BC Hydro
Power smart

Site C Clean Energy Project

Temporary Upstream Fish Passage Facility Operations Report

Reporting Period: May 1 to 31, 2021

Prepared by BC Hydro

Submitted August 10, 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 (Map 1). 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 during the reporting period (EIS, Volume 2, Appendix O[3]; BC Hydro 2015[4]) were transported and released upstream of the Project, which included Arctic Grayling, Bull Trout, Rainbow Trout, and the Sucker species. 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 May 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

Despite high water surface elevations, BC Hydro continuously operated the temporary facility during the reporting period. One hundred and ninety-six 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 158 Mountain Whitefish, 35 Longnose Sucker and 3 Arctic Grayling (Photos 1, 2 and 3). In addition to operating the temporary facility, BC Hydro conducted four sessions of contingent fish capture downstream of the diversion tunnel outlet and transported 217 Largescale Sucker, 138 Longnose Sucker, 51 Bull Trout, 8 White Sucker, 7 Arctic Grayling and 6 Rainbow Trout upstream of the Project (Table 6; Photos 4, 5 and 6). One thousand three hundred and forty-seven fish from other species were encountered during contingent fish capture and were released downstream of the Project (Table 6).

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 shared information related to the operation of the temporary facility through a number of venues:

- Presentation to Indigenous groups at Environmental Forum #18 on May 11; and
- Updates to CWR on May 21.

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, 196 fish were sorted in the temporary facility during the reporting period (Table 1; Figure 1). No mortalities were observed during the reporting period.

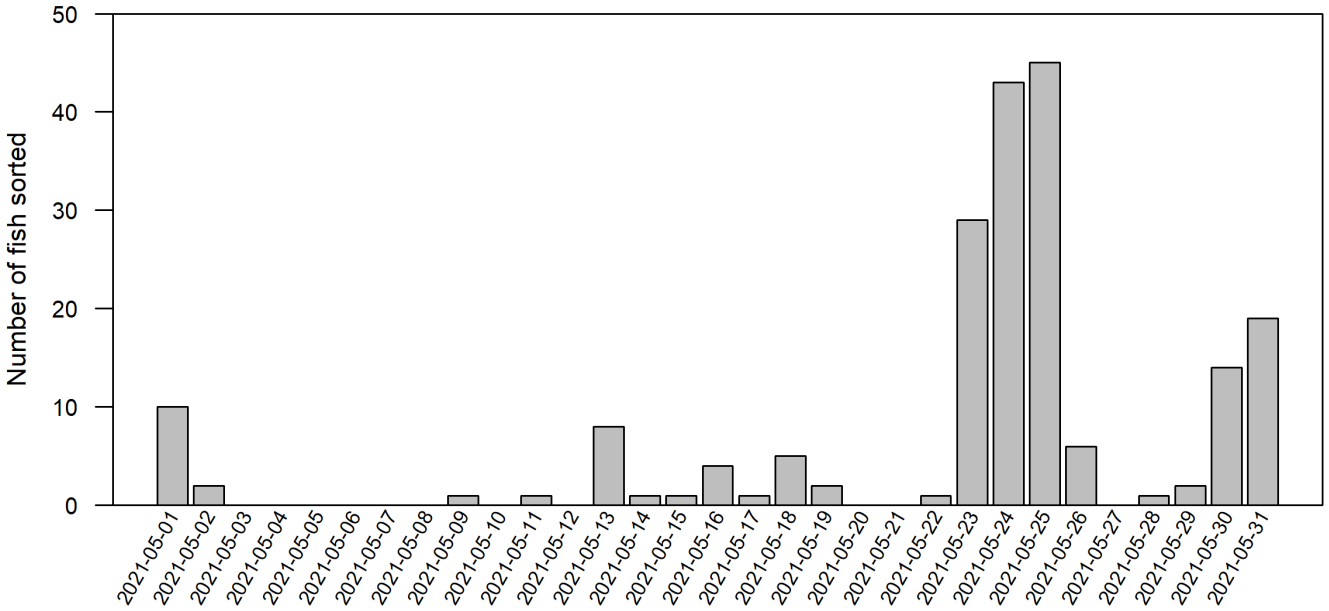
Table 1. Total number of fish sorted, sampled, transported and released during the reporting period.

Species	Sorted	Transported and released	PIT tagged	Mortalities	Genetics	Microchemistry or ageing
Arctic Grayling	3	3	3	0	3	3
Brook Stickleback						
Brook Trout						
Bull Trout						
Burbot						
Finescale Dace						
Flathead Chub						
Goldeye						
Kokanee						
Lake Chub						
Lake Trout						
Lake Whitefish						
Largescale Sucker						
Longnose Dace						
Longnose Sucker	35	35	34	0	N/A	N/A
Mountain Whitefish	158	158	149	0	N/A	103
Northern Pike						
Northern Pikeminnow						
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						
Yellow Perch						
Grand total	196	196	186	0	3	106

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

Between zero and 45 fish were sorted daily during the reporting period (Figure 1).

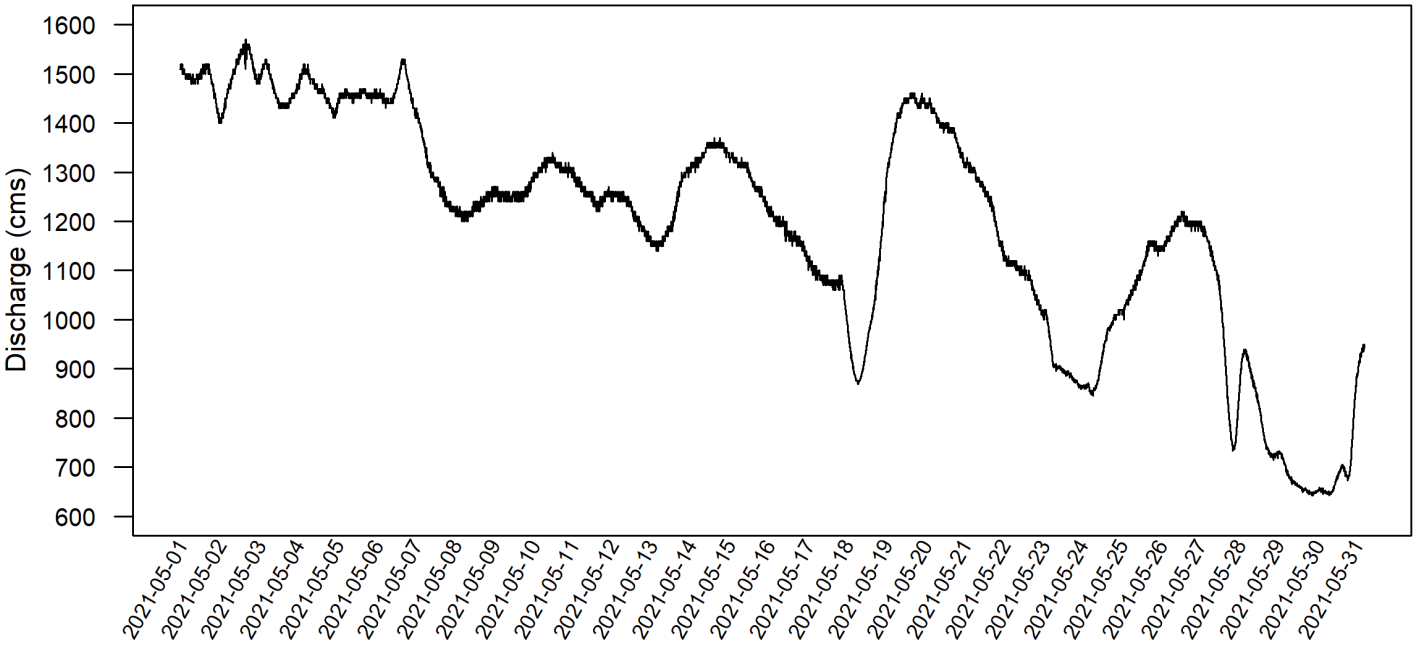
Figure 1. Daily number of fish sorted in the temporary facility during the reporting period.



Environmental conditions

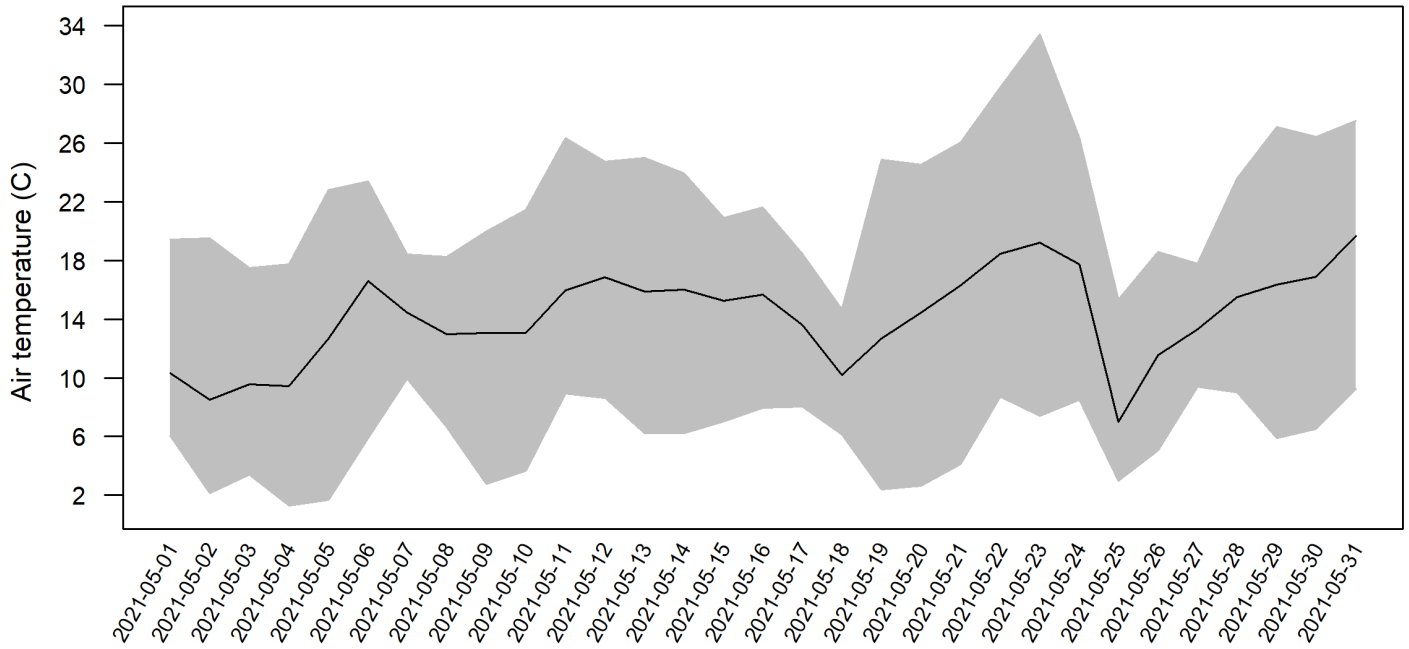
Discharge in the Peace River fluctuated during the reporting period from a low of 643 cms on May 30 to a high of 1570 cms on May 2 (Figure 2).

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 June 1 at 5-minute intervals and were listed as provisional by the WSC.



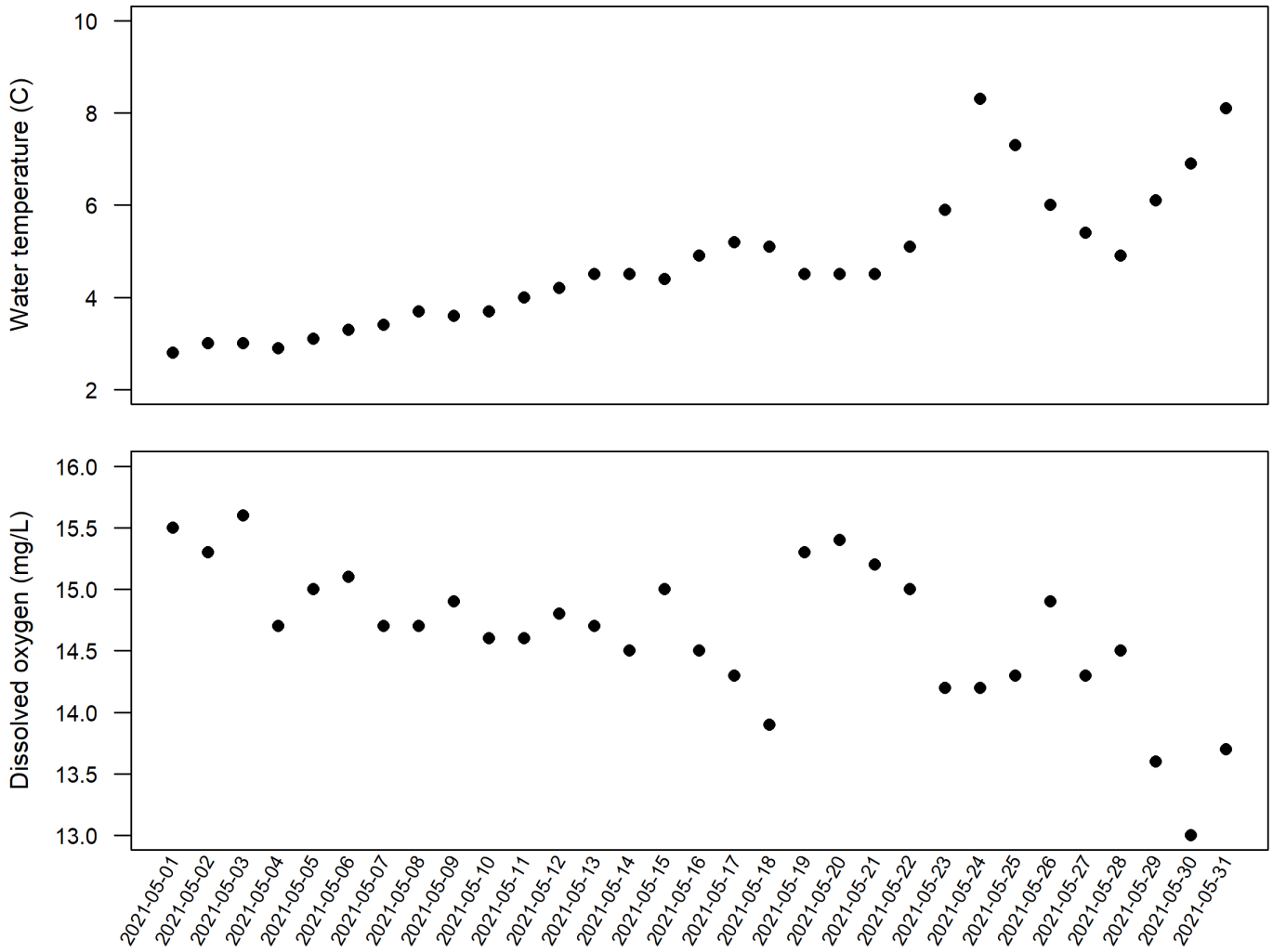
Air temperature fluctuated during the reporting period from a low of 1°C on May 4 to a high of 33°C on May 23 (Figure 3).

Figure 3. Mean daily air temperature (black line; °C) during the reporting period as measured at the temporary facility (Sensor No. TT-602). Shaded area represents the minimum and maximum daily air temperatures.



Water temperature steadily increased during the reporting period from a low of 2.8°C on May 1 to a high of 8.3°C on May 24 (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.

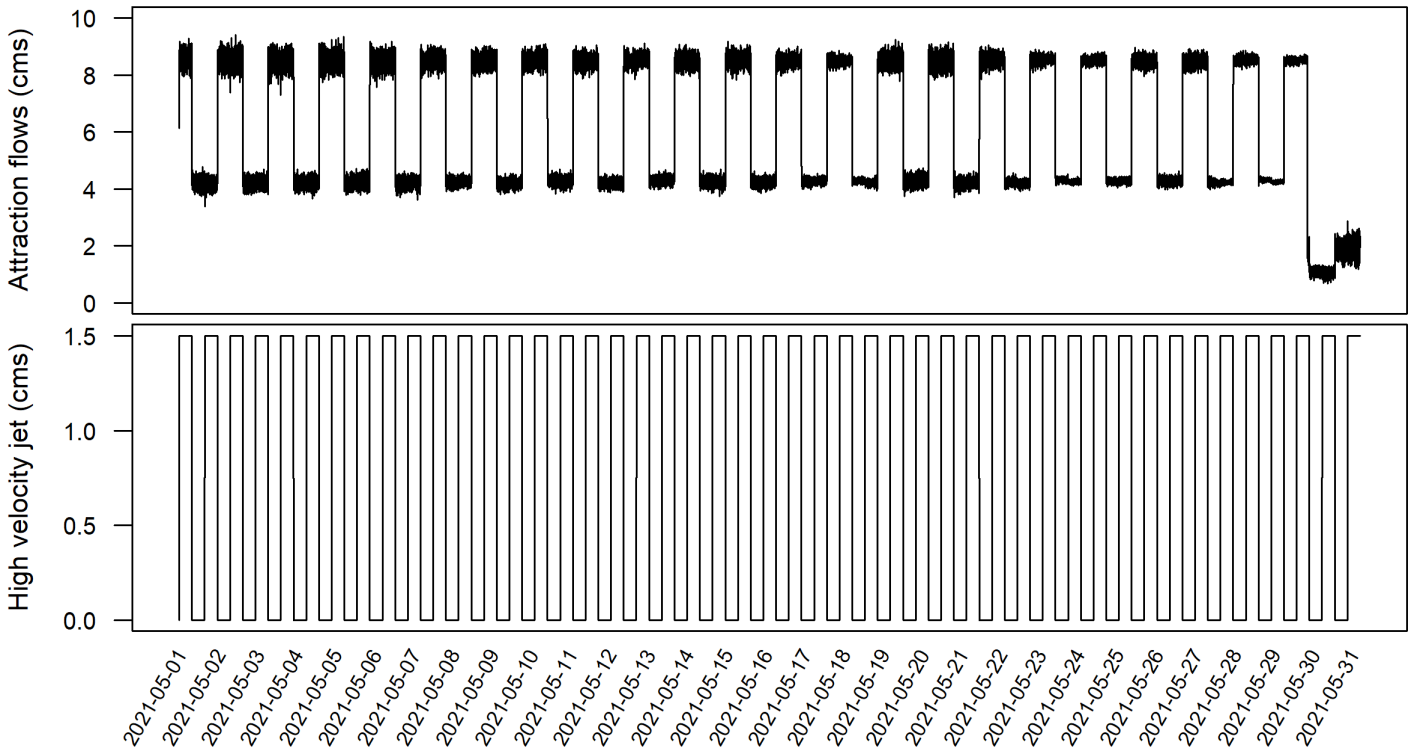


Mechanical operation

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). One exception included when a variable frequency drive on the attraction flow pumps faulted on May 30 and 31, which was reset and functioning normally by 06:49 on June 1 (Table 4).

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 May 10, 17 and 24 (Table 2).

Table 2. Daily total number of sorting cycles.

Date	Number of sorting cycles	Start time
2021-05-01	3	08:30, 11:00, 13:00
2021-05-02	3	08:30, 11:00, 13:00
2021-05-03	3	08:30, 11:00, 13:00
2021-05-04	3	08:30, 11:00, 13:00
2021-05-05	3	08:30, 11:00, 13:00
2021-05-06	3	08:30, 11:00, 13:00
2021-05-07	3	08:30, 11:00, 13:00
2021-05-08	3	08:30, 11:00, 13:00
2021-05-09	3	08:30, 11:00, 13:00
2021-05-10	1	08:30
2021-05-11	3	08:30, 11:00, 13:00
2021-05-12	3	08:30, 11:00, 13:00
2021-05-13	3	08:30, 11:00, 13:00
2021-05-14	3	08:30, 11:00, 13:00
2021-05-15	3	08:30, 11:00, 13:00
2021-05-16	3	08:30, 11:00, 13:00
2021-05-17	1	08:30
2021-05-18	3	08:30, 11:00, 13:00
2021-05-19	3	08:30, 11:00, 13:00
2021-05-20	3	08:30, 11:00, 13:00
2021-05-21	3	08:30, 11:00, 13:00
2021-05-22	3	08:30, 11:00, 13:00
2021-05-23	3	08:30, 11:00, 13:00
2021-05-24	1	08:30
2021-05-25	3	08:30, 11:00, 13:00
2021-05-26	3	08:30, 11:00, 13:00
2021-05-27	3	08:30, 11:00, 13:00
2021-05-28	3	08:30, 11:00, 13:00
2021-05-29	3	08:30, 11:00, 13:00
2021-05-30	3	08:30, 11:00, 13:00
2021-05-31	3	08:30, 11:00, 13:00

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

Date	Standby or shutdown	Rationale
N/A	N/A	No standby or shutdown periods occurred during 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
2021-05-30	Malfunction	Attraction flows decreased from 8.5 cms to 2 cms at 14:54.	Variable frequency drive faulted.	Variable frequency drive was reset and functioning normally by 06:49 on June 1.

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
Biological operation	Following Session 7 on May 13, BC Hydro started to only transport mature adult fish of spawning size through contingent fish capture and transport instead of all life stages from the target species. Young-of-the-year and immature life stages of target species are not undergoing spawning migrations and thus do not require to be transported and released upstream of the Project through contingent fish capture. Size-at-maturity for target species was based on the data collected under the Peace River Large Fish Indexing Survey[6] of the FAHMFP (2001 to 2020).

[6] Available at: http://sitecproject.com/sites/default/files/Mon-2-Task-2a-Peace-River-Large-Fish-Indexing-Survey-2019-Annual-Report.pdf

Contingent fish capture and transport

In total, 426 fish were transported upstream through contingent fish capture during the reporting period (Table 6). Specifically, 217 Largescale Sucker, 138 Longnose Sucker, 51 Bull Trout, 8 White Sucker, 7 Arctic Grayling and 6 Rainbow Trout were transported upstream of the Project. No mortalities were observed during the reporting period.

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

Species	Session 6		Session 7		Session 8		Session 9		Total
	May 6 and 7		May 13		May 20 and 21		May 26 and 27		
	U	D	U	D	U	D	U	D	
Arctic Grayling	3		1		1		2		7
Brook Stickleback									
Brook Trout				1					1
Bull Trout	13		13		14		11		51
Burbot								2	2
Finescale Dace									
Flathead Chub									
Goldeye									
Kokanee		2						1	3
Lake Chub									
Lake Trout								2	2
Lake Whitefish									
Largescale Sucker	36		51		56		74		217
Longnose Dace									
Longnose Sucker	12		18		36		72		138
Mountain Whitefish		491		353		229		246	1319
Northern Pike				1					1
Northern Pikeminnow		1		1		2		12	16
Northern Redbelly Dace									
Peamouth									
Pearl Dace									
Prickly Sculpin									
Pygmy Whitefish									
Rainbow Trout	2		1		2	1			6
Redside Shiner						1		1	2
Slimy Sculpin									
Spoonhead Sculpin									
Spottail Shiner									
Trout-perch									
Walleye									
White Sucker			4		3		1		8
Yellow Perch									
Total	66	494	88	356	112	233	160	264	1773
Grand total	560		444		345		424		

Photos

Photo 1. Sampling an Arctic Grayling in the sorting facility (May 1, 2021).

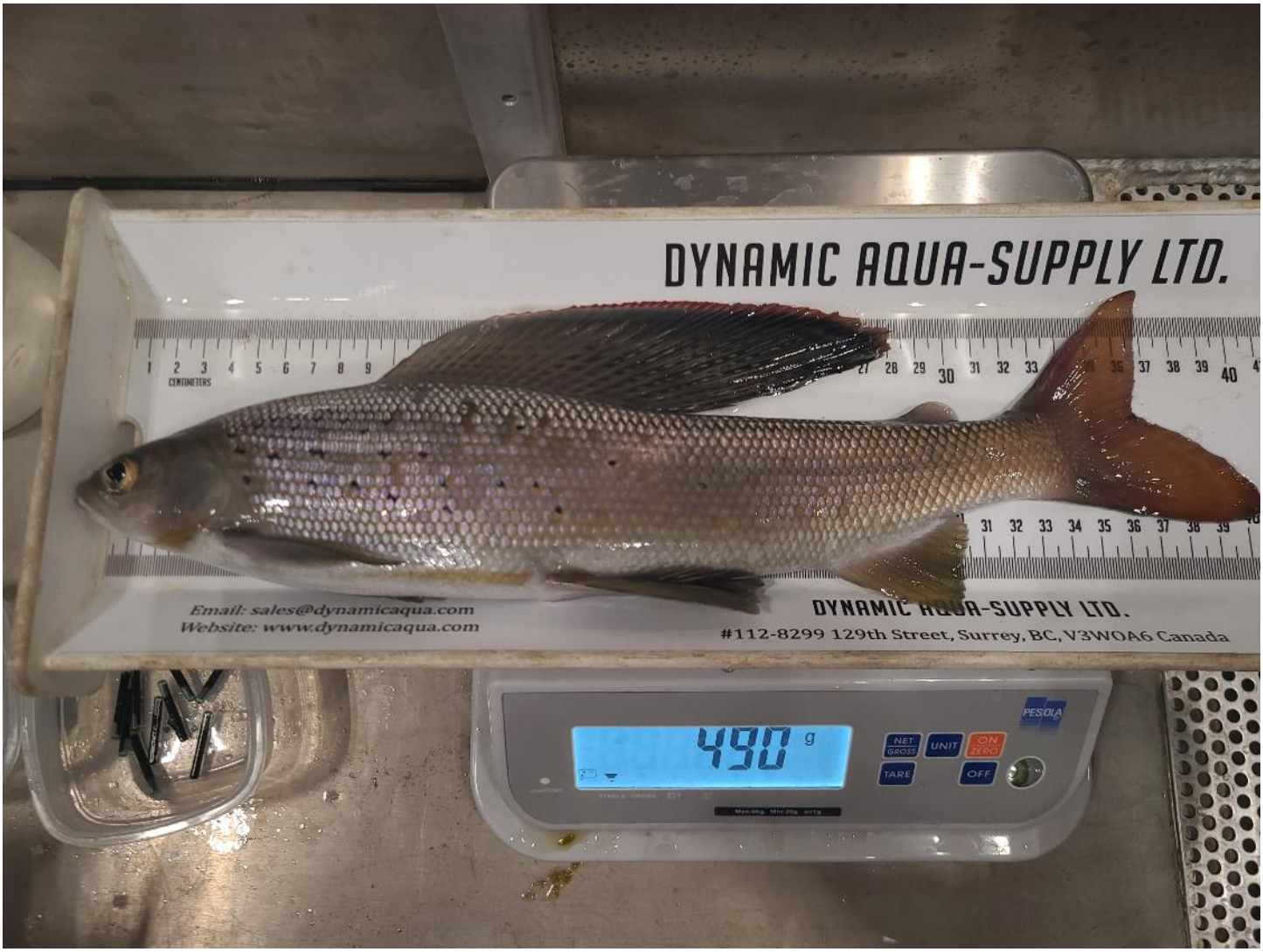


Photo 2. Processing fish in the sorting facility (May 21, 2021).

Photo 3. Releasing fish in the Peace River upstream of the Project (May 21, 2021).

Photo 4. Processing fish during contingent fish capture and transport (May 26, 2021).

Photo 5. Radio tagging a Bull Trout (top: May 26, 2021) and a Rainbow Trout (bottom: May 7, 2021) captured during contingent fish capture and transport to track their movements upstream of the Project.

Photo 6. Collecting a fin ray from a Bull Trout captured during contingent fish capture and transport for ageing and/or microchemistry (May 13, 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:	May 1 to 31, 2021
Subject:	Monthly Update on Upstream Fish Passage

196 fish sorted at facility

Operated facility for 31 days

426 fish transported through contingent fish capture

Category	Performance	Commentary
Safety		• Effective interfaces among contractors
Fish Passage[1]		• Observed higher passage in May compared to April • Some target species are in the fishway but are not passing
Sorting & Transport		• Sorted 196 fish from three species • Transported additional 426 fish through contingent fish capture
Fish Mortality		• No mortalities in April
Operation Within Criteria		• Operated within most engineering and design criteria
External Communication		• Presented to Indigenous groups at Environmental Forum • Provided updates to DFO, FLNRORD, and CWR
Effectiveness Monitoring		• Characterized fishway hydraulics under high water elevations
Learning & Adjustment		• Minor, process-based adjustments made to operations

Meets or Exceeds Expectations	Nearing Expectations	Far Below Expectations

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

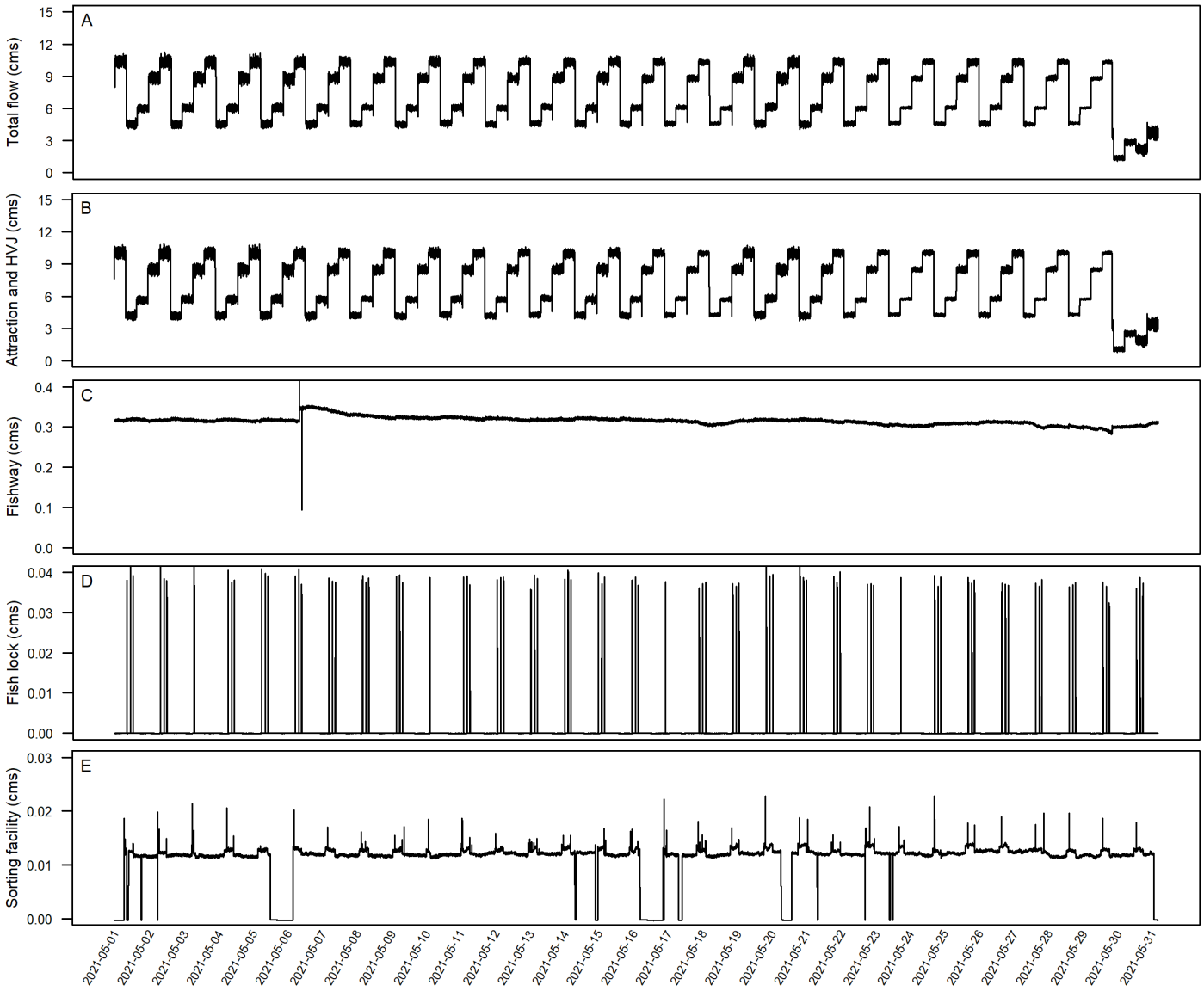
Target Species

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[7], 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).



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