	--
	8:50	Ditch line from tunnel portal ditch to river	-	50.9	-	-
	9:10	Ditch line from tunnel portal ditch to river	-	60.8	-	-
		Mixing Zone in Lillooet River	-	36.2	-	-
		Background in the river	-	2.87	-	-
March 12	10:15	Discharge to Lillooet River	-	7.3	-	-
ULRHEF Downstream Portal Water Treatment system and settling pond discharge						
February 29	10:55	Outlet test port	6.56	-	-	-
March 1	11:35	Outlet test port	7.51	-	-	-
March 2	15:15	Outlet test port	10.6	-	-	-
	15:45	Outlet test port	10.24	14.6	-	-
	16:57	Outlet test port	7.3	25.5	-	-
March 4	15:20	Outlet test port	6.79	15.9	-	-
	16:00	Outlet from sediment ponds	11.47	Visually turbid	-	-
March 5	9:30	Outlet test port	7.31	-	-	-
March 6	17:00	Outlet test port	7.2	-	-	-
March 7	17:05	Outlet test port	7.01	6.28	-	-
March 8	10:45	Outlet test port	7.09	6.82	-	-
	11:00	Outlet from sediment ponds	9.29	Visually turbid	-	-
March 9	13:15	Outlet test port	6.8	-	-	-
March 10	11:35	Outlet test port	7.28	11.51	-	-
	11:40	Outlet from sediment ponds	8.82	691AU	-	-
March 12	11:20	Outlet test port	6.5	-	-	-

4.6 Recommendations

ITEM recommendations for the ULRHEF are as follows:

- All water from the ULRHEF upstream tunnel heading should be conveyed to the sediment basins for treatment. CE should perform regular monitoring to ensure that the water treatment system is functioning as intended and that discharge to the Lillooet River continues to meet BCWQGs.
- CE should be regularly monitoring the downstream tunnel water treatment system to ensure it is functioning as intended and that discharge into Truckwash Creek continues to meet

BCWQGs. The water treatment system capacity should be assessed to prevent discharging process water above BCWQGs offsite (ITM ULR#46).

4.7 Upcoming Works

The following new and/or environmentally sensitive construction activities are scheduled to occur at the ULRHEF:

- Canopy tube installation, umbrella lattice structure installation, grout injection, drilling, and blasting in class 4CT material will continue at the ULRHEF upstream tunnel portal.
- Drilling, blasting and tunnel stabilization at the ULRHEF downstream tunnel.
- Dewatering to the ULRHEF intake sediment basins will continue.
- CE will consult with a QP prior to performing repairs needed at the outlet of the culvert at KM43.5 of the Lillooet River FSR to ensure protection of CTF during the works.

5.0 Boulder Creek Hydroelectric Facility – Monitoring Results

5.1 Intake & Diversion Tunnel

Construction Activities:

- No activity due to winter shutdown period.

Environmental Summary:

- No environmental issues were observed or reported at the BDRHEF intake during this reporting period.

5.2 Downstream Tunnel Portal and Powerhouse

Construction Activities:

- Drilling, blasting and tunnel stabilization in the downstream tunnel portal (Photo 13).
- BDRHEF powerhouse electrical component installation (Photo 12).
- Dewatering of the tunnel and powerhouse to the oil water separator and settling ponds continued (Photo 13).

Environmental Summary:

- All wastewater related to the BDRHEF tunnelling works continues to be conveyed to the downstream portal settling ponds for treatment (Photo 13). Water discharging from the sediment ponds empties to the perimeter ditch surrounding the spoil pile and continues to infiltrate to ground prior to reaching surface waters.

Photos:



Photo 12 – Current conditions inside the BDRHEF powerhouse (March 6, 2016).



Photo 13 – BDRHEF downstream tunnel portal, powerhouse, and settling ponds (March 6, 2016).

5.3 Water Quality Results

The following table presents the results of the routine WQ sampling program for the BDRHEF. The IEM is undertaking a weekly monitoring program according to the conditions outlined in the Surface Water Quality Protection Plan. The regular monitoring sites have been selected to quantify WQ conditions within Boulder Creek upstream and downstream of active construction areas. The IEM acknowledges the natural variability of instream WQ conditions in Boulder Creek due to seasonal fluctuations in snowmelt. In the event that an exceedance of *in-situ* WQ (turbidity and/or pH) is deemed to be caused by project-related activities, the IEM will highlight the exceedance, discuss the cause, and outline measures undertaken by the Contractor to correct the issue. When an exceedance cannot be attributed to project related activities, the exceedance will be marked by an asterisk (*).

Date	Time	Sample Location Description	pH	Turbidity (NTU)	Cond (uS)	Temp (°C)
Routine Water Quality						
March 4, 2016	-	BDR BG – Upstream of BDRHEF intake *not accessible*	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake *not accessible*	-	-	-	-
	15:20	BDR #2 – Upstream of BDRHEF Powerhouse	6.9	1.6	97	3.5
	15:30	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.1	0.5	98	3.5
March 9, 2016	-	BDR BG – Upstream of BDRHEF intake *not accessible*	-	-	-	-
	-	BDR #1 – Downstream of BDRHEF intake *not accessible*	-	-	-	-
	14:10	BDR #2 – Upstream of BDRHEF Powerhouse	7.6	0.5	100	3.8
	14:17	BDR #3 – Downstream of BDRHEF Powerhouse at Pebble Creek Bridge	7.6	1.2	99	3.6

5.4 Recommendations

IEM recommendations for the BDRHEF are as follows:

- All wastewater related to the BDRHEF tunnelling works should continue to be contained and conveyed to the downstream portal settling ponds for treatment. Regular inspections of the treatment ponds should be performed to ensure the necessary maintenance activities outlined in the work plan are performed.

5.5 Upcoming Works

The following new and/or environmentally sensitive construction activities are scheduled to occur at the BDRHEF:

- BDRHEF downstream portal tunnelling works will continue.
- Electrical component installation will continue at the BDRHEF powerhouse.

6.0 Transmission Line – Monitoring Results

6.1 Transmission Line Construction Activities

- No activities occurred on the TX Line during this reporting period.

7.0 Wildlife Sightings

As per the CEMP, a wildlife sightings record has been implemented and will be updated regularly by Project Personnel. It is mandatory for all personnel to report wildlife sightings including, but not limited to bears, cougars, mountain goats and deer. Wildlife sightings will be reported and recorded by the contractor(s). Wildlife Observation forms will be included in first reporting period following month end. Observation or detection of the following species will trigger notification to identified parties according to the following table.

Species Observed or Detected	Notification Period	Agencies to be Notified
Northern rubber boa	Immediately	IEM, Owner
Grizzly bear	24hrs	IEM, Safety Officer, Conservation Officer, Owner
Wolverine den	24hrs	IEM, MFLNRO, Owner
Spotted owls	24hrs	IEM, MOE, Owner
Mountain goats	48hrs	IEM, MFLNRO, Owner

The Owner, Contractors, and IEM team reported the following wildlife sightings in February 2016.

Upper Lillooet Hydro Project - Wildlife Observation Form					
Date	Time	Observer (Company)	Species or Description	Location	Comments
23/02/2016	9:05	Stephanie Ellis (Sartori)	Coyote	KM25 Upper Lillooet FSR	Travelling
23/02/2016	9:11	Stephanie Ellis (Sartori)	Moose	KM26 Wetland next to FSR	Eating

8.0 Mountain Goat Monitoring Program

The following mitigation measures related to mountain goats were implemented during this monitoring period:

- Access to the BDRHEF intake is gated and is locked fulltime to restrict motorized use within the UWR until April 30, 2016.
- Noise level monitoring data continued to be collected and used to adaptively manage construction related noise and ensure that the 75db noise level threshold is not exceeded as outlined in the Mountain Goat Management Plan.
- The IEM or designate was on site to monitor Mountain Goat activity within 500m of construction activities at the ULRHEF intake and the ULRHEF downstream tunnel portal. Mountain goats were monitored from four sites:
 - Truckwash Creek viewing river right of the Migration Corridor– MG-OBS01 (10U 467955 5612773):
 - Keyhole Falls viewing the south side u-2-002 UL11 – MG-OBS02 (10U 466593 5613988); and,
 - Garibaldi Pumice mine site viewing u-2-002 UL 19 – MG-OBS03 (10U 467388 561408); and,
 - Salal Creek monitoring site viewing u-2-002 UL 8 – MG-OBS04 (10U 466133 5613991).

Monitoring effort was split between all sites during daylight hours, unless safety concerns or weather conditions interfered. The order of site visits rotated daily. Construction activities must cease if a goat(s) are observed moving towards the ULRHEF intake and/or if a goat(s) are observed within a 500m line of site of a construction activity. No goats were observed within 500m line of sight of construction activities and no work stoppages were required.

9.0 Environmental Issues Tracking Matrix (ITM)

9.1 Hydroelectric Facilities (ULRHEF & BDRHEF)

ITM Tracking Legend:		<i>Work Item Open</i>					
		<i>Work Item Complete</i>					
		<i>Issue Closed</i>					
Issue Tracking		Environmental Issue		Mitigation Measures			
ID No.	Status	Location	Issue Description	Action Taken/Recommended	Date of Identification	Targeted Date for Completion	Date Completed
ULR#43	OPEN	Road Drainage along the Lillooet River FSR between KM44.5 – KM49	Road run-off caused by rain and snowmelt is not being directed to roadside ditches and is eroding the running surface/contributing sediment to watercourses.	<ol style="list-style-type: none"> 1. Address road drainage concerns between KM47.5 and KM48 to prevent further turbid water inputs to the fish-bearing stream at KM48. Update: CE installed a temporary cross-ditch to divert water away from the watercourse on February 19. 2. Address road drainage concerns between KM44.5 - KM46 and along the ULRHEF downstream tunnel portal access road to prevent further turbid water inputs to Truckwash Creek. March 6: A ditch and cross ditching has been installed along the downstream tunnel portal access road and drainage is being directed to the ditch, oil/water separator and water treatment system. 3. Address road drainage concerns between KM48 and KM49 to prevent further turbid water inputs to the Lillooet River at Keyhole Bridge. Update: March 6 CE has installed a sump adjacent to the Keyhole Bridge; however, turbid water discharge at this location continues to result in exceedance of the BCWQGs. Ditch armouring remains outstanding. 	February 19, 2016	February 26, 2016	-

Issue Tracking		Environmental Issue		Mitigation Measures			
ID No.	Status	Location	Issue Description	Action Taken/Recommended	Date of Identification	Targeted Date for Completion	Date Completed
ULR#44	CLOSED	Culvert at KM43.5 of the Lillooet River FSR	Road runoff and snow melt has eroded the headwall/armouring at the culvert outlet of this CTF bearing stream.	1. Repair the culvert outlet. If instream works are required consult a QP and conduct a CTF salvage in conjunction with any dewatering activity. Update March 6: CE installed a cross-ditch to divert turbid water away from the CTF stream, and a silt fence was installed around the culvert to stop sediment from flowing into the CTF stream until a salvage can be planned and performed and the culvert properly re-armoured. This temporary repair has addressed the immediate concern; however, the culvert armouring still needs to be completed. As the area is temporarily stabilized the issue is considered closed.	March 6, 2016	March 12, 2016	March 6, 2016
ULR#45	CLOSED	Construction waste bin at KM48 of the Lillooet River FSR	Improperly stored food waste in the construction waste bin was attracting pine martins. See FAM#9 for further details.	1. Notification that the bin at KM48 has been emptied and cleaned of all food waste and that all wildlife attractants have been removed from the ULRHEF intake work areas. 2. Post signs at the KM48 construction waste bin to visually remind crews that no domestic wastes are permitted to be deposited in the bin. 3. Conduct a review of all construction waste storage areas onsite to ensure they are free of wildlife attractants. 4. Review waste management procedures with all crews to remind them of the importance of proper waste management practices as we move into the spring and bears begin to emerge from winter hibernation.	March 8, 2016	March 10, 2016	March 9, 2016
ULR#46	OPEN	ULRHEF lower tunnel water treatment system	The active water treatment system at Truckwash creek is not sufficiently sized to treat all water emanating from the ULRHEF lower tunnel	1. Address turbid & high pH water discharging to vegetation that is not being captured in the water treatment system. 2. Water out letting from the ponds and down the bank may cause erosion and impact the Lillooet River Trail downstream. Assess and confirm that necessary repair work will be completed to stabilize areas that have been eroded due to runoff from this excess discharge.	March 6, 2016	March 14, 2016	-
ULR#47	OPEN	KM41 of the Lillooet River FSR	Drainage and ditching requires maintenance to prevent turbid road run-off from discharging to the Lillooet River	1. Repair ditches between KM40.5 – KM41.2 and ensure road runoff is directed to repaired ditch lines. 2. Install silt fencing along the river side edge of the FSR between KM41.2 - KM40.75.	March 6, 2016	March 14, 2016	-
No outstanding environmental issues (next ITM – BDR#28 & ULR#48)							

9.2 Transmission Line

ITM Tracking Legend:		<i>Work Item Open</i>						
		<i>Work Item Complete</i>						
		<i>Issue Closed</i>						
Issue Tracking		Environmental Issue			Mitigation Measures			
ID No.	Status	Location	Issue Description	Action Taken/Recommended	Date of Identification	Targeted Date for Completion	Date Completed	
<i>No outstanding environmental issues (next ITM – Tx#3)</i>								



FIELD ADVICE MEMO (FAM)

Project:	Upper Lillooet Hydro Project	FAM Number: (yyyy-mm-dd_FAM##)	2016-03-08_FAM#9
FAM Author:	Tom Hicks, Lead Monitor Sartori Environmental Services	Date of FAM Issuance:	March 8, 2016
Distribution List: (Name - Company)	To: Jean Pelletier, Jordan Gagne, Ian McKeachie, Lianne Leblond - CRT-ebc		
Environmental Incident Reports (EIR): (If applicable)	This FAM is not associated with an environmental incident; however, this is the third incident related to improper waste management that has attracted pine martins, and has the potential to attract bears to work area this spring if conditions persist. This issue will be tracked in the Issue Tracking Matrix in the Weekly Environmental Monitoring Report.		

Identified Environmental Issue(s):

Food waste was observed in the construction waste bin at KM48 has attracted pine martins that have been feeding on the improperly stored waste. This FAM has been prepared as this is the third infraction related to improper waste management in contravention of the Human-Bear Conflict Management Plan since December 5, 2015. If left unmitigated this issue has the potential to attract bears to work areas. We expect CE to respond and restore proper waste management practices at the ULRHEF intake and to maintain current waste management practices at remaining work areas that have not seen an issue to date. A repeat infraction related to waste management this spring will result in written notification to MFLNRO and BCEAO within 24hrs and the generation of a formal incident report.

Waste generated by construction crews must be managed in accordance with the Human-Bear Conflict Management Plan. Specifically:

- Food and other attractants (e.g., garbage, machinery-related attractants) will be stored within air-tight containers in fully closed vehicles or in portable bear-proof containers (BCCF 2013a). Under no circumstances shall bear attractants be left in an open vehicle, in the back of a pick-up, outside of a vehicle, or anywhere that may be accessible to a bear. Food carried away from camp should not be highly odorous. When food is carried away from a vehicle, a portable bear proof food/garbage container will be used. If there is evidence that leaving food in closed vehicles may be increasing risks of human-bear conflict, bear proof containers to store food within vehicles will be provided. Bears are strong enough to tear apart cars looking for food and may do so if they become habituated (BCCF 2013a); however, with strictly enforced preventative measures, habituation to vehicles for food is not likely to occur.
- All garbage (including compost such as apple cores and orange peels) will be brought to an appropriate bear-proof garbage storage container located within the electrified camp boundary.

Requested Outcome(s)

In response to this FAM, the IEM requests that CE provide the IEM with the following:

1. Notification that the bin at KM48 has been emptied and cleaned of all food waste and that all wildlife attractants have been removed from the ULRHEF intake work areas.
2. Post signs at the KM48 construction waste bin to visually remind crews that no domestic wastes is permitted to be deposited in the bin.
3. Conduct a review of all construction waste storage areas onsite to ensure they are free of wildlife attractants.
4. Review waste management procedures with all crews to remind them of the importance of proper waste management practices as we move into the spring and bears begin to emerge from winter hibernation.