

Site C Clean Energy Project

Temporary Upstream Fish Passage Facility Operations Report

Reporting Period: August 1 to 31, 2024

Prepared by BC Hydro

September 10, 2024

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 Q¹). 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 2024) 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 2024, the permanent upstream fish passage facility (hereafter permanent facility) will be operated at the outlet of the generating station to provide fish passage during the operation phase of the Project.

On April 15, 2024, the horizontal propeller pumps were removed from the pump station for detailed inspection. Both pumps had sustained extensive damage from operation in previous years and were shipped to the manufacturer for repair. Operating the temporary facility without attraction flows has 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 Plan².

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 trying to fulfill life history requirements upstream of the Project (Arctic Grayling, Bull Trout, Rainbow Trout, and Mountain Whitefish) were transported and released upstream of the Project during the reporting period (EIS, Volume 2, Appendix O³; BC Hydro 2015⁴). 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 August 2024.

This report has the following sections:

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

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 mechanical equipment to ensure the temporary facility achieves the biological objectives described in Section

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>

Summary

Ten thousand one hundred and twenty two fish – 9402 Redside Shiner, 254 Longnose Sucker, 167 Northern Pikeminnow, 139 Largescale Sucker, 77 Mountain Whitefish, 57 Sucker Species (Not Identified to Species), 8 White Sucker, 6 Bull Trout, 3 Prickly Sculpin, 2 Rainbow Trout, 2 Kokanee, 2 Peamouth, 1 Arctic Grayling, 1 Northern Pike, and 1 Slimy Sculpin – were sorted and sampled at the temporary facility, and transported and released into the Peace River upstream of the Project (Table 1, Photo 1).

In addition to operating the temporary facility, BC Hydro conducted one session of contingent fish capture downstream of the diversion tunnel outlet and transported 25 Mountain Whitefish and 16 Bull Trout upstream of the Project (Table 6). Fifty five fish from other species were encountered during contingent fish capture and were released downstream of the Project (Table 6).

River otters were observed throughout the reporting period. As such, BC Hydro continued live trapping efforts and captured and transported one otter to Dinosaur Reservoir (Photo 2).

Appendix I 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, 10122 fish were sorted in the temporary facility during the reporting period (Table 1; Figure 1). Eight mortalities were observed during the reporting period (0.7% of all fish sorted in 2024), which is in-line with the anticipated levels of mortality during operations⁶.

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

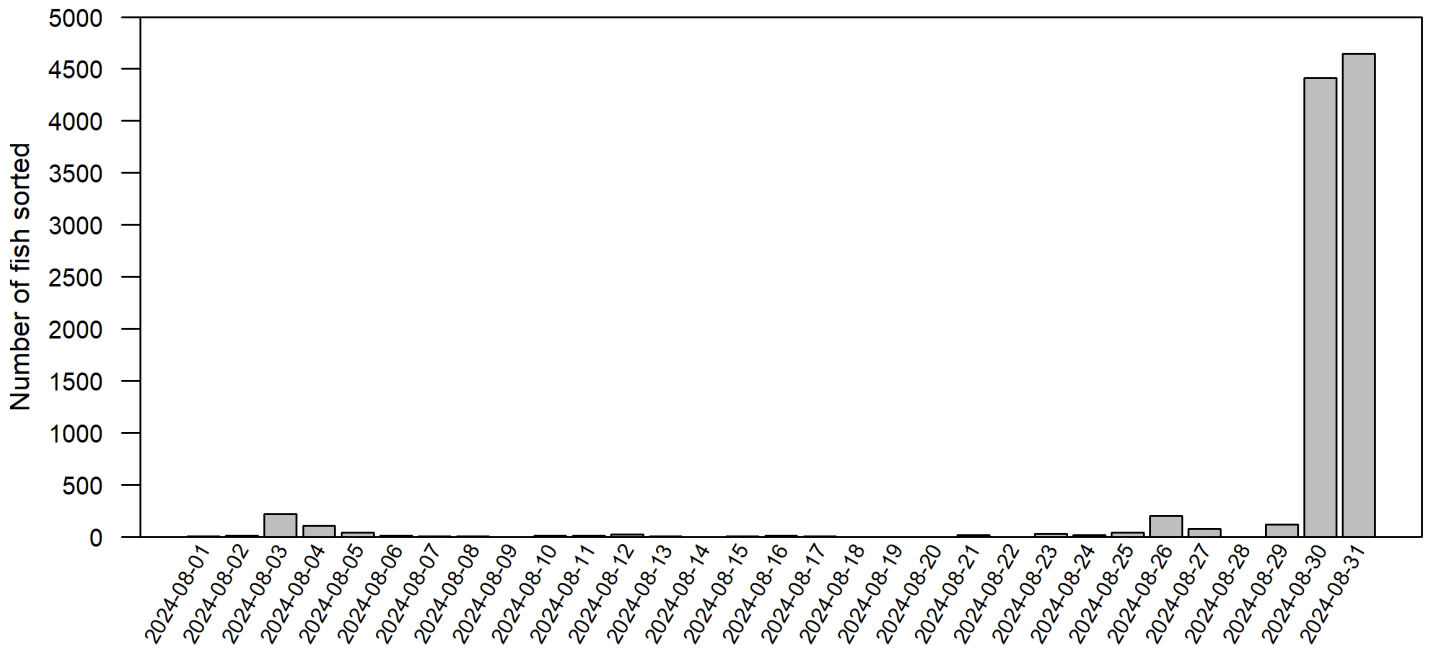
| Species | Sorted | Transported and released | PIT tagged | Mortalities | Genetics | Microchemistry or ageing |
|------------------------|--------|--------------------------|------------|-------------|----------|--------------------------|
| Arctic Grayling | 1 | 1 | | | | |
| Brook Stickleback | | | | | | |
| Brook Trout | | | | | | |
| Bull Trout | 6 | 6 | 2 | | 4 | 3 |
| Burbot | | | | | | |
| Finescale Dace | | | | | | |
| Flathead Chub | | | | | | |
| Goldeye | | | | | | |
| Kokanee | 2 | 2 | | | | |
| Lake Chub | | | | | | |
| Lake Trout | | | | | | |
| Lake Whitefish | | | | | | |
| Largescale Sucker | 139 | 139 | 59 | | | |
| Longnose Dace | | | | | | |
| Longnose Sucker | 254 | 254 | 161 | 1 | | |
| Mountain Whitefish | 77 | 77 | 57 | 2 | | 10 |
| Northern Pike | 1 | 1 | | | | |
| Northern Pikeminnow | 167 | 167 | | 1 | | |
| Northern Redbelly Dace | | | | | | |
| Peamouth | 2 | 2 | | | | |
| Pearl Dace | | | | | | |
| Prickly Sculpin | 3 | 3 | | 1 | | |
| Pygmy Whitefish | | | | | | |
| Rainbow Trout | 2 | 2 | 2 | | 2 | 2 |
| Redside Shiner | 9402 | 9402 | | 3 | | |
| Slimy Sculpin | 1 | 1 | | | | |
| Spoonhead Sculpin | | | | | | |
| Sculpin Species | | | | | | |
| Spottail Shiner | | | | | | |
| Sucker Species | 57 | 57 | | | | |
| Trout-perch | | | | | | |
| Walleye | | | | | | |
| White Sucker | 8 | 8 | 5 | | | |
| Yellow Perch | | | | | | |
| Grand total | 10122 | 10122 | 286 | 8 | 6 | 15 |

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

⁶ The FAA 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 4645 fish were sorted daily during the reporting period (Figure 1).

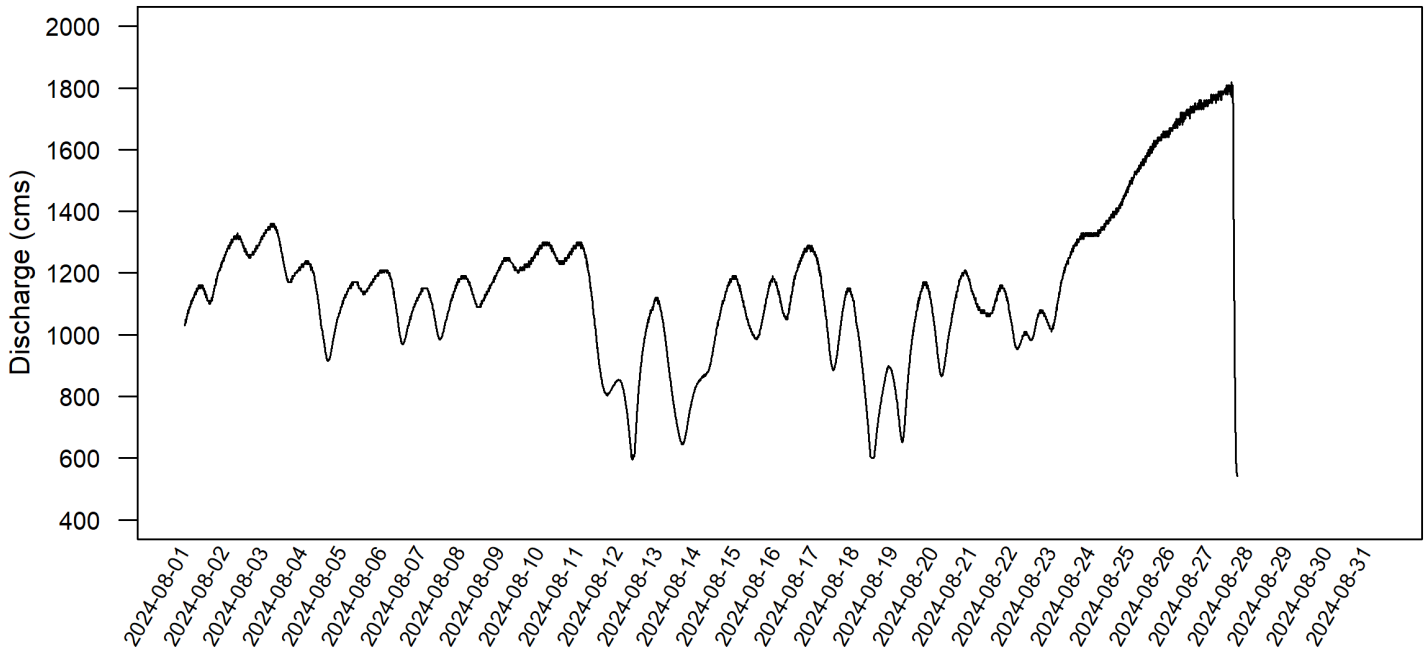
Figure 1. Daily number of fish sorted in the temporary facility during the reporting period.



Environmental conditions

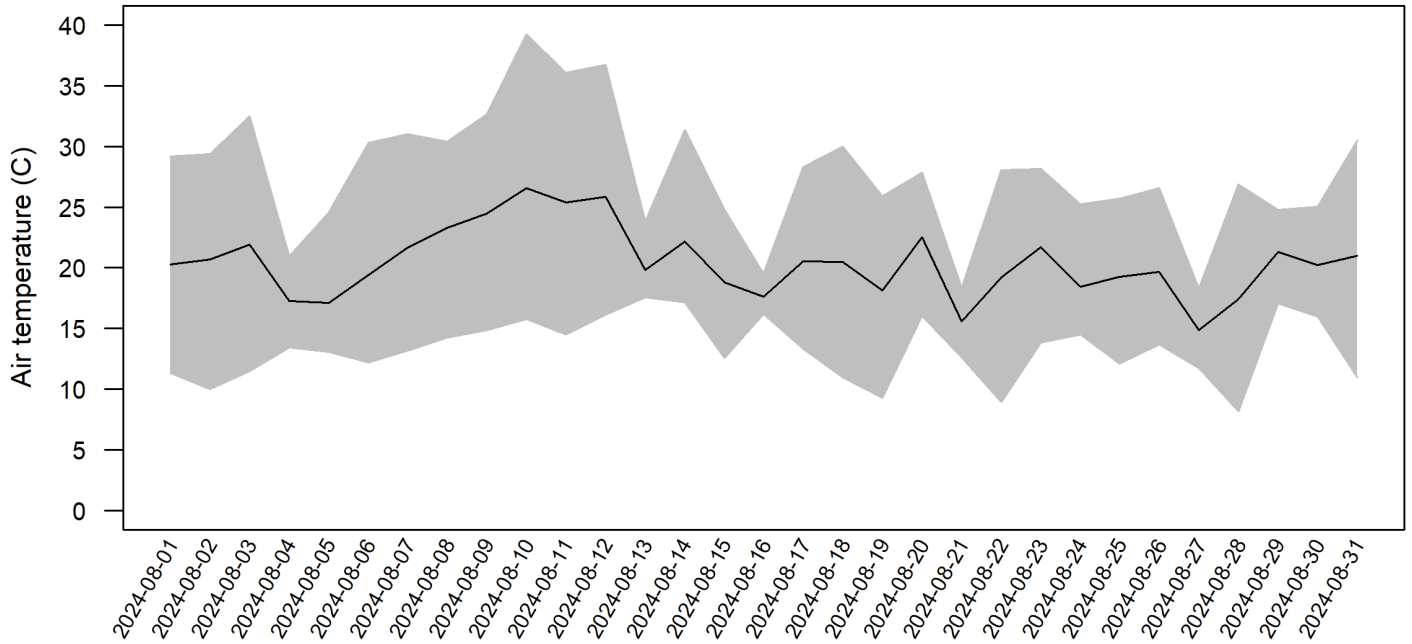
Discharge in the Peace River fluctuated during the reporting period from a low of 543 cms on August 28 to a high of 1820 cms on August 28 (Figure 2). Flows were reduced on August 28 to allow the closure of Diversion Tunnel #1 and to facilitate filling the Site C Reservoir. No data were available from August 28 to 31.

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 September 10; the downloaded data were provided at 5-minute intervals and were listed as provisional by the WSC.



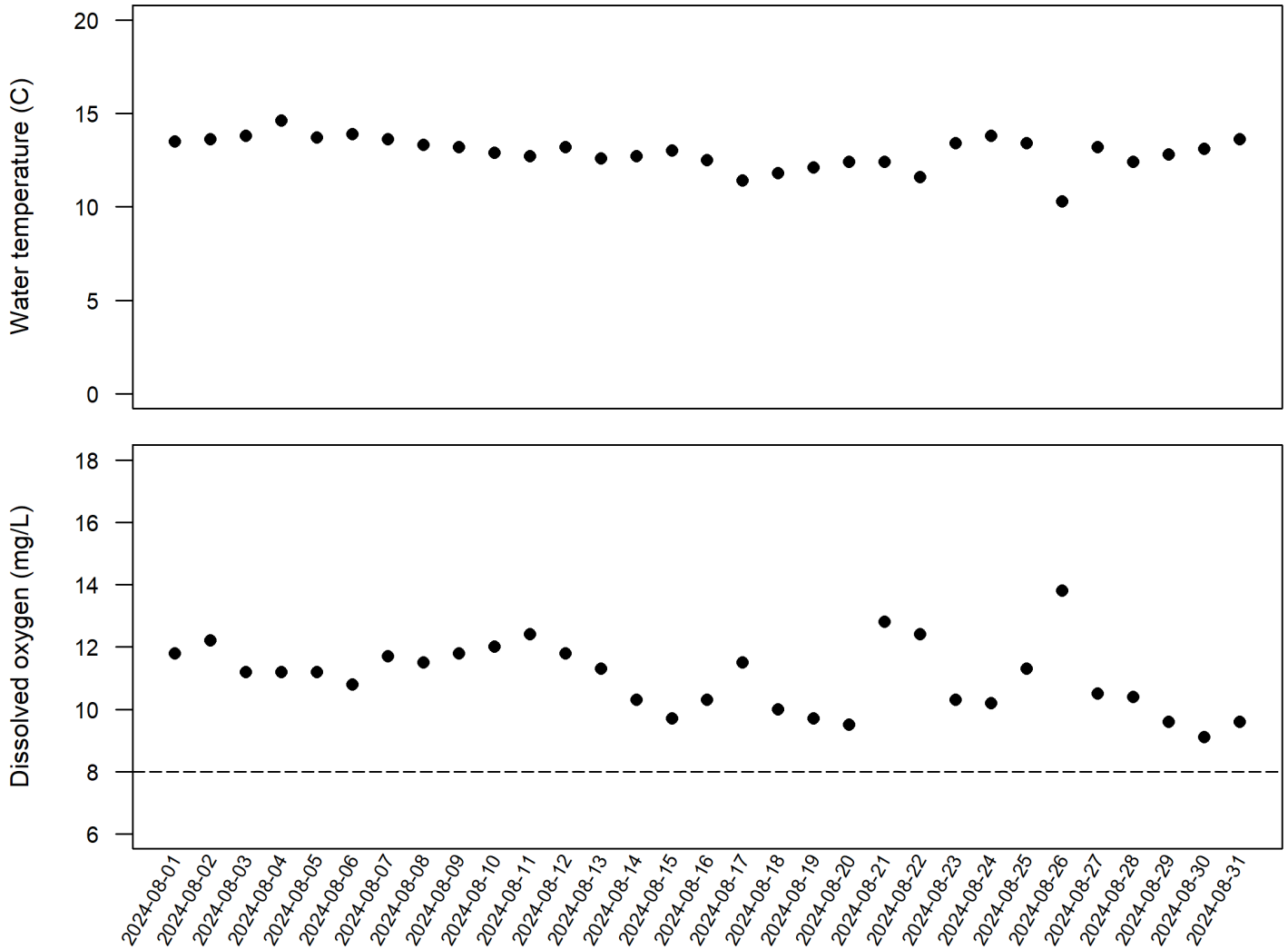
Air temperature fluctuated during the reporting period from a low of 8.2°C on August 28 to a high of 39.2°C on August 10 (Figure 3); this high is likely in response to direct sunlight on the temperature sensor.

Figure 3. Mean daily air temperature (black line; °C) during the reporting period as measured by a temperature sensor at the temporary facility (TT-602). Shaded area represents the minimum and maximum daily air temperatures.



Water temperature remained stable during the reporting period (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 Pool 25 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.

In 2024, BC Hydro intended to operate the attraction flows and high velocity jet at 10 cms and 0 cms, respectively (horizontal dashed lines in Figure 5). However, within the first week of operations, the attraction flows steadily declined and system alarms indicated electrical faults with the horizontal propeller pumps. BC Hydro 'turned off' the horizontal propeller pumps on April 5, 2024 and removed them from the pump station for a detailed inspection on April 15, 2024. As such, there were no attraction flows during the reporting period. BC Hydro turned off the high velocity jet on May 23 as water levels were not being maintained in the pump station to reliably operate the pump.

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”. Between one and six sorting cycles were conducted each day during the reporting period (Table 2).

Table 2. Daily total number of sorting cycles.

| Date | Number of sorting cycles | Start time |
|-------------|---------------------------------|--|
| 2024-08-01 | 5 | 09:17, 10:04, 11:16, 12:42, 13:43 |
| 2024-08-02 | 5 | 09:14, 10:24, 11:12, 12:30, 14:13 |
| 2024-08-03 | 5 | 09:15, 10:35, 12:06, 13:25, 14:33 |
| 2024-08-04 | 5 | 09:15, 10:45, 12:10, 13:52, 14:43 |
| 2024-08-05 | 3 | 10:10, 11:59, 14:16 |
| 2024-08-06 | 5 | 09:28, 10:31, 11:50, 12:54, 14:07 |
| 2024-08-07 | 5 | 08:52, 09:50, 11:22, 13:05, 13:56 |
| 2024-08-08 | 5 | 08:59, 10:02, 11:36, 12:52, 13:59 |
| 2024-08-09 | 1 | 08:03 |
| 2024-08-10 | 5 | 08:47, 10:07, 10:58, 12:02, 13:38 |
| 2024-08-11 | 5 | 08:53, 10:18, 11:25, 12:37, 13:28 |
| 2024-08-12 | 5 | 09:52, 10:56, 11:47, 12:50, 13:34 |
| 2024-08-13 | 2 | 10:01, 13:47 |
| 2024-08-14 | 2 | 09:34, 11:16 |
| 2024-08-15 | 3 | 08:55, 10:24, 13:16 |
| 2024-08-16 | 3 | 09:10, 10:26, 13:58 |
| 2024-08-17 | 4 | 09:00, 10:10, 11:06, 13:04 |
| 2024-08-18 | 6 | 08:53, 10:00, 11:03, 12:06, 13:16, 14:03 |
| 2024-08-19 | 4 | 09:16, 10:06, 11:04, 13:13 |
| 2024-08-20 | 5 | 11:37, 12:48, 14:12, 14:53, 15:42 |
| 2024-08-21 | 6 | 09:33, 10:30, 11:18, 12:57, 14:25, 15:04 |
| 2024-08-22 | 5 | 09:03, 09:59, 10:47, 11:54, 14:13 |
| 2024-08-23 | 4 | 08:54, 10:17, 12:40, 13:46 |
| 2024-08-24 | 5 | 09:15, 10:46, 11:34, 13:18, 14:24 |
| 2024-08-25 | 5 | 09:23, 10:08, 11:33, 13:20, 14:25 |
| 2024-08-26 | 4 | 09:01, 10:21, 11:29, 14:19 |
| 2024-08-27 | 5 | 09:26, 11:44, 13:35, 14:36, 15:10 |
| 2024-08-28 | 1 | 07:56 |
| 2024-08-29 | 5 | 11:22, 12:03, 13:33, 14:44, 15:11 |
| 2024-08-30 | 3 | 11:10, 14:11, 15:22 |
| 2024-08-31 | 3 | 09:29, 12:08, 14:30 |

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

| Date | Standby or shutdown | Rationale |
|-------------|----------------------------|------------------|
| N/A | N/A | N/A |

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 |
|---------------------------|---|--|-------------------|--|
| 2024-08-19 and 2024-08-23 | Malfunction | Fishway supply pump shut off during a crowd. | Unknown. | Operator reset the facility wet system, which restarted the fishway supply pump. |

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 Plan². In general the temporary facility was operated as planned and described in the OPP.

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

| Component | Adjustment |
|-----------|------------|
| N/A | N/A |

Contingent fish capture and transport

In total, 41 fish were transported upstream through contingent fish capture during the reporting period (Table 6). Specifically, 25 Mountain Whitefish and 16 Bull Trout 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 14 | |
|------------------------|------------|----|
| | August 9 | |
| | U | D |
| Arctic Grayling | | |
| Brook Stickleback | | |
| Brook Trout | | |
| Bull Trout | 16 | |
| Burbot | | |
| Finescale Dace | | |
| Flathead Chub | | |
| Goldeye | | |
| Kokanee | | |
| Lake Chub | | |
| Lake Trout | | |
| Lake Whitefish | | |
| Largescale Sucker | | 7 |
| Longnose Dace | | |
| Longnose Sucker | | 14 |
| Mountain Whitefish | 25 | 7 |
| Northern Pike | | 4 |
| Northern Pikeminnow | | 2 |
| Northern Redbelly Dace | | |
| Peamouth | | |
| Pearl Dace | | |
| Prickly Sculpin | | |
| Pygmy Whitefish | | |
| Rainbow Trout | | |
| Redside Shiner | | 2 |
| Slimy Sculpin | | |
| Spoonhead Sculpin | | |
| Spottail Shiner | | |
| Trout-perch | | |
| Walleye | | |
| White Sucker | | 19 |
| Yellow Perch | | |
| Total | 41 | 55 |
| Grand total | 96 | |

Photos

Photo 1. More than 9000 Redside Shiner were captured during the reporting period (August 30, 2024).



Photo 2. One river otter was trapped at the temporary facility during the reporting period and relocated to Dinosaur Reservoir (August 14, 2024).



Prepared by

This report was prepared by the following individuals:

| Qualified Individual | Expertise |
|--------------------------|-----------|
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Appendix I. (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 133987⁷, 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://siteproject.com/sites/default/files/fish-passage-facility-water-licences-133986-133987.pdf>