BC Hydro
Power smart

Site C Clean Energy Project

Temporary Upstream Fish Passage Facility Operations Report

Reporting Period: July 1 to 31, 2021

Prepared by BC Hydro

Submitted October 5, 2021

Introduction

BC Hydro diverted the Peace River through two diversion tunnels on the left bank of the dam site during the fall of 2020. River diversion represented the first activity in the construction of the Site C Clean Energy Project (the Project) to affect upstream fish movement in the Peace River (EIS, Volume 2, Appendix Q[1]). As such, the temporary upstream fish passage facility (hereafter temporary facility) was operated to pass fish upstream and allow them to fulfill portions of their lifecycles upstream of the Project.

Note that the temporary facility will operate during the river diversion phase of construction (2020 to 2023) on the left bank of the Peace River at the outlet of the diversion tunnels. BC Hydro intends to operate the temporary facility from April 1 to October 31 each year based on the timing of fish movements in the Peace River and to avoid damaging mechanical equipment during cold weather conditions from November to March. Following the closure of the diversion tunnels and reservoir filling in the fall of 2023, the permanent upstream fish passage facility will be operated at the outlet of the generating station to provide fish passage during the operation phase of the Project.

In 2021 water surface elevations at the temporary facility have been high and above the operating range (i.e., engineering design criteria) of the temporary facility, which led to a number of adjustments to infrastructure and operations to allow the temporary facility to operate above design criteria. High water surface elevations also have the potential to reduce the biological effectiveness of the temporary facility. As a result, BC Hydro implemented the contingent measures listed in Section 4.8 of the Fish Passage Management Plan[2].

Contingent measures consisted of weekly boat electroshocking surveys (hereafter contingent fish capture and transport) to capture target species downstream of the diversion tunnel outlet and transport and release them upstream of the Project. Only those species undergoing spawning migrations (Bull Trout) or fulfilling other life history requirements upstream of the Project (Arctic Grayling and Rainbow Trout) were transported and released upstream of the Project during the reporting period (EIS, Volume 2, Appendix O[3]; BC Hydro 2015[4]). All other species were released at their capture location downstream of the Project.

Operation of the temporary facility and implementation of contingent fish capture collectively provided for upstream fish passage for target species during the reporting period.

Structure of the report

This report summarizes the data and information presented in weekly reports prepared by the facility operator, as described in the Manual of Operational Parameters and Procedures (OPP), and covers the full extent of operations in July 2021.

This report has the following sections:

- Biological operation;
- Environmental conditions;
- Mechanical operation;
- Adjustments;
- Contingent fish capture and transport; and
- Photos.

Biological operation is defined as the sorting, sampling, tagging, transport and release of fish. Mechanical operation is defined as the operation of the pumps, gates, crowder, lock, sensors, loggers, and other

[1] Available at: https://www.ceaa-acee.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_Q.pdf
[2] Available at: http://sitecproject.com/sites/default/files/Fish%20Passage%20Management%20Plan.pdf
[3] Available at: https://www.ceaa-acee.gc.ca/050/documents_staticpost/63919/85328/Vol2_Appendix_O.pdf
[4] Available at: http://sitecproject.com/sites/default/files/Fisheries-and-Aquatic-Habitat-Monitoring-and-Follow-up-Program.pdf

mechanical equipment to ensure the temporary facility achieves the biological objectives described in Section 4.1 of the Fish Passage Management Plan[5].

Summary

Two hundred and twelve fish were sorted and sampled at the temporary facility, and transported and released into the Peace River upstream of the Project (Table 1). Specifically, the facility operator sorted 117 Longnose Sucker, 52 Mountain Whitefish, 18 White Sucker, 13 Largescale Sucker, and 12 Northern Pikeminnow. In addition to operating the temporary facility, BC Hydro conducted four sessions of contingent fish capture downstream of the diversion tunnel outlet and transported 58 Bull Trout, 7 Rainbow Trout, and 3 Arctic Grayling upstream of the Project (Table 6; Photo 1). Seven hundred and fifty-one fish from other species were encountered during contingent fish capture and were released downstream of the Project (Table 6).

On June 29 the facility operator observed a sheen on the surface of the water in the West Auxillary Water Supply (AWS) Receiving Pool and immediately shut down the facility. Given that the sheen may have been oil, and to mitigate the risk of oil being released into the Peace River, the operator deployed an absorbent boom in the pool and closed the entrance gates. One potential source for the sheen was suspected to be leaked oil from the horizontal pumps that provide the AWS. Therefore, the operator removed and inspected the horizontal pumps. Upon inspection, the operator confirmed that the horizontal pumps had not leaked any oil. Removing the horizontal pumps from the pump station broke the seal on the pumps, which required the operator to source and install new o-rings prior to re-installation and start up. Sourcing o-rings took longer than anticipated, forcing the facility to be shutdown for 25 days in July; thus contingent fish capture provided for upstream fish passage during the reporting period. Laboratory analysis of collected water samples confirmed that the sheen was not hydrocarbon-based and was instead of natural origin.

Several adjustments were made to improve the biological and mechanical operation of the temporary facility. Adjustments summarized in Table 5 will be reflected in an updated revision of the OPP for operations in 2022.

BC Hydro continued to share information related to the operation of the temporary facility through a number of venues, including the following:

- Presentation to Indigenous groups at Environmental Forum #19 on July 13.

Appendix I provides a high-level summary of operation of the temporary facility and implementation of contingent fish capture and transport during the reporting period.

Appendix II summarizes the total flow diverted from the Peace River to operate the temporary facility during the reporting period.

[5] Available at: http://sitecproject.com/sites/default/files/Fish%20Passage%20Management%20Plan.pdf

Biological operation

In total, 212 fish were sorted in the temporary facility during the reporting period (Table 1; Figure 1). Three mortalities – all Mountain Whitefish (two in the pre-sort holding pool and one during processing) – were observed during the reporting period (combined with mortalities observed in previous months, 0.7% of all fish sorted in 2021), which is in-line with the anticipated levels of mortality during operations[6]. Mortalities in the pre-sort holding pool were likely the result of a power outage from 06:00 to 06:57 on July 26 (Table 3).

Table 1. Total number of fish sorted, sampled, transported and released during the reporting period.

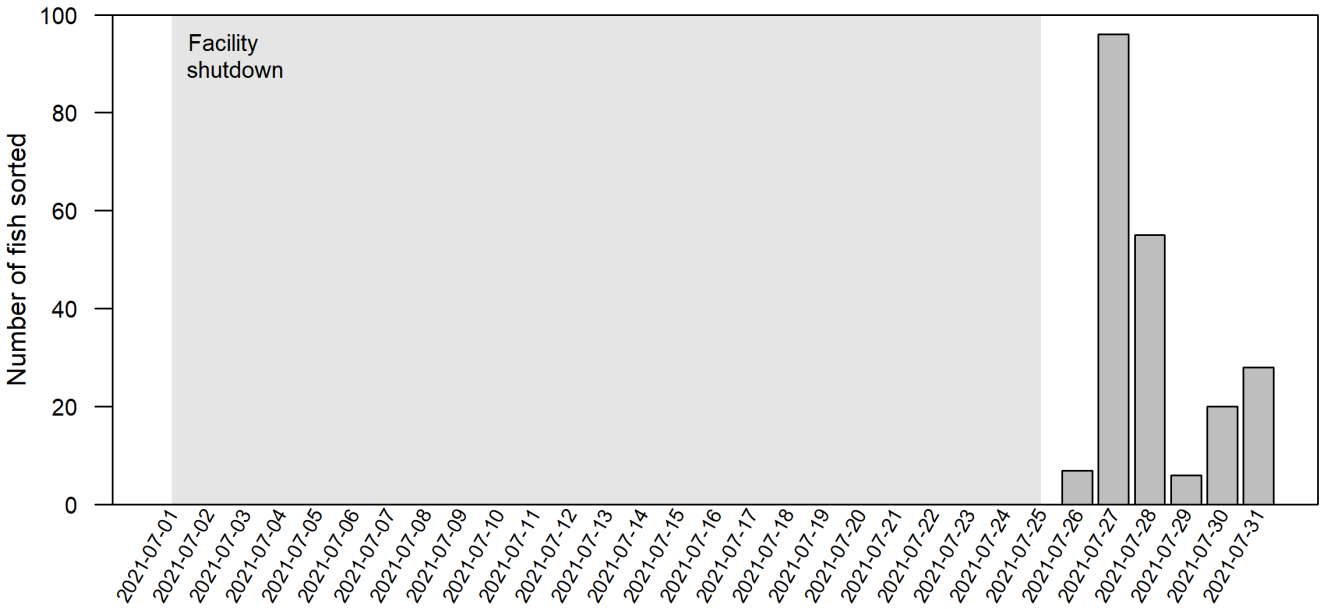
Species	Sorted	Transported and released	PIT tagged	Mortalities	Genetics	Microchemistry or ageing
Arctic Grayling						
Brook Stickleback						
Brook Trout						
Bull Trout						
Burbot						
Finescale Dace						
Flathead Chub						
Goldeye						
Kokanee						
Lake Chub						
Lake Trout						
Lake Whitefish						
Largescale Sucker	13	13	12	0	N/A	N/A
Longnose Dace						
Longnose Sucker	117	117	105	0	N/A	N/A
Mountain Whitefish	52	52	48	3	N/A	3
Northern Pike						
Northern Pikeminnow	12	12	N/A	0	N/A	N/A
Northern Redbelly Dace						
Peamouth						
Pearl Dace						
Prickly Sculpin						
Pygmy Whitefish						
Rainbow Trout						
Redside Shiner						
Slimy Sculpin						
Spoonhead Sculpin						
Spottail Shiner						
Trout-perch						
Walleye						
White Sucker	18	18	17	0	N/A	N/A
Yellow Perch						
Grand total	212	212	182	3	0	3

Not all fish species were PIT tagged or sampled for genetics, microchemistry, or ageing, as described in the OPP.

[6] The Fisheries Act Authoriation for Main Civil Works and Facility Operations (15-HPAC-01160) describes an acceptable level of incidental mortality to be no more than 5% of the total number of fish sorted in the temporary facility on an annual basis.

Between zero and 96 fish were sorted daily during the reporting period (Figure 1).

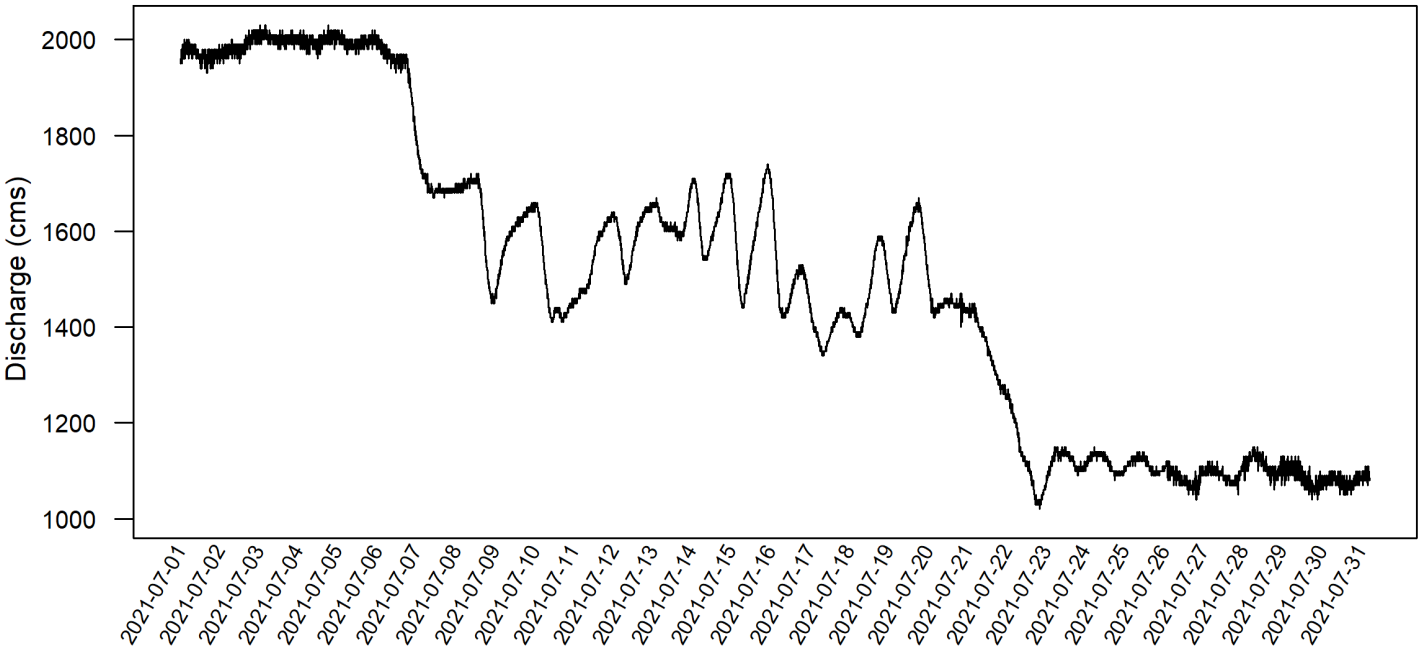
Figure 1. Daily number of fish sorted in the temporary facility during the reporting period.



Environmental conditions

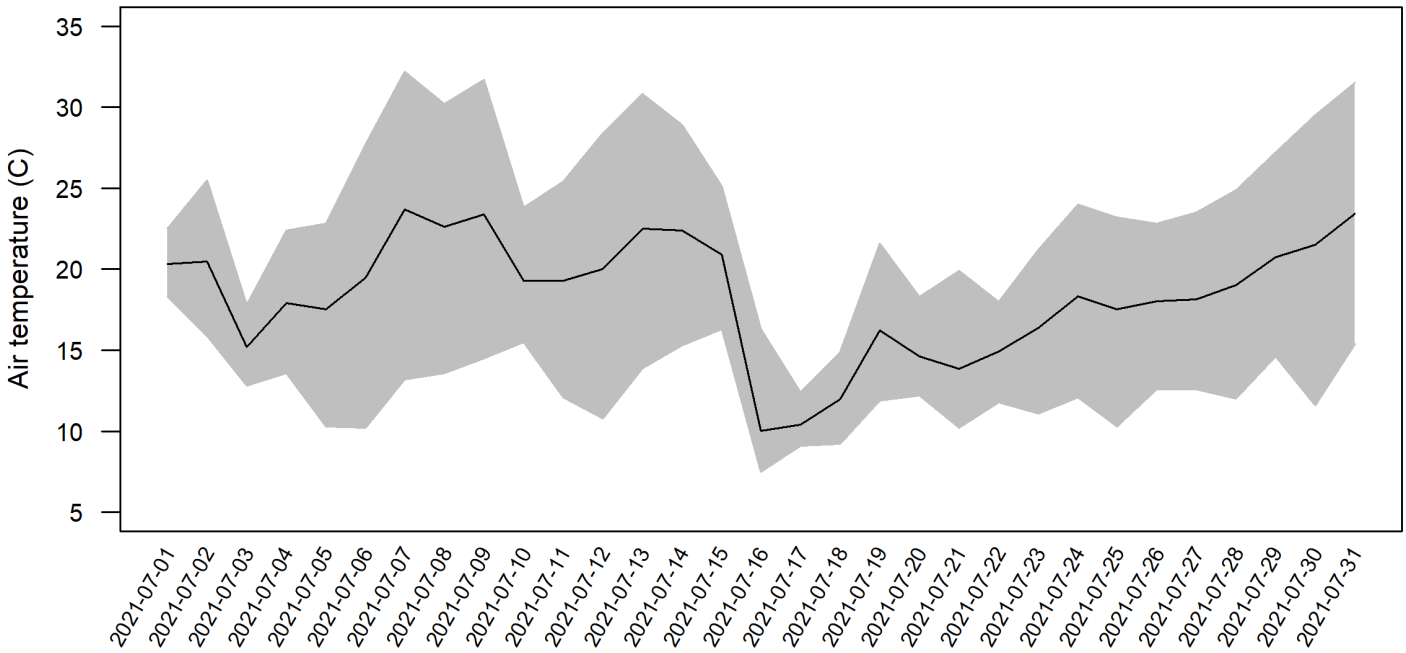
Discharge in the Peace River fluctuated during the reporting period from a low of 1020 cms on July 23 to a high of 2030 cms on July 3 (Figure 2).

Figure 2. Discharge in the Peace River during the reporting period as measured at the Peace River above Pine River (07FA004) Water Survey of Canada (WSC) hydrometric station. Data were downloaded from the WSC on August 13 at 5-minute intervals and were listed as provisional by the WSC.



Air temperature fluctuated during the reporting period from a low of 7.5°C on July 16 to a high of 32.2°C on July 7 (Figure 3).

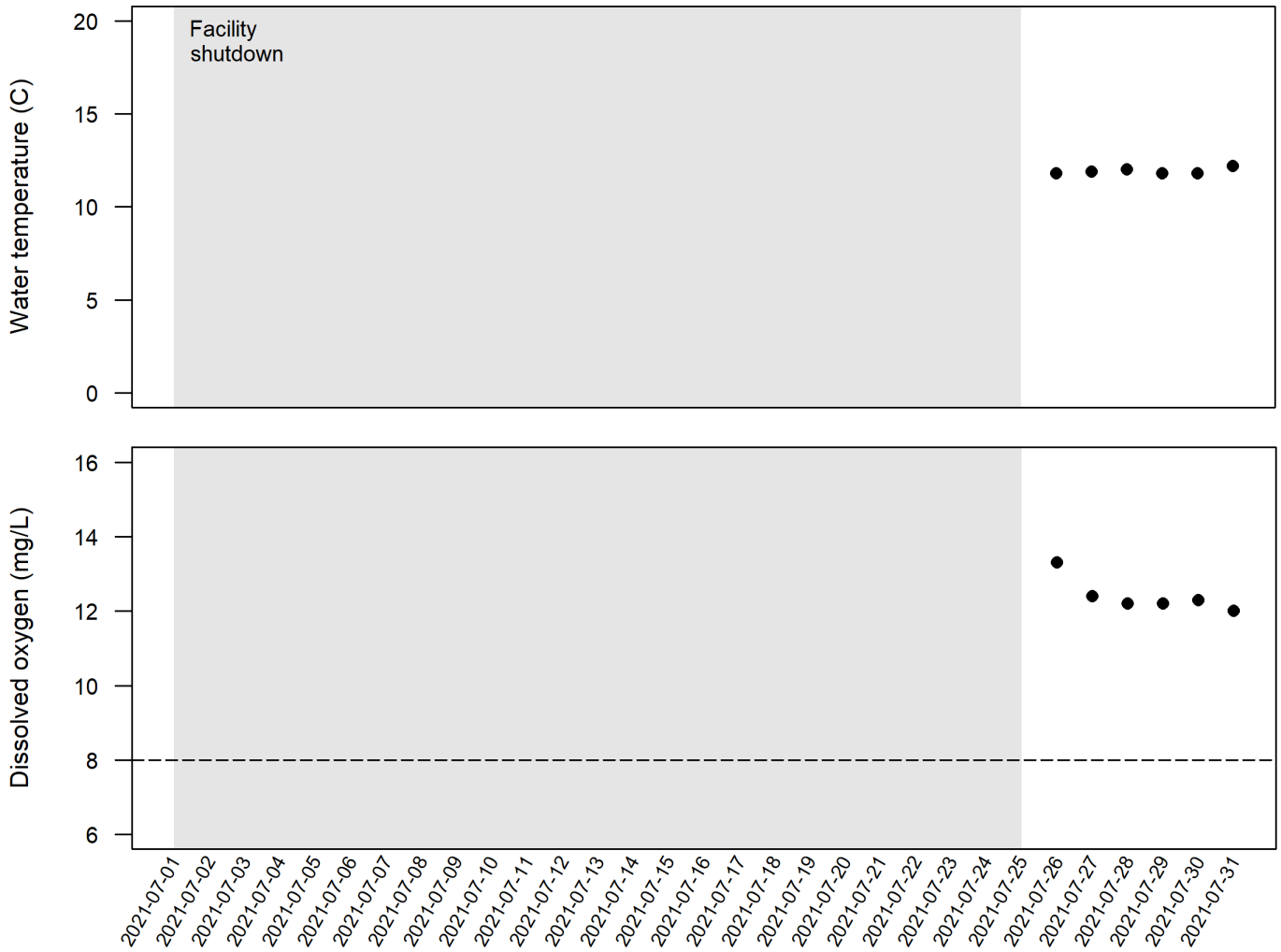
Figure 3. Mean daily air temperature (black line; °C) during the reporting period as measured by the provincial air monitoring station located on the dam site at the Site C Workers Accomodation[7] (E309527). Shaded area represents the minimum and maximum daily air temperatures.



[7] Available at: https://www.env.gov.bc.ca/epd/bcairquality/data/station.html?id=E309527

Water temperature remained stable during the reporting period from a low of 11.8°C on July 26 to a high of 12.2°C on July 31 (Figure 4). Dissolved oxygen remained above the minimum dissolved oxygen level (8.0 mg/L) described in the design report of the temporary facility.

Figure 4. Daily water temperature (°C) and dissolved oxygen (mg/L) during the reporting period as measured in the pre-sort holding pool of the temporary facility.



Mechanical operation

Operation of the attraction flows and high velocity jet intends to attract fish towards the fishway entrance. Once fish have entered the temporary facility, flows within the fishway intend to provide a flow signal for fish to detect and swim up each pool to the sorting facility.

BC Hydro operated the attraction flows and high velocity jet as described in Section 3.2.1.3 of the OPP, whereby conditions were changed every 8 hours during the reporting period (Figure 5). Attraction flows and the high velocity jet were not operated when the facility was shutdown between July 1 and 25 (Table 3).

Figure 5. Operation of the attraction flows and high velocity jet during the reporting period.

Fish were crowded daily from the pre-sort holding pool into the fish lock. Operators then proceeded to raise crowded fish to the elevation of the sorting facility. Note that this process is referred to as a “sorting cycle”.

Three sorting cycles were conducted each day during the reporting period, with the exception of July 27 and 30 (Table 2).

Table 2. Daily total number of sorting cycles.

Date	Number of sorting cycles	Start time
2021-07-01	-	Facility shutdown
2021-07-02	-	Facility shutdown
2021-07-03	-	Facility shutdown
2021-07-04	-	Facility shutdown
2021-07-05	-	Facility shutdown
2021-07-06	-	Facility shutdown
2021-07-07	-	Facility shutdown
2021-07-08	-	Facility shutdown
2021-07-09	-	Facility shutdown
2021-07-10	-	Facility shutdown
2021-07-11	-	Facility shutdown
2021-07-12	-	Facility shutdown
2021-07-13	-	Facility shutdown
2021-07-14	-	Facility shutdown
2021-07-15	-	Facility shutdown
2021-07-16	-	Facility shutdown
2021-07-17	-	Facility shutdown
2021-07-18	-	Facility shutdown
2021-07-19	-	Facility shutdown
2021-07-20	-	Facility shutdown
2021-07-21	-	Facility shutdown
2021-07-22	-	Facility shutdown
2021-07-23	-	Facility shutdown
2021-07-24	-	Facility shutdown
2021-07-25	-	Facility shutdown
2021-07-26	3	08:30, 11:00, 13:00
2021-07-27	2	08:30, 13:00
2021-07-28	3	08:30, 11:00, 13:00
2021-07-29	3	08:30, 11:00, 13:00
2021-07-30	2	08:30, 11:00
2021-07-31	3	08:30, 11:00, 13:00

Table 3. Summary of standby or shutdown periods during the reporting period.

Date	Standby or shutdown	Rationale
2021-07-01 00:00 to 2021-07-25 10:03	Shutdown	On June 29 the facility operator observed a sheen on the surface of the water in the West AWS Receiving Pool and immediately shut down the facility. Given that the sheen may have been oil, and to mitigate the risk of oil being released into the Peace River, the operator deployed an absorbent boom in the pool and closed the entrance gates. One potential source for the sheen was suspected to be leaked oil from the horizontal pumps that provide the AWS. Therefore, the operator removed and inspected the horizontal pumps. Upon inspection, the operator confirmed that the horizontal pumps had not leaked any oil. Removing the horizontal pumps from the pump station broke the seal on the pumps, which required the operator to source and install new o-rings prior to re-installation and start up. Sourcing o-rings took longer than anticipated, forcing the facility to be shutdown for 25 days in July; thus contingent fish capture provided for upstream fish passage during the reporting period. Laboratory analysis of collected water samples confirmed that the sheen was not hydrocarbon-based and was instead of natural origin.
2021-07-26 06:00 to 2021-07-26 06:57	Shutdown	Power outage caused a brief shutdown of the facility. Power was restored by 06:58 and the facility continued to operate for the remainder of the reporting period.

Table 4. Root causes and corrective actions as a result of equipment malfunctions, breakdowns, or damage during the reporting period.

Date	Malfunction, breakdown or damage	Description	Root cause	Corrective action
2021-06-29	Damage	Facility operator removed and inspected the horizontal pumps to determine the source of the sheen on the surface of the water in the West AWS Receiving Pool (Table 3).	Removing the horizontal pumps from the pump station broke the seal on the pumps.	Operator sourced and installed new o-rings prior to re-installation and start up.

Adjustments

Several adjustments were made during the reporting period to improve the biological and mechanical operation of the temporary facility (Table 5). BC Hydro described the potential for adjustments to the day-to-day biological and mechanical operation of the temporary facility in Section 7 of the Fish Passage Management Plan[2]. In general the temporary facility was operated as planned and described in the OPP. Adjustments outlined below will be reflected in an updated revision of the OPP for operations in 2022.

Table 5. Summary of adjustments made to the biological and mechanical operation of the temporary facility during the reporting period.

Component	Adjustment
Mechanical operation	Laboratory analysis of collected water samples confirmed that the sheens observed in the West AWS Receiving Pool in June 2021 were not hydrocarbon-based and were instead of natural origin. Moving forward, if a sheen is observed at the facility, the operator will collect a water sample and the facility will continue to operate unless the laboratory results indicate that the sheen is hydrocarbon-based.

Contingent fish capture and transport

In total, 68 fish were transported upstream through contingent fish capture during the reporting period (Table 2). Specifically, 58 Bull Trout, 7 Rainbow Trout, and 3 Arctic Grayling were transported upstream of the Project.

Table 6. Number of fish captured by boat electroshocking and transported and released upstream (U) and downstream (D) of the Project.

Species	Session 12		Session 13		Session 14		Session 15		Total
	July 1		July 8		July 15		July 20		
	U	D	U	D	U	D	U	D	
Arctic Grayling	1		2						3
Brook Stickleback									
Brook Trout									
Bull Trout	17		20		7		14	1	59
Burbot									
Finescale Dace									
Flathead Chub									
Goldeye									
Kokanee									
Lake Chub									
Lake Trout		1				1			2
Lake Whitefish								1	1
Largescale Sucker		24		27		15		2	68
Longnose Dace									
Longnose Sucker		122		85		66		6	279
Mountain Whitefish		48		81		54		104	287
Northern Pike				1		1		1	3
Northern Pikeminnow		12		6		7		3	28
Northern Redbelly Dace									
Peamouth									
Pearl Dace									
Prickly Sculpin									
Pygmy Whitefish									
Rainbow Trout	1		1		2		3		7
Redside Shiner								1	1
Slimy Sculpin						1		1	2
Spoonhead Sculpin									
Spottail Shiner									
Trout-perch									
Walleye		7		9		2		4	22
White Sucker		7		19		20		11	57
Yellow Perch									
Total	19	221	23	228	9	167	17	135	
Grand total	240		251		176		152		

Photos

Photo 1. Collecting a fin ray from a Bull Trout captured during contingent fish capture and transport for ageing and/or microchemistry (July 15, 2021).

Prepared by

This report was prepared by the following individuals:

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Appendix I. High-level summary of operation of the temporary facility and implementation of contingent fish capture during the reporting period.

From:	Brent Mossop and Nich Burnett, Fish and Aquatic – Site C Clean Energy Project
Reporting Period:	July 1 to 31, 2021
Subject:	Monthly Update on Upstream Fish Passage

212 fish sorted at facility

Operated facility for 6 days

68 fish transported through contingent fish capture

Category	Performance	Commentary
Safety		• Effective interfaces among contractors
Fish Passage[1]		• Observed high passage during the six operating days • Some target species are in the fishway but are not passing
Sorting & Transport		• Sorted 212 fish from five species • 25 day shutdown
Fish Mortality		• Three mortalities during reporting period • Survival rate >99% for all fish sorted in 2021
Operation Within Criteria		• Operated within and outside of design criteria
External Communication		• Presented to Indigenous groups at Environmental Forum
Effectiveness Monitoring		• Monitoring equipment performing well
Learning & Adjustment		• Procedure updated when sheens observed on water surface

Meets or Exceeds Expectations	Nearing Expectations	Far Below Expectations

[1] Infographic available here: https://www.sitecproject.com/sites/default/files/fish-passage-facility.pdf

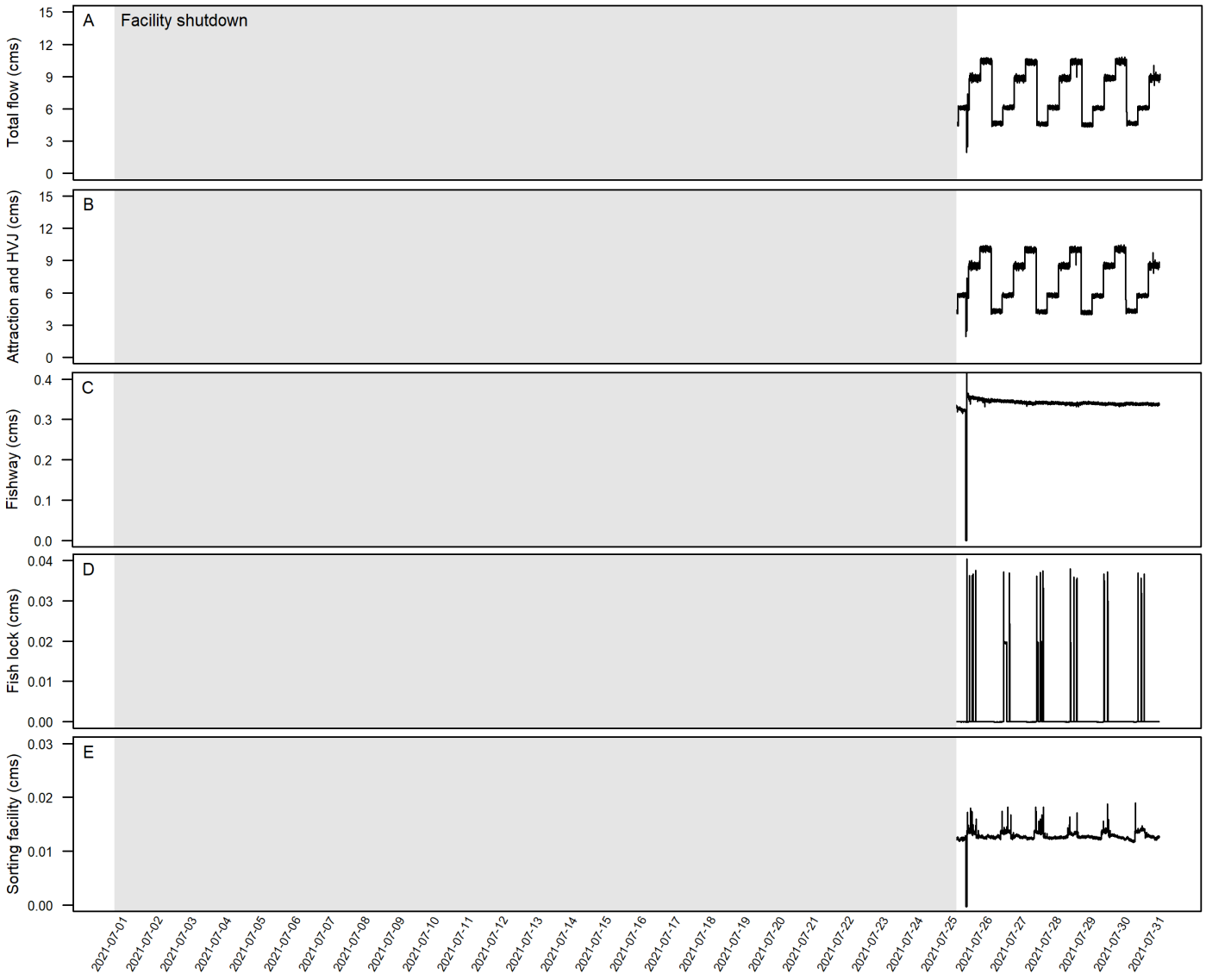
Target Species

Bull Trout

Rainbow Trout

Arctic Grayling

Appendix II. (A) Total flow (cms) diverted from the Peace River to operate the temporary facility during the reporting period. Total flow is a combination of flows used for the attraction flows and high velocity jet (B), fishway (C), fish lock (D), and sorting facility (E), as described in T023 Plan for Measurement of Flow. Under Conditional Water Licence 133987[8], BC Hydro is authorized to divert up to 15 cms of flow from the Peace River to operate the temporary facility; this authorized quantity was not exceeded during the reporting period (A).



[8] Available at: http://sitecproject.com/sites/default/files/fish-passage-facility-water-licences-133986-133987.pdf