Site C Clean Energy Project

Fisheries and Aquatic Habitat Monitoring and Follow-up Program

Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b)

Task 2c – Site C Reservoir Tributaries Fish Population Indexing Survey

Construction Year 2 (2016)

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FINAL REPORT

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Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c)

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Executive Summary

In accordance with Provincial Environmental Assessment Certificate Condition No. 7[1] and Federal Decision Statement Condition Nos. 8.4.3[2] and 8.4.4[3] for BC Hydro's Site C Clean Energy Project (the Project), BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP[4]). The Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b) represents one component of the FAHMFP and is designed to monitor Peace River fish populations that spend portions of their lifecycles in Peace River tributaries and migrate past the Site C location to fulfill their life history requirements. Most notably, these species include Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), and Rainbow Trout (*Oncorhynchus mykiss*). The Site C Reservoir Tributaries Fish Population Indexing Survey is one component (Task 2c) of Mon-1b and is intended to monitor the abundances of these target species in the Chowade River, Cypress Creek, and the upstream portion of the Halfway River (termed the Halfway River watershed), the Moberly River, and Lynx and Maurice creeks. This report summarizes the findings of Task 2c during its initiation year (Site C Construction Year 2; 2016). As the first year of a multi-year study, 2016 results are intended to provide baseline data prior to subsequent phases of Site C construction and reservoir creation and to identify the most effective sampling locations and methods to employ during future study years.

Specifically, Task 2c investigated Arctic Grayling, Bull Trout, and Rainbow Trout populations in the Chowade River, Cypress Creek, and the upper Halfway River using a combination of backpack electrofishing and small fish boat electroshocking, and investigated Arctic Grayling populations in the Moberly River using a combination of backpack electrofishing, small fish boat electroshocking, and beach seining. Sampling in Lynx and Maurice creeks was proposed using a combination of backpack electrofishing and beach seining; however, Maurice Creek was not surveyed in 2016 at the request of BC Hydro due to site access limitations associated with sampling crew safety and security. Fish collection activities were not attempted in Lynx Creek due to extremely high water turbidity and conductivity that may have been associated with an upstream landslide. Data collection activities at Lynx Creek were limited to water quality measurements, habitat measurements, and photographs.

Prior to sampling, habitat within the Halfway River watershed was categorized as either single channel, braided, or tributary confluence using historical data and aerial photographs. This stratification resulted in 11 sections within the Chowade River study area, 4 sections within Cypress Creek study area, and 6 sections within the upper Halfway River study area. The Moberly River was separated into 12 sections using the classification system and section delineations outlined by Mainstream (2011).

Overall, 53 backpack electrofishing sites, 140 small fish boat electroshocking sites, and 14 beach seine sites were surveyed during the 2016 field season (all study areas combined). Tributaries of the Halfway River watershed were sampled between August 6 and 28. The Moberly River was sampled between September 8 and 18.

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[1] The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.

[2] The plan shall include: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area;

[3] The plan shall include: an approach to monitor and evaluate the effectiveness of mitigation or offsetting measures and to verify the accuracy of the predictions made during the environmental assessment on fish and fish habitat.

[4] Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/document-library/environmental-management-plans-and-reports.

In the Chowade River, 4 Arctic Grayling, 111 Bull Trout, and 66 Rainbow Trout were captured (all methods combined). Of those, 4 Arctic Grayling, 17 Bull Trout, and 65 Rainbow Trout were implanted with half-duplex (HDX) passive integrated transponder (PIT) tags. In Cypress Creek, 1 Arctic Grayling, 42 Bull Trout, and 30 Rainbow Trout were captured (all methods combined). With the exception of one Rainbow Trout, all of the target fish captured in Cypress Creek were implanted with a PIT tag. In total, 23 Bull Trout (18 tagged) and 9 Rainbow Trout (all tagged) were captured in the upper Halfway River. Arctic Grayling were not recorded in the upper Halfway River during the 2016 survey. Most (72%) Bull Trout were recorded during backpack electrofishing surveys, whereas Arctic Grayling and Rainbow Trout were only recorded during small fish boat electroshocking surveys. Young-of-the-Year (YOY) Bull Trout were recorded in the Chowade River only and were too small to receive PIT tags (i.e., less than 120 mm fork length [FL]). All Rainbow Trout recorded in the Halfway River watershed were larger than 150 mm FL.

In the Moberly River, 105 Arctic Grayling were recorded; however, only 19 of these fish were large enough to receive a PIT tag. In total, 3 adult Arctic Grayling and 15 immature Arctic Grayling were recorded in the Moberly River. All remaining Arctic Grayling (n = 87) were YOY. Arctic Grayling were most commonly recorded in the middle sections (Sections 5 through 8) of the Moberly River and were not recorded within the future inundation zone of the proposed Site C reservoir (i.e., Section 10). Higher than normal water levels and turbidity in the Moberly River during the 2016 study period may have influenced results; however, Arctic Grayling catch rates in the Moberly River were similar to or higher than catch rates recorded during previous studies (Mainstream 2010, 2011, 2013). Two immature Bull Trout were recorded within the future inundation zone of the proposed Site C reservoir (i.e., Section 10). Rainbow Trout were not recorded in the Moberly River during the 2016 survey.

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1.0 INTRODUCTION

In accordance with Provincial Environmental Assessment Certificate Condition No. 7[5] and Federal Decision Statement Condition Nos. 8.4.3[6] and 8.4.4[7] for BC Hydro's Site C Clean Energy Project (the Project), BC Hydro has developed the Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program (FAHMFP[8]). The Site C Reservoir Tributaries Fish Community and Spawning Monitoring Program (Mon-1b) represents one component of the FAHMFP and is designed to monitor Peace River fish populations that use tributaries situated within the future inundation zone of the proposed Site C reservoir to fulfill portions of their life cycles. Most notably, these species include Arctic Grayling (*Thymallus arcticus*), Bull Trout (*Salvelinus confluentus*), and Rainbow Trout (*Oncorhynchus mykiss*). Peace River Arctic Grayling are known to spawn in the Moberly River (AMEC and LGL 2008a, 2008b, 2010a), Peace River Bull Trout are known to spawn in the Halfway River watershed (AMEC and LGL 2008a, 2008b, 2010a, 2010b; BC MELP 2000; Burrows et al. 2001; Pattenden et al. 1991), and Peace River Rainbow Trout are known to spawn in Maurice and Lynx creeks (Pattenden et al. 1991; Mainstream 2009a). The Site C Reservoir Tributaries Fish Population Indexing Survey is one component (Task 2c) of Mon-1b and is intended to monitor the abundances of Arctic Grayling, Bull Trout, and Rainbow Trout in these known spawning tributaries that could be affected by the Project. This report summarizes the findings of Task 2c during its initiation year (Site C Construction Year 2; 2016). As the first year of a multi-year study, 2016 results are intended to provide baseline data prior to subsequent phases of Site C construction and reservoir creation and to identify the most effective sampling locations and methods to employ during future study years.

A key uncertainty identified in the Project's Environmental Impact Statement (EIS) relates to the expected movements of Peace River Bull Trout during and after construction of the Project, which in turn, influences the number of spawning Bull Trout expected to be present in the Halfway River[9]. The objective of the Peace River Bull Trout Spawning Assessment (Mon-1b, Task 2b) is to monitor Bull Trout spawner abundance and redd numbers in select locations within the Halfway River watershed to monitor the population's response to the construction and operation of the Project. The abundance of adult Bull Trout in the Halfway River watershed, as measured under Task 2b, may be influenced by changes in the abundance of juvenile Bull Trout in the study area and may be influenced by changes in the abundance of the Halfway River's resident Bull Trout population. Therefore, the Site C Reservoir Tributaries Fish Population Indexing Survey is designed, in part, to monitor juvenile Bull Trout abundance in the Halfway River watershed to test the hypothesis that Bull Trout juvenile abundance in the Halfway River will not decline relative to baseline estimates.

A program dedicated to monitoring juvenile Bull Trout abundance in the Halfway River watershed has not previously been implemented, although incidental catches were noted during some studies (e.g., Mainstream 2009a, 2010, 2011, 2013). Therefore, for the purposes of testing the above hypothesis, data collected during initial study years (i.e., 2016 and 2017) will serve as baseline data with which to test juvenile Bull Trout abundance estimates against future study years.

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[5] The EAC Holder must develop a Fisheries and Aquatic Habitat Monitoring and Follow-up Program to assess the effectiveness of measures to mitigate Project effects on healthy fish populations in the Peace River and tributaries, and, if recommended by a QEP or FLNR, to assess the need to adjust those measures to adequately mitigate the Project's effects.

[6] The plan shall include: an approach to monitor changes to fish and fish habitat baseline conditions in the Local Assessment Area;

[7] The plan shall include: an approach to monitor and evaluate the effectiveness of mitigation or offsetting measures and to verify the accuracy of the predictions made during the environmental assessment on fish and fish habitat.

[8] Site C Fisheries and Aquatic Habitat Monitoring and Follow-up Program available at https://www.sitecproject.com/document-library/environmental-management-plans-and-reports.

[9] Site C Clean Energy Project Environmental Impact Statement, Volume 2, Appendix Q3.

The Project's EIS identified uncertainties regarding the continued use of Maurice and Lynx creeks for spawning and rearing by Peace River Rainbow Trout populations. Sampling will test the hypothesis that Rainbow Trout from Site C reservoir will continue to spawn and rear in Maurice and Lynx creeks upstream of the Site C reservoir inundation zone following reservoir formation.

While Rainbow Trout have been recorded in Maurice and Lynx creeks during their spawning season (Pattenden et al. 1991; Mainstream 2009a), dedicated spawning studies have not been conducted for this species in these watersheds. The above hypothesis could theoretically be tested by conducting ground-based spawner counts similar to those being conducted for Bull Trout in the Halfway River watershed as part of Task 2b (Instream Fisheries Research in prep.); however, high flows and high water turbidity in Maurice and Lynx creeks during the Rainbow Trout spring spawning season would limit the reliability of ground-based spawner counts (e.g., spawning Rainbow Trout could be present, but undetected due to poor water visibility). Mon-1b also states that information on juvenile Rainbow Trout densities and growth rates are required to provide insight when interpreting Rainbow Trout abundance estimates generated for Site C reservoir as measured under other components of the FAHMFP. For the above reasons, use of Maurice and Lynx creeks for spawning by Rainbow Trout will be inferred under Task 2c by monitoring use by juvenile Rainbow Trout and the presence of young-of-the-year (YOY) Rainbow Trout in either tributary during the summer survey confirming that Rainbow Trout spawned in the tributary during the preceding spring spawning season.

The Project's EIS describes key uncertainties for the Peace River Arctic Grayling population upstream of the Project[10]. These include the species' ability to overwinter in the Moberly River and its response to Site C reservoir habitat. After impoundment, Arctic Grayling use upstream of the Project is expected to largely be limited to the Moberly River, and to be present at lower numbers when compared to baseline estimates (e.g., Mainstream 2013). Sampling under this program will contribute to the information used to test the hypothesis that a self-sustained population of Arctic Grayling will remain in the Moberly River.

Sampling in the Moberly River under Task 2c in 2016 and 2017 will add to the existing pre-development baseline dataset to further describe the fish community located within and upstream of the Site C reservoir inundation level while improving understanding of the Moberly River Arctic Grayling population.

2.0 METHODS

2.1 Study Area

The Task 2c study area included tributaries that were previously identified as having key habitats for migratory Peace River Arctic Grayling, Bull Trout, and Rainbow Trout populations (Appendix A, Figure A1). Sections of each tributary that were sampled depended on sampling logistics and the species-specific hypotheses being tested, as described in the following sections.

[10] Site C Clean Energy Project Environmental Impact Statement, Volume 2, Appendix Q3.

2.1.1 Halfway River Watershed

Select areas previously identified as important Bull Trout spawning areas (Euchner and Mainstream 2013) were monitored during the 2016 study. These included the Chowade River and Cypress Creek, which are both tributaries of the Halfway River, and a portion of the Halfway River proper (termed the upper Halfway River; Appendix A, Figure A1).

The Chowade River study area was approximately 33 km long and was defined as the portion of the Chowade River from the upstream extent of the Chowade Bull Trout Wildlife Habitat Area (WHA; River Km 53.5 as measured from the Chowade River confluence), as defined by MoE (2016), downstream to the Halfway Graham Forest Service Road bridge (River Km 20.9; Appendix A, Figure A2; Table A1). The Task 2b Chowade River PIT Tag Monitoring and Resistivity Counter Station was located approximately 400 m upstream of the bridge near River Km 21.3 (Instream Fisheries Research in prep.).

The Cypress Creek study area was approximately 43 km long and was defined as the portion of Cypress Creek from an upstream barrier to fish movements that was previously identified by Euchner and Mainstream (2013; River Km 60.3 as measured from the Cypress Creek confluence) downstream to the Cypress Creek Road bridge (River Km 17.7; Appendix A, Figure A3; Table A1).

The upper Halfway River study area was approximately 42 km long and was defined as the portion of the Halfway River from an upstream barrier to fish movements that was previously identified by Euchner and Mainstream (2013; River Km 259.4 as measured from the Halfway River confluence) downstream to near the 147 Mile Road (River Km 217.5; Appendix A, Figure A4; Table A1).

A fourth study area, Needham Creek, is identified for monitoring under Task 2c, with surveys initiating in 2017. As detailed in Mon-1b, Needham Creek was not surveyed in 2016. Its exclusion in 2016 allowed for increased sampling effort in the initial study year in tributaries expected to yield higher juvenile numbers.

2.1.2 Maurice and Lynx Creeks

Maurice and Lynx creeks were previously identified as being important to the Peace River Rainbow Trout population (Pattenden et al. 1991; Mainstream 2009a); however, impassable barriers limit their use by Peace River fish populations to the bottom 3.0 km in Maurice Creek and 9.9 km in Lynx Creek. The development of Site C reservoir will result in the inundation of approximately 0.5 km of Maurice Creek and 1.3 km of Lynx Creek.

The Lynx Creek study area was limited to the 2 km long section immediately upstream from its confluences with the Peace River (Appendix A, Figure A5). This area was chosen to maintain consistency with historical datasets (Mainstream 2009a).

At the request of BC Hydro, Maurice Creek was not surveyed in 2016 due to site access limitations associated with sampling crew safety and security.

Field crews visited the Lynx Creek study area on August 11, 2016 and observed extremely turbid water. Based on local media reports, the high turbidity was understood to be due to a recent landslide in Brenot Creek (a Lynx Creek tributary) that occurred approximately 10.5 km upstream of the Lynx Creek confluence[11]. The high turbidity, coupled with unstable stream banks, hindered sampling and limited data collection in 2016 to basic water quality and habitat measurements. These data are provided in the Site C Reservoir Tributary Fish Population Indexing Survey database (Attachment A) but are not presented or discussed in this report.

2.1.3 Moberly River

The Moberly River study area was approximately 124 km long and was defined as the portion of the Moberly River from the outlet of Moberly Lake (River Km 123.7) downstream to the Moberly River confluence (River Km 0.0; Appendix A, Figures A6 and A7; Table A1).

2.1.4 Sample Sites

The Moberly River and Halfway River study areas, including the Chowade River and Cypress Creek, were divided into sections based on general river characteristics and habitat types; however, the habitat classification systems employed were different between the Halfway River watershed and Moberly River.

For the Halfway River watershed, study areas were divided into sections based on a review of aerial photos and historical site data. Sections were delineated based on broad changes in geomorphology, with the entire length of each study area being classified as one of three geomorphological habitat types: 1) single channel; 2) braided channel; or 3) tributary confluence area (Appendix A, Table A1).

For the Moberly River, previous baseline studies had already delineated river sections (Mainstream 2011; Appendix A, Table A1). To maintain consistency with previous datasets, these sections were implemented for the 2016 study. The habitat classifications delineated by Mainstream (2011) were as follows:

1) Irregular meanders; frequent riffle complexes interspersed with extended runs with some flats; and

2) Tortuous meanders dominated by low water velocities; flats with few riffle sections.

Site selection within sections followed the same approach for the Halfway River watershed and Moberly River study areas. For small fish boat electroshocking, the initial study design was to select sample sites within each section using a stratified random design. However, logistic challenges (e.g., difficult access, frequent woody debris jams, and shallow sections that hindered boat travel) would have resulted in random sites that could not be feasibly or efficiently sampled. As a consequence, sites were established based on access, sampling logistics, and safety protocols. Sites were established in 100 to 600 m lengths of watercourses that were navigable by inflatable boat, were free of large woody debris jams that could not be portaged, and had site access at upstream and downstream ends by road or suitable helicopter landing area (Appendix A, Table A2). For backpack electrofishing and beach seining, random site selection within each section would have resulted in a large number of sites that could not be safely or efficiently sampled due to fast or deep water. These sites were selected opportunistically, targeting areas

[11] http://hudsonshope.ca/residents/water-services/.

where the sample method would be most effective and habitats were thought to be suitable for the target species (Appendix A, Table A2). For these two methods, these areas were often side channels or low velocity habitats near the channel margin.

In the Halfway River watershed, the small fish boat electroshocker was the most commonly employed method, covering 21.7 km of river length (all three study areas combined). Backpack electrofishing was used to sample 1.8 km of shoreline (all three study areas combined; Table 1). In the Moberly River, 21.9 km of the river was sampled using a small fish boat electroshocker, whereas 4.4 km were sampled by backpack electrofisher (Table 1). In total, 14 sites were sampled by beach seine in the Moberly River, covering a total area of 1,538 m^2 (Appendix B, Table B1).

Table 1: Electrofishing effort, in sample time and distance sampled, employed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Tributary	Backpack Electrofishing			Small Fish Boat Electroshocking		
	# Sites Sampled	Electrofishing Time Sampled (seconds)	Stream Length Sampled (m)	# Sites Sampled	Electroshocking Time Sampled (seconds)	Stream Length Sampled (m)
Chowade River	4	4,574	650	44	9,767	11,017
Cypress Creek	3	3,205	570	17	4,486	4,690
upper Halfway River	2	2,663	550	18	4,509	6,010
Halfway River Total	**9**	**10,442**	**1,770**	**79**	**18,762**	**21,717**
Moberly River Total	**44**	**24,623**	**4,436**	**61**	**17,812**	**21,904**

2.1.5 Study Period

Cypress Creek was sampled on August 6, 24, and 25. The Chowade River was sampled from August 17 to 20 and from August 22 to 24. On August 21, inclement weather reduced visibility and prevented the helicopter from accessing the Halfway River watershed so sampling was not conducted on that day. The upper Halfway River was sampled on August 26 and 28. The Moberly River was sampled between September 8 and 18.

2.2 Fish Capture and Processing

A combination of backpack electrofishing and small fish boat electroshocking was used to capture fish in the Halfway River watershed while targeting Arctic Grayling, Bull Trout, and Rainbow Trout and in the Moberly River while targeting Arctic Grayling. Sampling consisted of a single pass in open sites. Small fish boat electroshocking was used to sample main channel habitats and sites where the water was too deep or fast to safely wade or efficiently use a backpack electrofisher. Whitewater-style rafts (Avon™ 13 Pathmaker; 4 m long by 1.75 m wide) were used for small fish boat electroshocking. The rafts were equipped with an electrofisher (a Smith-Root 2.5 Generated Powered Pulsator or a Smith-Root Type VI-A) and a generator contained in a waterproof tub. The electrofishers were connected to cathode array curtains placed on the bows of the rafts, and two anode pole arrays extending approximately 1.5 m in front of the rafts were angled between 20 and 40° off either side of the bow. While sampling, a single crew member was positioned at the bow of the boat. This crew member netted stunned fish and transferred them to a water-filled holding tank positioned behind the bow but in front on the oarsman. The netter attempted to capture all stunned fish but priority was given to target species (i.e., Arctic Grayling, Bull Trout, and Rainbow Trout) if more than one species was observed at the same time. The oarsman sat in an elevated chair behind the holding tank and maneuvered the boat with oars braced in oar locks. During sampling, a third crew member walked the shoreline ahead of the boat to identify approaching hazards and mark the upstream and downstream ends of the site with a GPS unit. Electrofisher settings were adjusted at each site, depending on local conditions and the size and species of fish observed, to minimize injuries to fish. The electrofisher was generally operated at 60 Hz pulsed direct current (PDC) if mostly small fish (i.e., less than approximately 20 cm) were observed and at 30 Hz PDC if many large fish (i.e., longer than approximately 20 cm) were observed. The amperage was adjusted as needed to attain the desired response in fish, which was galvanotaxis (forced swimming) without immediate tetany. This response typically corresponded to an amperage of 2.0 to 2.5 amps as measured on the GPP gauge.

Backpack electrofishing was used to sample locations where the water was shallow and slow enough for safe wading and efficient capture using this technique. These sites were often side channel or braided areas where the channel was less than 5 m wide, had mean water depths less than 0.6 m, and water velocities less than approximately 1.0 m/s. Backpack electrofishing was conducted with one person operating the electrofisher and one person netting fish. Captured fish were netted and transferred to stream-side coolers or buckets set along the side of the sample site. At each site, habitat conditions (e.g., water temperature and water clarity, cover types and distribution, habitat features), electrofisher settings (e.g., waveform, pulse, voltage), crew information (netter names and electrofisher operator), and sampling effort (e.g., seconds of electrofisher operation, length surveyed) were recorded. Backpack electrofishers used included the Smith-Root models LR-24 and 12B. Electrofisher settings were adjusted as needed to minimize injuries to fish while efficiently capturing the target size and species. Voltage ranged from 300 to 400 volts, frequency ranged from 30 to 60 Hz, and pulse width ranged from 4 to 20 ms.

The original study plan included estimating electrofishing catchability by conducting a mark-recapture program at a subsample of sites over a two-day period. These recapture electrofishing passes were to be conducted on the Chowade River for Bull Trout and the Moberly River for Arctic Grayling. However, the number of target species captured and tagged at each site was low (typically less than five tagged fish per site), which meant that the probability of recapturing tagged fish during a second pass also was low, and it was unlikely that it would have been possible to estimate catchability. After discussions with BC Hydro, the second electrofishing passes were not conducted and catchability was not estimated in 2016 in either the Chowade or Moberly rivers. The effort that would have been expended on the second pass was re-allocated to sample additional site.

In the Moberly River, beach seining was used as a fish capture method, as was done during previous studies that targeted Arctic Grayling in the study area (Mainstream 2009a, 2011). The beach seine was 4.5 m (width) x 1.5 m (height) with a mesh size of 5.0 mm. One seine haul was conducted at each site along channel margins for a predetermined distance (e.g., 30 m) similar to the method used by Mainstream (2009a, 2011).

All captured fish were identified to species, counted, measured for fork length (FL; total length for Burbot [*Lota lota*]) to the nearest 1 mm, and weighed (to the nearest 1 g). When catches of species other than Arctic Grayling, Bull Trout, and Rainbow Trout exceeded 30 individuals per site, only the first 30 were measured and weighed; all other individuals were enumerated and released without measuring or weighing them. Arctic Grayling, Bull Trout, and Rainbow Trout in good condition following processing were implanted with half-duplex (HDX) PIT tags

(ISO 11784/11785 compliant). Tags were implanted within the left axial muscle below the dorsal fin origin and oriented parallel with the anteroposterior axis of the fish. The type and size of PIT tags used were selected to ensure compatibility with BC Hydro's Chowade River PIT Tag Detector Station (Instream Fisheries Research in prep.) and other BC Hydro programs, most notably the Peace River Large Fish Indexing Survey (Mon-2, Task 2a). Fish between 120 and 199 mm FL received 12 mm long PIT tags (Oregon RFID 12.0 mm x 2.12 mm HDX+). Fish between 200 and 299 mm FL received 23 mm long HDX PIT tags (Oregon RFID 23.0 mm x 3.65 mm HDX+). Fish greater than 300 mm FL received 32 mm long HDX PIT tags (Oregon RFID 32.0 mm x 3.65 mm HDX+). After processing, all fish were released at the downstream end of the site.

Scale samples were collected from all captured Arctic Grayling and Rainbow Trout. Scales were collected from above the lateral line and posterior to the dorsal fin. The first leading fin ray of the left pectoral fin was collected from all Bull Trout longer than 100 mm FL. Scale and fin ray samples were stored in appropriately labelled coin envelopes and a subsample of collected ageing structures was analyzed as detailed in Section 2.4.

Genetic samples were collected from select Bull Trout. Overall, 33 samples were collected from the Chowade River, 18 samples were collected from Cypress Creek, 21 samples were collected from the upper Halfway River, and 2 samples were collected from the Moberly River. These samples were not analyzed but were provided to BC Hydro for long term storage for possible future comparisons.

In addition to fish capture and biological characteristics, other parameters were measured at each site to ensure compliance with the Project's Federal Decision Statement[12] and provincial fish collection permit requirements. These included date and time, personnel, upstream and downstream UTM coordinates, sample method settings, distance and time sampled, water temperature (°C), and water conductivity (µS/cm). Water clarity was recorded to the nearest 1 cm using a "Secchi Bar" that was manufactured based on the description provided by Mainstream and Gazey (2014). Raw data were stored in a MS-Access© database and are provided as an attachment to this report.

2.3 Habitat Assessment

2.3.1 Halfway River Watershed

Habitat conditions were assessed at all sample sites. Habitat variables measured or estimated at each site were the same for backpack electrofishing and small fish boat electroshocking sites and are summarized in Table 2. Data collected (Appendix C, Table C1) were not intended to quantify habitat availability or imply habitat preferences but provide a summary of the general conditions and differences among sites.

Table 2: List and description of habitat variables recorded at each Halfway River watershed site sampled during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Variable	Description
Air Temp	Air temperature at the time of sampling (to the nearest 1°C)
Water Temp	Water temperature at the time of sampling (to the nearest 1°C)
Conductivity	Water conductivity at the time of sampling (to the nearest 10 µS/cm)

[12] Site C Federal Decision Statement, October 14, 2014, Section 18 – Record Keeping; Page 23 of 23.

Variable	Description
Cloud Cover	A categorical ranking of cloud cover (clear = 0-10% cloud cover; partly cloudy = 10-50% cloud cover; mostly cloudy = 50-90% cloud cover; overcast = 90-100% cloud cover)
Weather	A general description of the weather at the time of sampling (e.g., comments regarding wind, rain, or fog)
Secchi Depth	Water transparency as measured using a Secchi Bar (to the nearest 0.01 m). If the bottom substrate was visible everywhere in a sample site, it was recorded as "bottom".
Length Sampled	The length of shoreline sampled (to the nearest 1 m)
Time Sampled	The time of electrofisher operation (to the nearest 1 second)
Mean Depth	The estimated mean depth sampled (to the nearest 0.1 m)
Maximum Depth	The estimated maximum depth sampled (to the nearest 0.1 m)
Instream Velocity	A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)
Instream Cover	The type (i.e., interstices; woody debris; cutbank; turbulence; flooded terrestrial vegetation; aquatic vegetation; shallow water; deep water) and amount (as a percent) of available instream cover
Substrate Type	The dominant and subdominant substrate types (organics, silt, sand, gravel, cobble, boulder, or bedrock)

2.3.2 Moberly River

In the Moberly River, the same habitat variables listed in Table 2 were recorded at small fish boat electroshocking sites. At backpack and beach seine sites, more detailed habitat data were collected following a modified version of the Level 1 assessment procedure described in BC's Watershed Restoration Technical Circular No. 8 (Johnston and Slaney 1996) and Fish and Fish Habitat Inventory: Standards and Procedures (RISC 2001). Mesohabitat types (pool, riffle, run, or glide) were identified and the GPS location of the upstream and downstream end of each habitat unit was recorded. Each backpack electrofishing or beach seine site was located within one mesohabitat unit. Within each site, various physical attributes were measured and recorded on standardized data forms. Information recorded included date and time, photograph number, UTM location, habitat type, wetted channel width, bankfull width and height, channel gradient (%), mean water depth and velocity (based on ¼, ½, and ¾ wetted channel width), maximum water depth in pools, substrate composition (% fines, gravels, cobbles, boulders, bedrock). Percent substrate composition was visually estimated using a classification system based on the modified Wentworth Scale (Cummins 1962). In addition, each transect included a visual assessment of substrate characteristics compatible with baseline datasets (Mainstream 2009a, 2011). These included the following: 90th percentile particle size (D90); embeddedness (sand, silt, and clay) present within the substrate; and compaction to evaluate the density or looseness of the substrate within the channel. Compaction and embeddedness were evaluated as low, moderate, or high. The presence or absence of large organic debris or woody debris (%), defined as having a diameter greater than 10 cm and a length greater than 1 m, was recorded. The percent of overhead cover, off-channel habitat, and riparian vegetation also were recorded.

The habitat data collection procedure was modified in the mainstem of the Moberly River, as higher than normal water levels resulted in many of the sites being un-wadeable and low water clarity reduced visibility needed to view and characterize substrates. Due to higher than normal flows, many backpack electrofisher and beach seine sites were located in side channels or along the stream margin and did not include the thalweg of the mainstem. At sites located on the stream margin or side channels, wetted widths were estimated and include the mainstem.

Velocity for these sites were measured at ¼, ½, ¾ of the sampled width instead of at ¼, ½, ¾ of the entire stream width. At some sites, substrate composition could not be assessed because of low water clarity. The modified Level 1 habitat assessment data collected in the Moberly River are provided in the Site C Reservoir Tributary Fish Population Indexing Survey database and in Appendix C, Table C2, but are not discussed in detail in this report.

2.4 Fish Ageing

All captured Arctic Grayling and Rainbow Trout were aged by scale analysis. Scales were aged by counting the number of growth annuli present on the fish scale following methods outlined in Mackay et al. (1990) and RISC 1997). Scales were temporarily mounted between two slides and examined using a trinocular microscope equipped with a digital camera. If needed, several scales were examined and the highest quality scale was photographed using the integrated 3.1-megapixel digital macro camera and saved as a JPEG-type picture file. All scale images were catalogued by appending them to a MS-Access database. All scales were examined independently by two experienced individuals and ages assigned. For each scale sample, the agers had access to the species and the date of capture but no other information about the sampled fish (e.g., fork length or capture history). If the two assigned ages did not agree, a third ager assigned an age. If two out of three agers agreed on the age, then this age was used for analysis. If two out of three agers did not agree on an age, then the sample was not used for analyses. All assigned ages are stored in the database together with the identity of the agers and the date the structure was aged. This information could allow statistical correction of ageing errors in future years of the program, if needed.

Bull Trout fin rays were aged by counting the number of growth annuli present on the sample following methods outlined in Mackay et al. (1990). Fin rays were coated in epoxy and allowed to dry. Once the epoxy dried, a jeweler's saw was used to create cross-sections of the fin ray sample. The cross-sections were permanently mounted on a microscope slide using a clear coat nail polish and examined using a digital microscope. If needed, several fin ray cross-sections were examined and the cross-section with the most visible annuli was used. All fin rays were examined independently by two experienced individuals using the same approach as detailed above for scales.

2.5 Data Analysis

All data collected during field surveys was entered and stored in a custom MS-Access© database that conforms to BC Hydro's established Site C data standards. Data on field sheets were entered into spreadsheet format and the digital data were verified and checked by a second person before uploading the data to the database. Before data analysis, Quality Control / Quality Assurance (QA/QC) included checks of the range and format of all variables and graphical methods to check for possible errors including histograms and bivariate plots.

In 2016, data analysis was limited to descriptive analyses and data summarizations due to the low numbers of target species encountered. Catch was summarized by sample method, species, life stage, river, and river section and presented in tabular format. Catch-per-unit-effort (CPUE) for electrofishing was calculated as the number of fish captured per 100 m of stream length. CPUE was calculated separately for backpack electrofishing and small fish boat electroshocking by dividing the summed total number of fish captured at all sites by the sum of effort at all sites. Percent composition of total catch was calculated for each life stage and species, combining all sample methods for each tributary. Length-frequency histograms were calculated for the three target species (Bull Trout, Rainbow Trout, and Arctic Grayling) by river and sampling method. Age-frequency histograms were calculated for Bull Trout and Rainbow Trout captured in tributaries of the Halfway River watershed (all three rivers pooled) and for Arctic Grayling captured in the Moberly River. Length-at-age data were used to plot three-parameter von Bertalanffy growth curves for the three target species (Pardo et al. 2013). Data from the Moberly River and all three Halfway River tributaries were pooled for von Bertalanffy curves so that sample sizes and the range of ages was sufficient for the model.

Fish were assigned a life stage of YOY, immature, or adult based on their body length (fork length or total length). The maximum size of YOY was determined for each species based on breaks in the length-frequency histograms between the first and second mode. Fish larger than 250 mm were classified as adult for all species. Although some individuals larger than 250 mm for some species are likely not mature adults, 250 mm was used as a consistent cut-off to summarize data by length-class.

3.0 RESULTS

3.1 Halfway River Watershed

The primary target species and life stage for the Halfway River watershed was immature Bull Trout. The highest number of immature Bull Trout were captured in Cypress Creek, where 28 individuals were captured and tagged (Table 3). In the Chowade River, 10 immature Bull Trout were captured but only seven of these were taggable; the remainder were too small to tag. In the upper Halfway River, 16 immature Bull Trout were captured and 11 of these were tagged. In the Chowade River, 90 YOY Bull Trout were captured but 89 of these fish were from three sites located between River Km 45.0 and 45.3. YOY Bull Trout were not captured in Cypress Creek or the upper Halfway River. Greater numbers of Rainbow Trout (n = 28) and Arctic Grayling (n = 4) were captured in the Chowade River when compared to the other two streams (Table 3). Non-target species captured in the Halfway River watershed were limited to Mountain Whitefish (*Prosopium williamsoni*) (n = 415) and Slimy Sculpin (*Cottus cognatus*) (n = 77). Mountain Whitefish were commonly recorded, representing more than 50% of the catch in all three study areas (Appendix B, Table B2).

Backpack electrofishing captured over three times more immature Bull Trout than small fish boat electroshocking in the upper Halfway River and Cypress Creek (Table 4) even though substantially more stream length was sampled by the boat-based method (Table 1). For all three target species and study areas, small fish boat electroshocking caught more adults than backpack electrofishing (Table 4). CPUE for YOY and immature Bull Trout was higher for backpack electrofishing when compared to small fish boat electroshocking (Figure 1 and Figure 2). CPUE for adult Bull Trout was higher for small fish boat electroshocking when compared to backpack electrofishing. For small fish boat electroshocking, Rainbow Trout and Bull Trout CPUEs were similar (Figure 2 and Figure 3, respectively) and higher than CPUEs for Arctic Grayling (Figure 4).

Bull Trout catch in the Chowade River by small fish boat electroshocking was distributed across most river sections; however, most immature Bull Trout were captured in Section 6 (Figure 5; Appendix A, Figure A2). Section 6 was a single channel habitat type and sample sites consisted of gravel-cobble substrates with moderate water velocities (Appendix C, Table A1). For the Chowade River, three of four backpack electrofishing sites were located in Section 5, which was characterized as braided channel habitat type with low to moderate water velocities (Appendix C, Table C1). Most (97%) of the Bull Trout recorded in Section 5 during backpack electrofishing surveys were YOY (Figure 6).

Table 3: Number of target species fish caught and tagged in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Species	Life Stage[a]	Chowade River		Cypress Creek		Upper Halfway River		Total	
		# Caught	# Tagged	# Caught	# Tagged	# Caught	# Tagged	# Caught	# Tagged
Arctic Grayling	Adult	4	4	0	0	0	0	**4**	**4**
	Immature	0	0	1	1	0	0	**1**	**1**
	YOY	0	0	0	0	0	0	**0**	**0**
	Total	**4**	**4**	**1**	**1**	**0**	**0**	**5**	**5**
Bull Trout	Adult	11	10	14	14	7	7	**32**	**31**
	Immature	10	7	28	28	16	11	**54**	**46**
	YOY	90	0	0	0	0	0	**90**	**0**
	Total	**111**	**17**	**42**	**42**	**23**	**18**	**176**	**77**
Rainbow Trout	Adult	53	52	9	8	8	8	**70**	**68**
	Immature	13	13	21	21	1	1	**35**	**35**
	YOY	0	0	0	0	0	0	**0**	**0**
	Total	**66**	**65**	**30**	**29**	**9**	**9**	**105**	**103**

a. Life stage was assigned based on body length. Fish were classified as Adults when longer than 249 mm and Immature when less than 250 mm, but this category did not include YOY fish. The maximum size of YOY fish varied by species and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

Table 4: Number of target species fish captured by backpack electrofisher ('Backpack') and small fish boat electroshocker ('Boat') in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Species	Life Stage[a]	Chowade River		Cypress Creek		Halfway River		Total	
		Backpack	Boat	Backpack	Boat	Backpack	Boat	Backpack	Boat
Arctic Grayling	Adult	0	4	0	0	0	0	**0**	**4**
	Immature	0	0	0	1	0	0	**0**	**1**
	YOY	0	0	0	0	0	0	**0**	**0**
	Total	**0**	**4**	**0**	**1**	**0**	**0**	**0**	**5**
Bull Trout	Adult	0	11	1	13	1	6	**2**	**30**
	Immature	3	7	21	7	13	3	**37**	**17**
	YOY	89	1	0	0	0	0	**89**	**1**
	Total	**92**	**19**	**22**	**20**	**14**	**9**	**128**	**48**
Rainbow Trout	Adult	0	53	0	9	0	8	**0**	**70**
	Immature	0	13	0	21	0	1	**0**	**35**
	YOY	0	0	0	0	0	0	**0**	**0**
	Total	**0**	**66**	**0**	**30**	**0**	**9**	**0**	**105**

a. Life stage was assigned based on body length. Fish were classified as Adults when longer than 249 mm and Immature when less than 250 mm, but this category did not include YOY fish. The maximum size of YOY fish varied by species and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

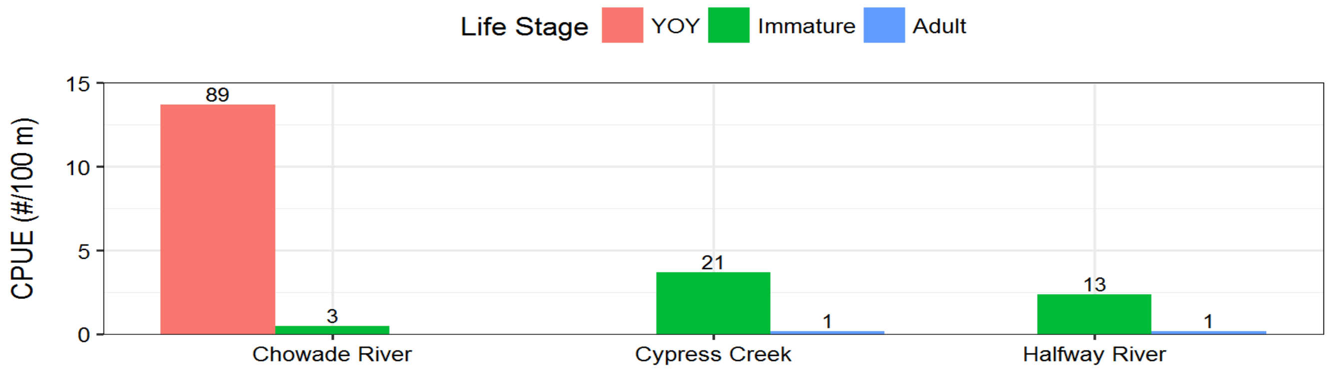

Figure 1: Catch-per-unit-effort for Bull Trout captured by backpack electrofishing in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

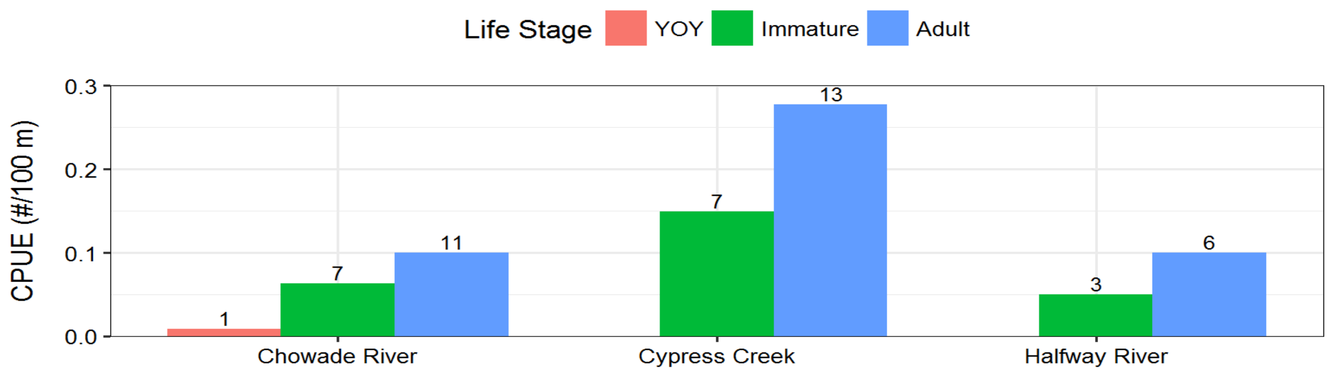

Figure 2: Catch-per-unit-effort for Bull Trout captured by small fish boat electroshocking in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

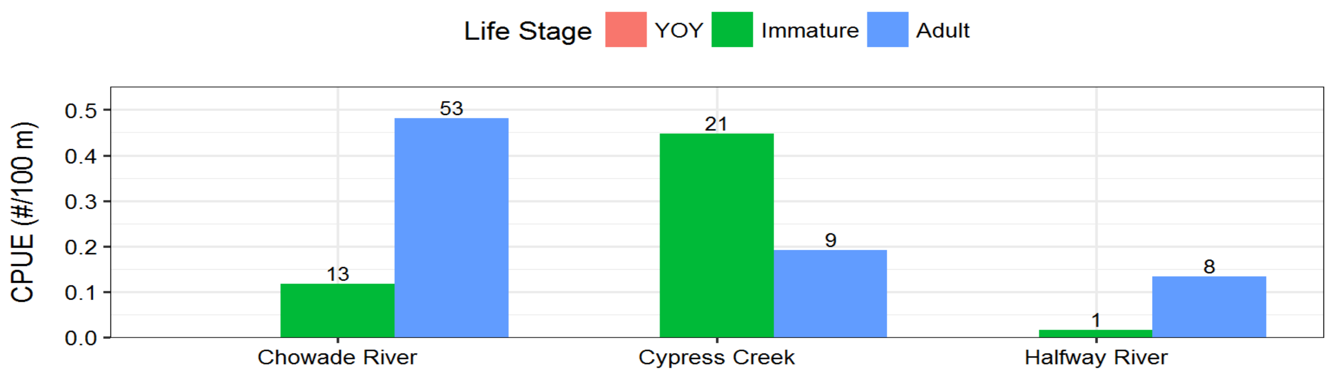

Figure 3: Catch-per-unit-effort for Rainbow Trout captured by small fish boat electroshocking in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

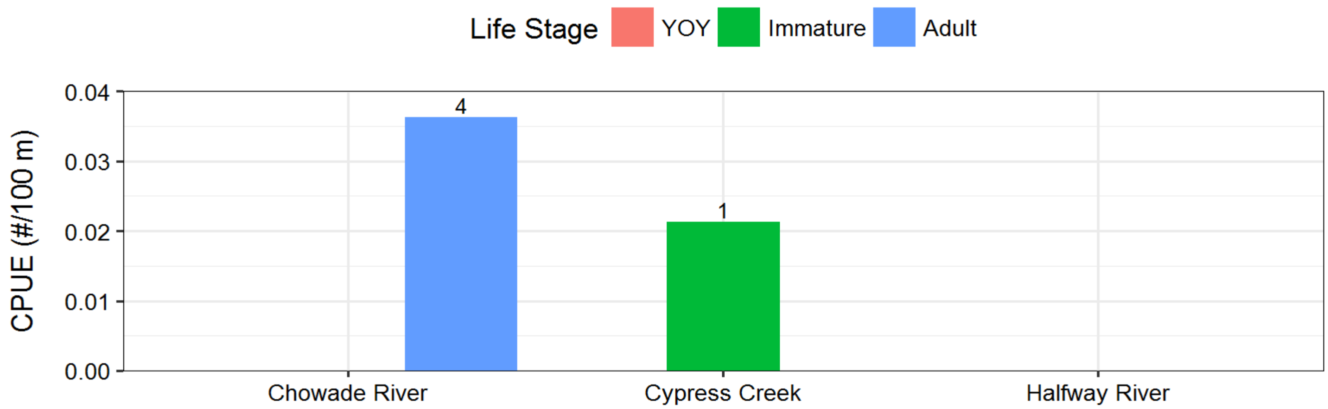

Figure 4: Catch-per-unit-effort for Arctic Grayling captured by small fish boat electroshocking in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

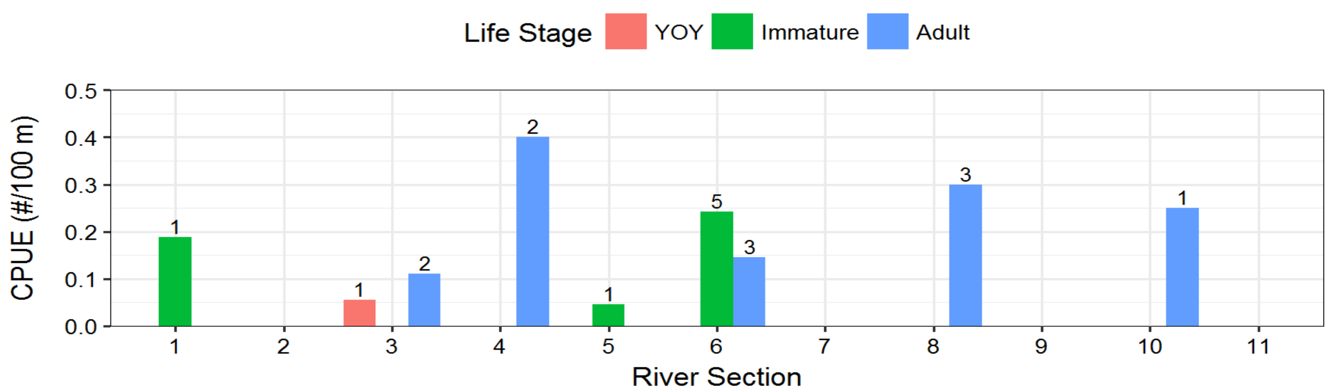

Figure 5: Catch-per-unit-effort for Bull Trout captured by small fish boat electroshocking in the Chowade River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

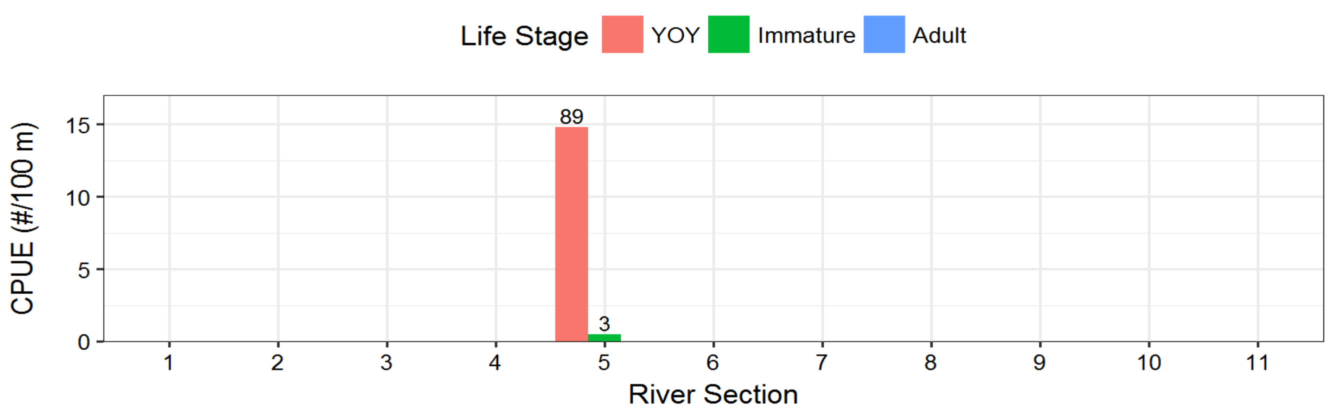

Figure 6: Catch-per-unit-effort for Bull Trout captured by backpack electrofishing in the Chowade River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

Length-frequency histograms for Bull Trout show a mode at 40-80 mm, which likely represents age-0 Bull Trout and a second mode at 140-180 mm, which likely represents age-1 Bull Trout (Figure 7). Most (82%) of the Chowade River Bull Trout were less than 120 mm FL and, therefore, too small to receive a PIT tag. However, Bull Trout longer than 120 mm FL comprised the greatest proportion of the catch in Cypress Creek (100%) and the upper Halfway River (83%; Figure 7).

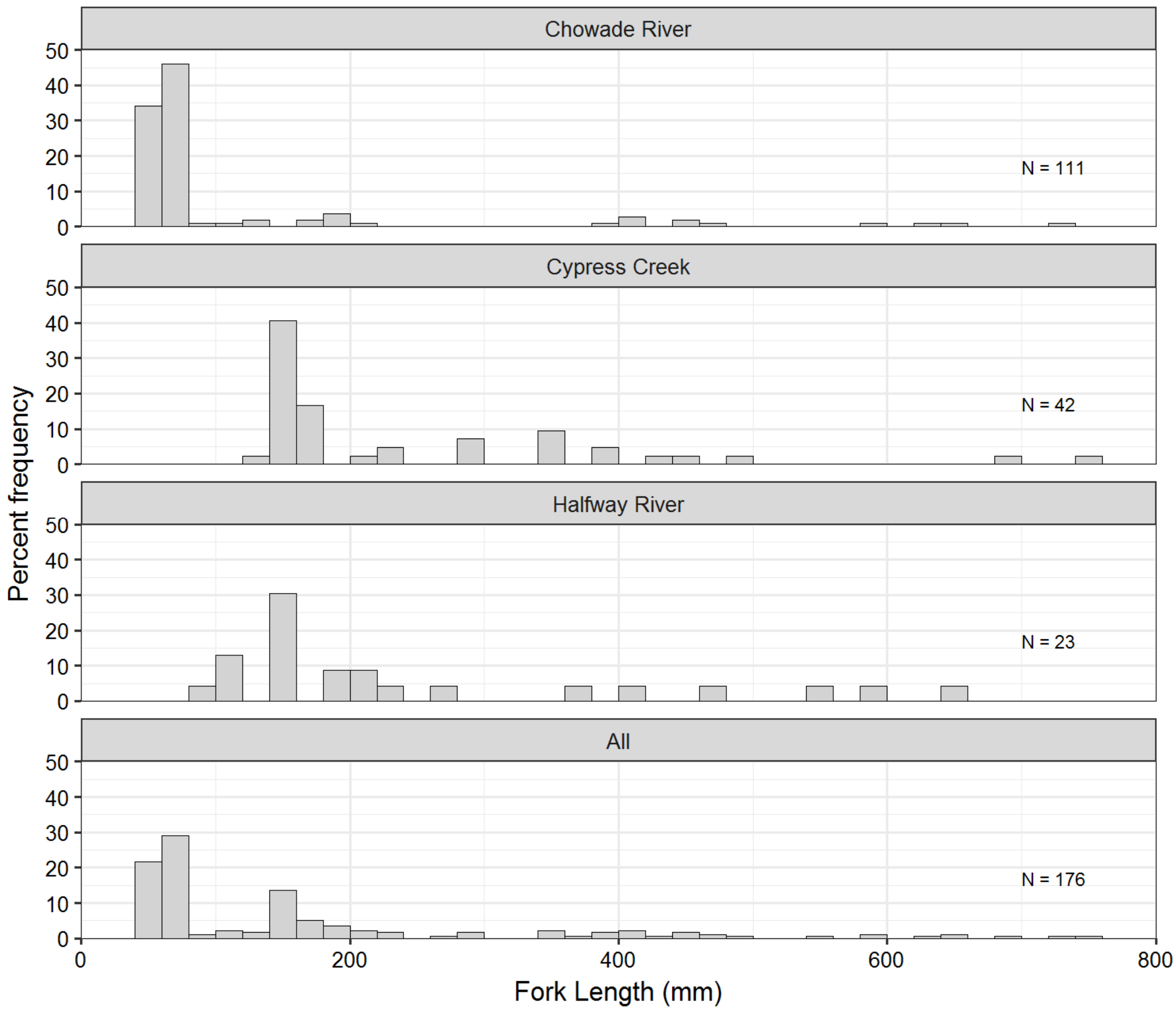

Figure 7: Length-frequency distribution for Bull Trout captured by backpack electrofishing and small fish boat electroshocking (both methods combined) in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Bull Trout less than 120 mm FL, which were likely all YOY, comprised a large percentage of the backpack electrofisher catch, whereas very few Bull Trout less than 120 mm FL were recorded during small fish boat electroshocker surveys (2%; Figure 8). Bull Trout larger than 300 mm FL were mostly captured during small fish boat electroshocker surveys; only one adult larger than 300 mm was captured by backpack electrofisher (Figure 8).

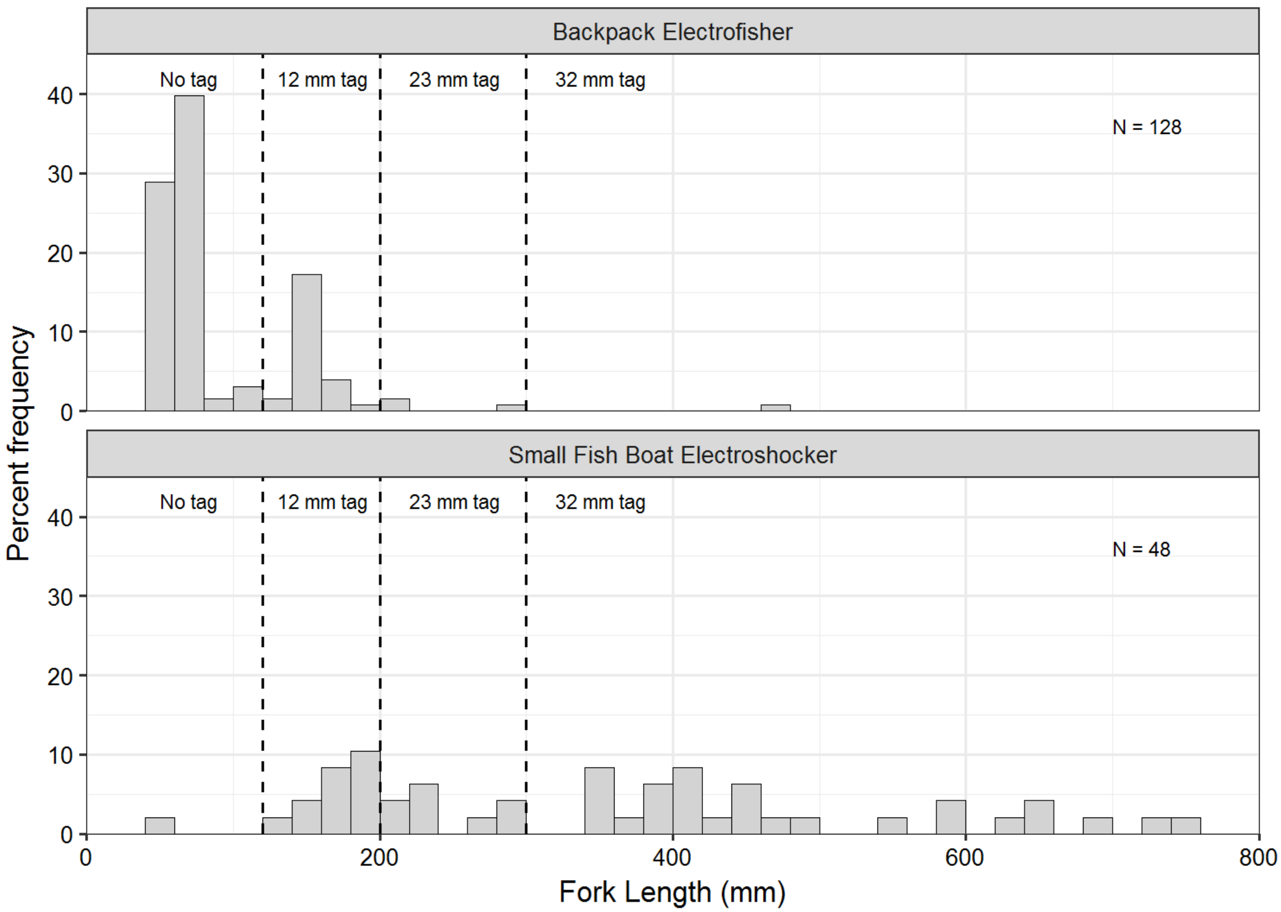

Figure 8: Length-frequency distribution for Bull Trout captured by backpack and small fish boat electroshocking (both methods combined) in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Vertical dashed lines represent the size ranges for the different PIT-tag sizes deployed in 2016.

The length-frequency histogram for Rainbow Trout indicates a mode at approximately 200 mm FL which represents mostly age-1 individuals; there are no other distinct modes (Figure 9). Rainbow Trout fork lengths ranged between 160 and 451 mm, with similar length ranges among all three study areas.

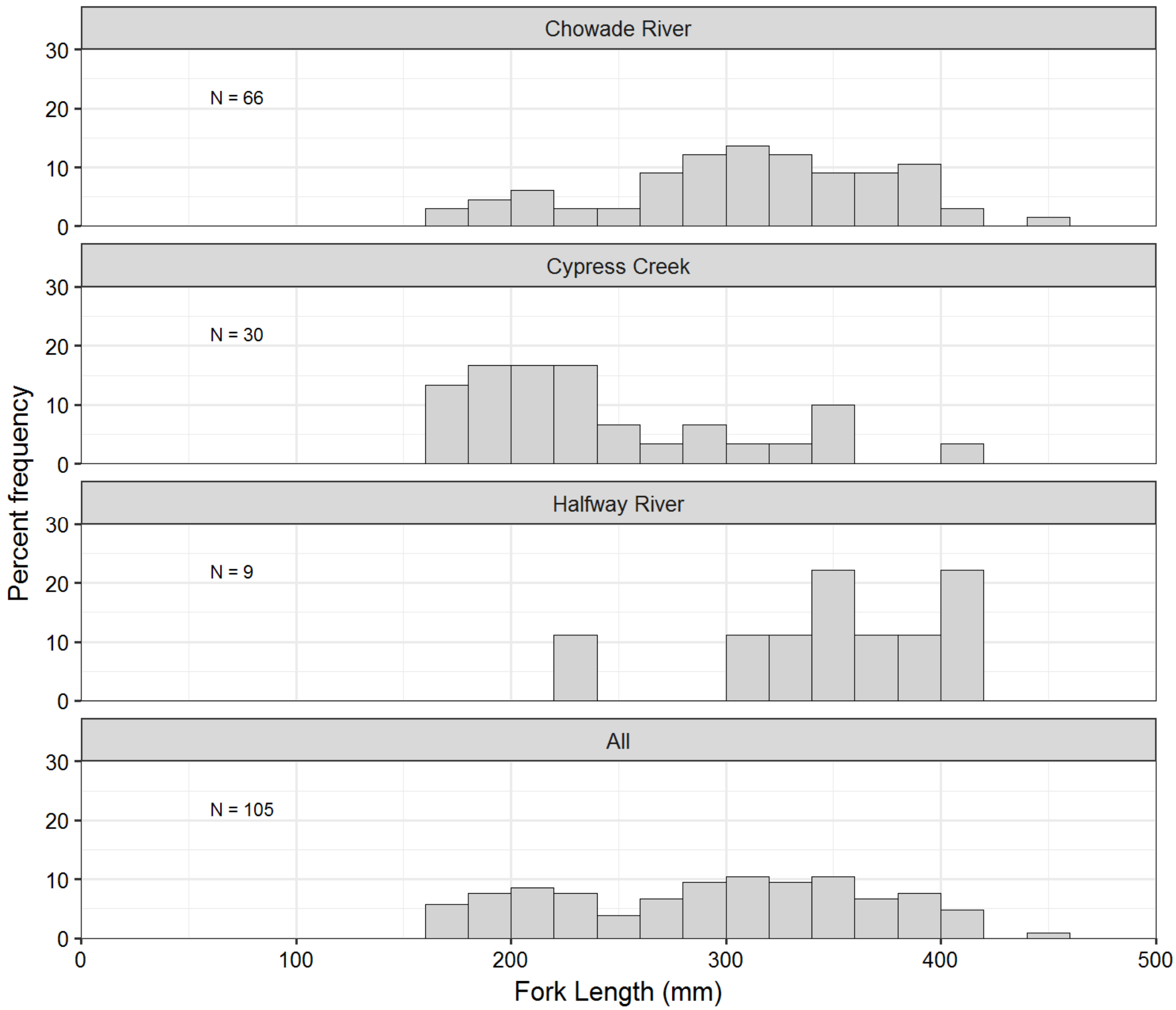

Figure 9: Length-frequency distribution for Rainbow Trout captured by backpack and small fish boat electroshocking (both methods combined) in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Fin-ray samples from 60 Bull Trout captured in the Halfway River watershed were used to assign ages to the fish. Ages ranged from age-0 to age-10; however, the majority of captured Bull Trout were age-6 or younger (Figure 10). Age-1 was the most common age-class in the catch. The low number of older Bull Trout in the catch was expected and is partially due to the study specifically targeting immature life stages prior to mature Bull Trout migrating into the study area. The von Bertalanffy growth curve suggests that age-6 Bull Trout had not yet reached their asymptotic length (Figure 11). The length-at-age data indicate overlapping length distributions for age-1 and age-2 Bull Trout (Figure 11), which also was suggested in length-frequency histograms (Figure 7).

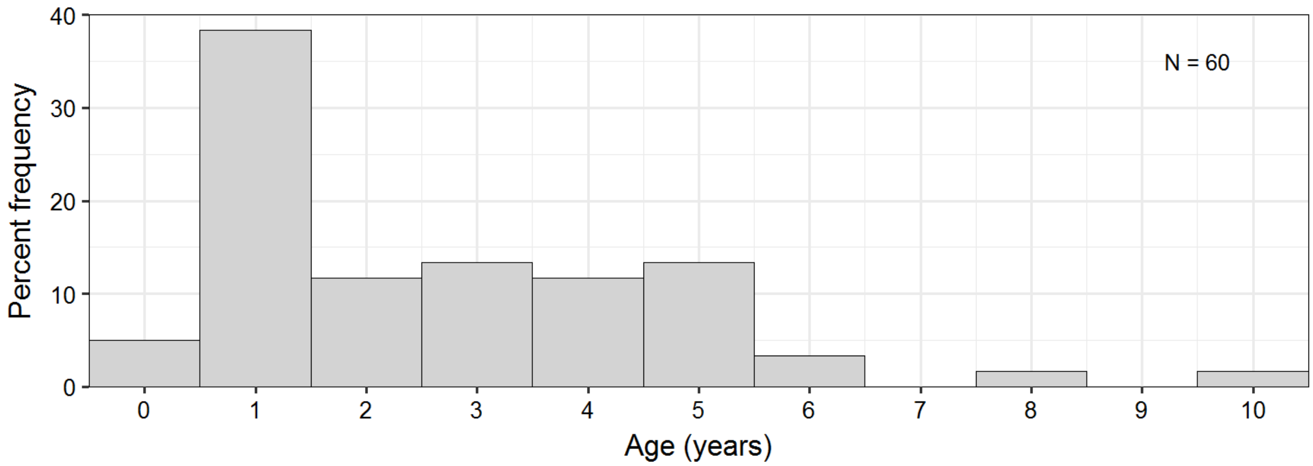

Figure 10: Age-frequency distribution for Bull Trout captured in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

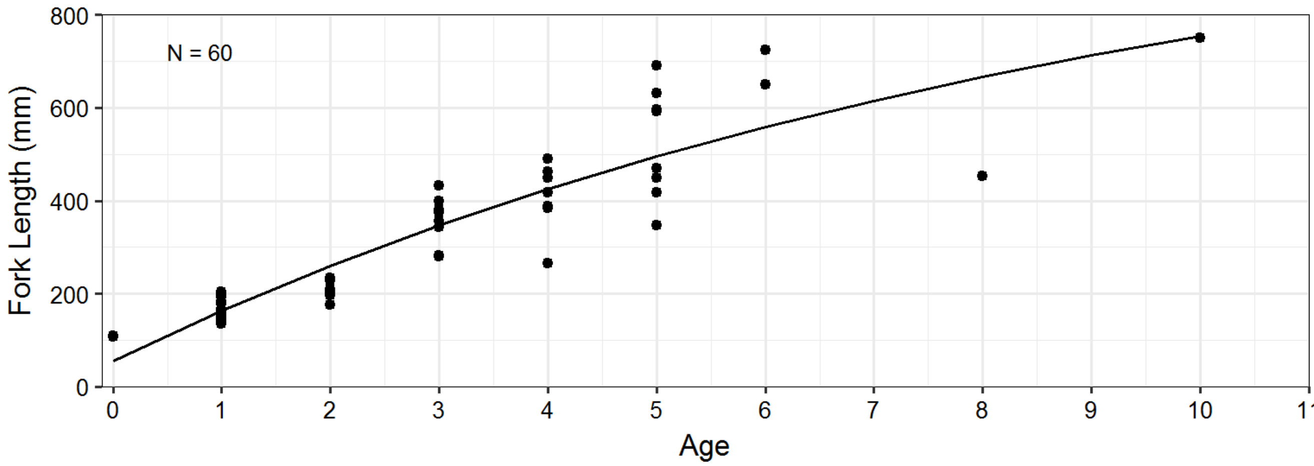

Figure 11: Length-at-age and von Bertalanffy growth curve for Bull Trout captured in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Of the 90 Rainbow Trout scale samples analyzed, ages ranged from age-1 to age-7 (Figure 12). Age-2 and age-3 Rainbow Trout made up most of the catch (72%). Age-0 Rainbow Trout were not captured in 2016. The von Bertalanffy growth curve suggested an asymptotic length of approximately 400 mm was reached by age-6 for Rainbow Trout in the Halfway River watershed. Length-at-age data aligned with the von Bertalanffy curve; however, there was significant variability in length within most age classes (Figure 13). For instance, age-2 Rainbow Trout ranged in fork length from 160 to 362 mm FL and age-3 Rainbow Trout ranged from 228 to 397 mm FL. From age-1 to age-6, length distributions of adjacent age-classes overlapped.

Overall, five Arctic Grayling were captured in the Halfway River watershed. These fish ranged in age from age-2 to age-5 (data not shown; Attachment A).

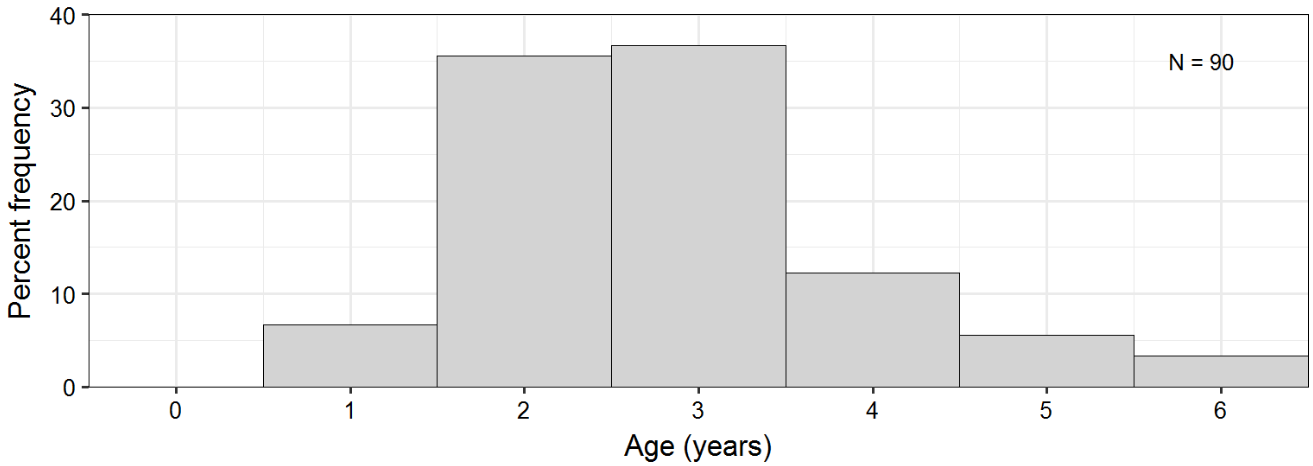

Figure 12: Age-frequency distribution for Rainbow Trout captured in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

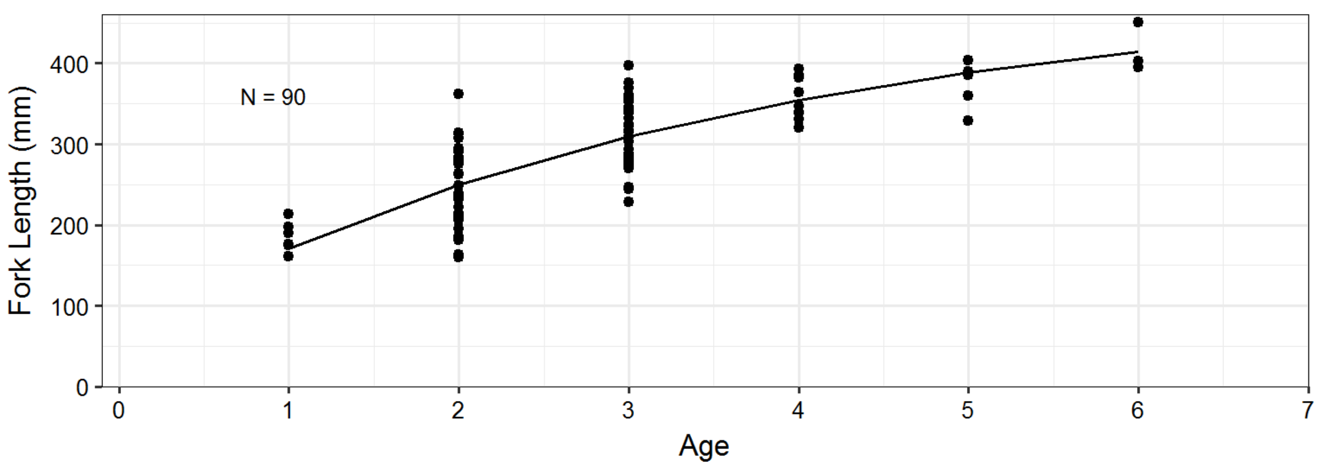

Figure 13: Length-at-age and von Bertalanffy growth curve for Rainbow Trout captured in the Halfway River watershed during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

3.2 Moberly River

The primary target species for the Moberly River was Arctic Grayling. All adult Arctic Grayling (*n* = 3) and the most of immature Arctic Grayling (13 of 15) recorded in the Moberly River were captured using small fish boat electroshocking (Table 5). The total catch of YOY Arctic Grayling by backpack electrofishing (*n* = 44) and small fish boat electroshocking (*n* = 42) were similar. A single Arctic Grayling (a YOY) was captured by beach seine.

Nine Mountain Whitefish were captured in the Moberly River that had previously been tagged during BC Hydro's Peace River Large Fish Indexing Survey (Golder and Gazey 2015; Attachment A). All of these fish were adults (i.e., greater than 300 mm FL).

Two Bull Trout (both immature) were captured in the Moberly River (Table 5); Rainbow Trout were not captured in the Moberly River. Non-target species represented the majority of the beach seine catch and included (in declining order of abundance) Redside Shiner (*Richardsonius balteatus*) (*n* = 459), Sucker species (*Catostomidae*) (*n* = 456), Longnose Dace (*Rhinichthys cataractae*) (*n* = 228), Longnose Sucker (*Catostomus catostomus*) (*n* = 122), Trout-perch (*Percopsis omiscomaycus*) (*n* = 115), and Slimy Sculpin (*n* = 86; Appendix B, Table B3). All of the sucker species recorded during beach seine sampling were YOY. Non-target species captured by electrofishing (both backpack electrofishing and small fish boat electroshocking) included (in decline order of abundance) Mountain Whitefish (*n* = 771), Sucker species (Largescale Sucker [*Catostomus macrocheilus*], Longnose Sucker, and White Sucker [*Catostomus commersoni*] combined; *n* = 667), Longnose Dace (*n* = 465), Redside Shiner (*n* = 428), Lake Chub (*Couesius plumbeus*) (*n* = 96), Slimy Sculpin (*n* = 75), Trout-perch (*n* = 29), Northern Pikeminnow (*Ptycheilus oregonensis*) (*n* = 27), Northern Pike (*Esox lucius*) (*n* = 9), Burbot (*n* = 7), Finescale Dace (*Phoxinus neogaeus*) (*n* = 2), Flathead Chub (*Platygobio gracilis*) (*n* = 1), and Kokanee (*Oncorhynchus nerka*) (*n* = 1) (Appendix B, Table B3).

Data from the modified Level 1 habitat assessments conducted at backpack electrofisher and beach seine sites are presented in Appendix C, Table C2.

Table 5: Number of fish captured by backpack electrofisher, beach seine, and small fish boat electroshocker in the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Species	Life Stage[a]	Backpack Electrofisher		Beach Seine		Small Fish Boat Electroshocker		Total	
		# Caught	# Tagged	# Caught	# Tagged	# Caught	# Tagged	# Caught	# Tagged
Arctic Grayling	Adult	0	0	0	0	3	3	**3**	**3**
	Immature	2	1	0	0	13	13	**15**	**14**
	YOY	44	2	1	0	42	0	**87**	**2**
	Total	**46**	**3**	**1**	**0**	**58**	**16**	**105**	**19**
Bull Trout	Adult	0	0	0	0	0	0	**0**	**0**
	Immature	0	0	0	0	2	2	**2**	**2**
	YOY	0	0	0	0	0	0	**0**	**0**
	Total	**0**	**0**	**0**	**0**	**2**	**2**	**2**	**2**
Rainbow Trout	Adult	0	0	0	0	0	0	**0**	**0**
	Immature	0	0	0	0	0	0	**0**	**0**
	YOY	0	0	0	0	0	0	**0**	**0**
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

a. Life stage was assigned based on body length. Fish were classified as Adults when longer than 249 mm and Immature when less than 250 mm, but this category did not include YOY fish. The maximum size of YOY fish varied by species and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

Backpack electrofishing CPUE for Arctic Grayling YOY (Figure 14) was higher when compared to small fish boat electroshocking (Figure 15). Small fish boat electroshocker CPUE for Arctic Grayling was less than one fish per 100 m of shoreline sampled for all river sections and life stages (Figure 15). CPUE by section (Figure 14 and Figure 15) did not suggest any difference in catch rates for YOY and immature Arctic Grayling between the two habitat classifications: irregular meandering (Sections 1A and Sections 7 to 10) and tortuous meanders (Sections 1 to 6; Appendix A, Table A1).

For small fish boat electroshocking (all sites combined), Arctic Grayling CPUE during the current study (0.26 fish/100 m) was higher than during previous baseline studies (0.16 fish/100 m; Mainstream 2010). For backpack electrofishing (all sites combined), Arctic Grayling CPUE during the current study (1.03 fish/100 m) was similar to 2010 baseline studies (1.02 fish/100 m; Mainstream 2011) and higher than 2009 (0.26 fish/100 m; Mainstream 2010) and 2011 (0.46 fish/100 m; Mainstream 2013) baseline studies.

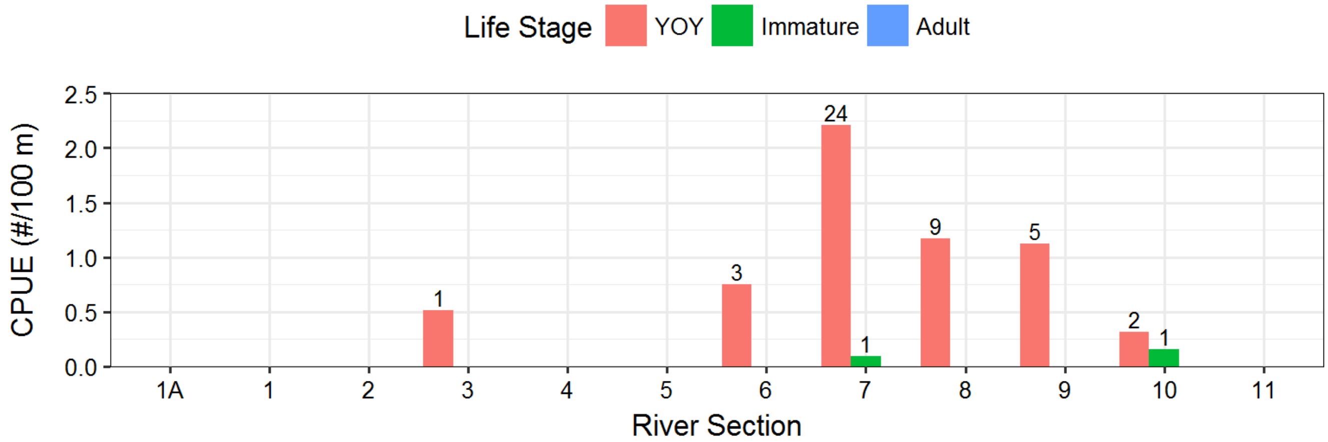

Figure 14: Catch-per-unit-effort for Arctic Grayling captured by backpack electrofishing in the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

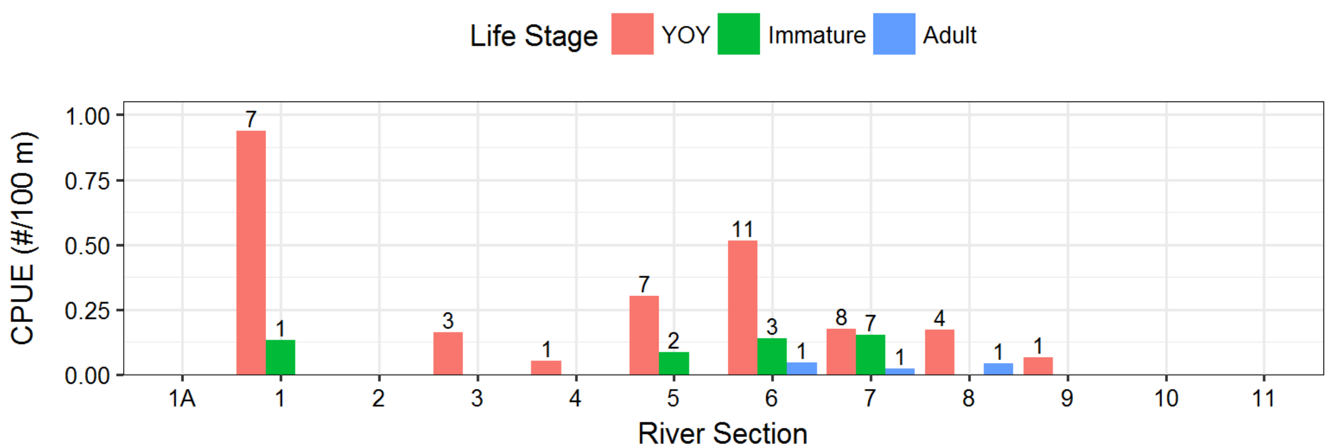

Figure 15: Catch-per-unit-effort for Arctic Grayling captured by small fish boat electroshocking in the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Numbers on the tops of the bars represent the number of fish captured.

The length-frequency histogram for Arctic Grayling suggests a mode representing YOY from 60 to 120 mm FL (Figure 16). This size-class represented the majority (83%) of the Arctic Grayling catch. The remaining Arctic Grayling catch ranged in size from 166 to 264 mm FL.

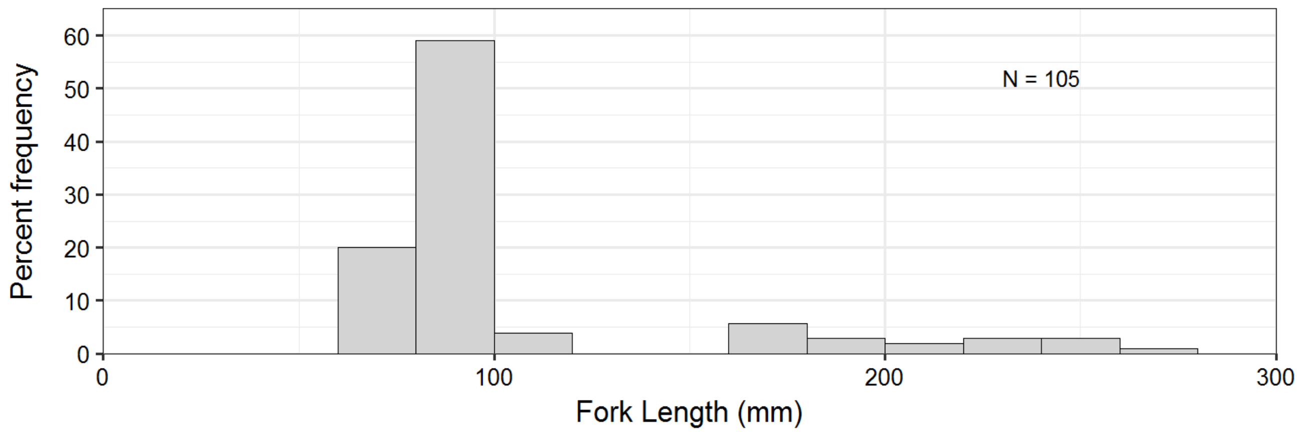

Figure 16: Length-frequency distribution for Arctic Grayling captured in the Moberly River (all capture methods combined) during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Of the 97 Arctic Grayling aged from scale samples collected in the Moberly River, 82% were age-0, 8% were age-1 and 10% were age-2 (Figure 17). To increase sample size, particularly for older age-classes, the 97 Arctic Grayling aged from the Moberly River were combined with the five Arctic Grayling aged from the Halfway River watershed for length-at-age analyses. The combined length-at-age data fit well with a von Bertalanffy growth curve even though sample sizes were small for age-3 to age-5 Arctic Grayling. All age-3 and older Arctic Grayling in the model were recorded in the Halfway River watershed (Figure 18). Length distributions did not overlap for age-0 and age-1 Arctic Grayling, a result that was supported by the length-frequency histogram (Figure 16).

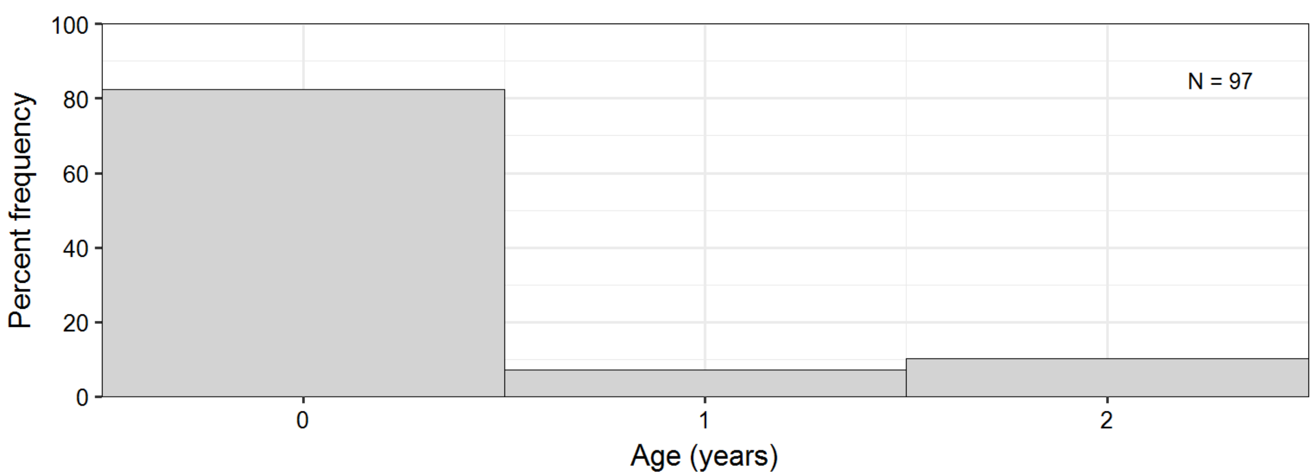

Figure 17: Age-frequency distribution for Arctic Grayling captured in the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

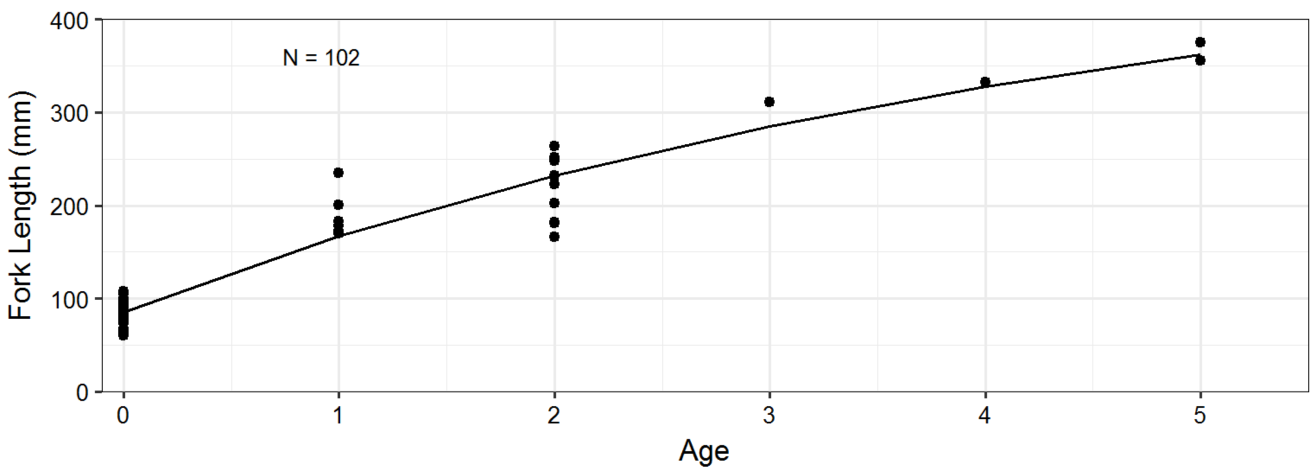

Figure 18: Length-at-age and von Bertalanffy growth curve for Arctic Grayling captured in the Halfway River watershed and the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016. Data include 97 fish from the Moberly River and the five fish from the Halfway River watershed.

4.0 DISCUSSION

The current program represents the first year of a multi-year monitoring program. An objective of this implementation year was to identify sample locations and methods in each study areas that would be most effective during future years of the program.

4.1 Lynx and Maurice Creek

As detailed in Section 2.1.2, Maurice Creek was not sampled in 2016 at the request of BC Hydro due to access and personnel safety issues. At Lynx Creek, high suspended sediment levels, assumed to be due to input from a landslide in Brenot Creek (a tributary to Lynx Creek) limited data collected at Lynx Creek to water quality and habitat measurements, and photographs. Based on conditions observed in the Lynx Creek study area in August (Plate 1 and Plate 2), it is unlikely that Rainbow Trout would inhabit such conditions, and it is uncertain if conditions have been like those observed in August 2016 since the landslide occurred in August 2014. Suitable Rainbow Trout spawning habitat may still exist in Lynx Creek upstream of the Brenot Creek confluence, which enters Lynx Creek approximately 7.0 km upstream of Lynx Creek's confluence. During future study years, monitoring Lynx Creek is not recommended unless the Lynx Creek study area is moved upstream of the Brenot Creek confluence. However, it is the opinion of the authors that Peace River Rainbow Trout are unlikely to migrate into Lynx Creek in its current condition due to the high suspended sediment content during most of the year.

Maurice and Lynx creeks are the only two confirmed spawning areas for Rainbow Trout that inhabit the mainstem of the Peace River. If Lynx Creek no longer provides suitable spawning habitat for this species, Maurice Creek becomes more important to the Rainbow Trout that inhabit the Peace River. Sampling Maurice Creek is required to monitor Rainbow Trout that inhabit the Peace River, as other components of the FAHMFP are unlikely to have Rainbow Trout catch rates that are sensitive enough to detect changes to the population. Future sampling in Maurice Creek will depend on access permissions and security risks to field crews.

Plate 1: Lynx Creek as viewed facing upstream. The photograph was taken on August 11, 2016 near the Lynx Creek confluence.

Plate 2: Photograph of Lynx Creek taken on August 11, 2016 near the stream's confluence. Note the high turbidity and deposited sediment due to an upstream landslide.

4.2 Halfway River Watershed

In the Halfway River watershed, immature Bull Trout CPUE (number of fish per 100 m of sampled shoreline) was much higher for backpack electrofishing when compared to small fish boat electroshocking (Figures 1 and 2). Overall, 1.77 km of habitat were sampled by backpack electrofishing, compared to approximately 21.7 km sampled by small fish boat electroshocking. Higher immature Bull Trout captures during backpack electrofishing survey, despite expending less effort, suggests that backpack electrofishing may be a more effective technique to employ in the study streams during future study years. However, the two methods sample different habitats, with use of the backpack electrofisher during the current study largely limited to small side channels that could not be sampled by small fish boat electroshocking. Small fish boat electroshocking, which was used in deeper, faster flowing areas, also captured immature Bull Trout and was the only method that captured Arctic Grayling and Rainbow Trout in the Halfway River watershed. Based on these results, adjustments may need to be made in the selection and allocation of sampling effort. For example, during future study years, it may be possible to increase Bull Trout catch rates by focusing effort on backpack electrofishing, but it may reduce catch rates for the other target species. While use of the backpack electrofisher in 2016 was limited to less than 2000 m, there were additional habitat areas in the study area that could have been sampled by this method. These areas should be sampled if additional backpack electrofishing effort is implemented during future study years.

The 2016 results provide baseline data regarding the relative abundance of juvenile Bull Trout in the Halfway River watershed that can be used in future years to test hypotheses regarding the status of juvenile Bull Trout following the construction of the Project. As catchability was not assessed in 2016, CPUE was used as an indicator of relative abundance. CPUE by small fish boat electroshocking was low relative to backpack electrofishing, with less than 0.3 Bull Trout captured per 100 m of shoreline sampled for all three life stages (YOY, immature, and adult; Figure 2). CPUE by backpack electrofishing was greater for all life stages when compare to small fish boat electroshocking but especially for YOY in the Chowade River (13.7 YOY/100 m; Figure 3). The large number of YOY captured at just a few sites suggests a patchy distribution for this age-class, limited primarily to low velocity side channel and braided sections, which is consistent with the literature regarding habitat preferences of age-0 Bull Trout (McPhail 2007).

It is uncertain whether fish may have migrated downstream and out of the study areas prior to the study period. The specific timing of the immature Bull Trout downstream migration is not known; however, based on the results of the current program and data collected at a fish fence on the Chowade River in 1994 (R.L.&L. 1995), it is believed to occur prior to mid-August. Sampling in the Halfway River in 2016 was initially scheduled to occur between July 17 and 31, but was postponed until the latter half of August due to the timing of receipt of the Scientific Fish Collection Permit, issues related to helicopter approval processes, and safety concerns. Based on historical discharge data for the Halfway River (http://wateroffice.ec.gc.ca), sampling in the mid to late July period would ensure sampling occurs after peak freshet and possibly before downstream migration commences.

The 2016 results provide baseline data regarding Bull Trout and Rainbow Trout population structures in the Halfway River watershed. Length-at-age data suggest overlapping length frequencies for Bull Trout of all adjacent age-classes with the exception of age-0. Predicted mean length-at-age for Bull Trout from the von Bertalanffy growth curve was 162 mm for an age-1, 258 mm for an age-2, and 345 mm for an age-3 (Figure 13). These lengths closely aligned with data from the mainstem of the Peace River (Golder and Gazey 2016). Age data for Rainbow Trout suggest that the Chowade River, Cypress Creek, and the upper Halfway River are not used during the summer months for early rearing, as YOY Rainbow Trout were not recorded in any of these systems with the selected sample methods. Rainbow Trout may rear in some of the smaller, adjacent tributaries as barriers limit fish movements farther upstream in most of these systems.

Sampling in the Halfway River watershed was conducted primarily to provide data regarding the relative abundance of Bull Trout; however, it also had a secondary objective of capturing immature Bull Trout to implant them with PIT tags that could later be detected at stationary PIT tag detectors. In 2016, the only stationary PIT tag detector was installed in the Chowade River. In the future, PIT tag detectors may be installed in Cypress Creek, the upper Halfway River, and at the temporary and permanent Site C trap-and-haul facilities. Data collected by these PIT tag detectors would be used to estimate the proportion of out-migrating juvenile Bull Trout that survive downstream passage at Site C, use of the trap-and-haul facilities, and return to natal spawning areas as adults. An important consideration for future years of the current program is the development of a sampling design that will best accomplish both of the above two objectives (i.e., monitor relative abundance and deploying PIT tags). For instance, expending proportionately more sampling effort by backpack electrofishing in braided sections and off-channel habitat would likely improve estimates of relative abundance for YOY Bull Trout across years, but could result in fewer tagged fish if age-1 and age-2 Bull Trout are not as common in these habitats. The combination of backpack electrofishing and small fish boat electroshocking would target age-0 through age-3 life stages, although spreading effort across different habitats (mainstem and side channel) and methods may result in small sample sizes for each age-class and sampling method, as was the case in 2016.

CPUE can be used as an indicator of relative abundance; however, differences in catchability among years could confound ability to detect changes in abundance over time. As electrofishing catchability can be affected by changes in environmental conditions and habitat variables (Speas et al. 2004), estimates of catchability are recommended during future study years, if feasible. One way to increase the number of marked Bull Trout available for recapture, as required for catchability estimates, would be to use an alternative method to mark YOY Bull Trout, such as adipose fin clip, visible implant tags, or coded wire tags, which can be applied to fish that are too small to safely receive a PIT tag. As catchability can vary with body length and life stage, estimates of catchability for all juvenile age-classes would be recommended if sample sizes allow.

4.3 Moberly River

Sampling for Arctic Grayling in the Moberly River in 2016 extended pre-project baseline data collected from 2008 to 2011 (Mainstream 2009a, 2009b, 2010, 2011, 2013). Mostly YOY Arctic Grayling were present during the 2016 study period, with low catches of immature and adult life stages when compared to YOY catches. Discharge in the Moberly River reached a maximum of approximately 50 m^3/s during the September sample period, which is over five times greater than the typical mean value for that time of year (less than 10 m^3/s; http://wateroffice.ec.gc.ca). This high discharge resulted in turbid water and poor visibility during sampling, which may have influenced results by affecting catchability and reducing CPUE. However, the Arctic Grayling catch in the Moberly River in 2016 could also be related to the suspected overall declining abundance of this species in the Peace River watershed. Catch rates for Arctic Grayling in the mainstem of the Peace River have generally declined since 2007 (Golder and Gazey 2016). Results from 2016 sampling suggest that small fish boat electroshocking is more effective at capturing immature and adult life stages of Arctic Grayling, at least during the higher than normal flow conditions experienced in 2016, whereas both backpack electrofishing and small fish boat electrofishing captured YOY

Arctic Grayling (Figures 14 and 15). Both of these sampling methods are recommended for future study years. Only a single Arctic Grayling was recorded during beach seining surveys and is not an effective method of capturing the target species; however, beach seining was the most effective method of capturing non-target species (Appendix B, Table B3).

5.0 CLOSURE

We trust that this report meets your current requirements. If you have any further questions, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

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Project Manager, Fisheries Biologist

Shawn Redden, BSc, RPBio
Project Director, Associate

DF/SR/cmc

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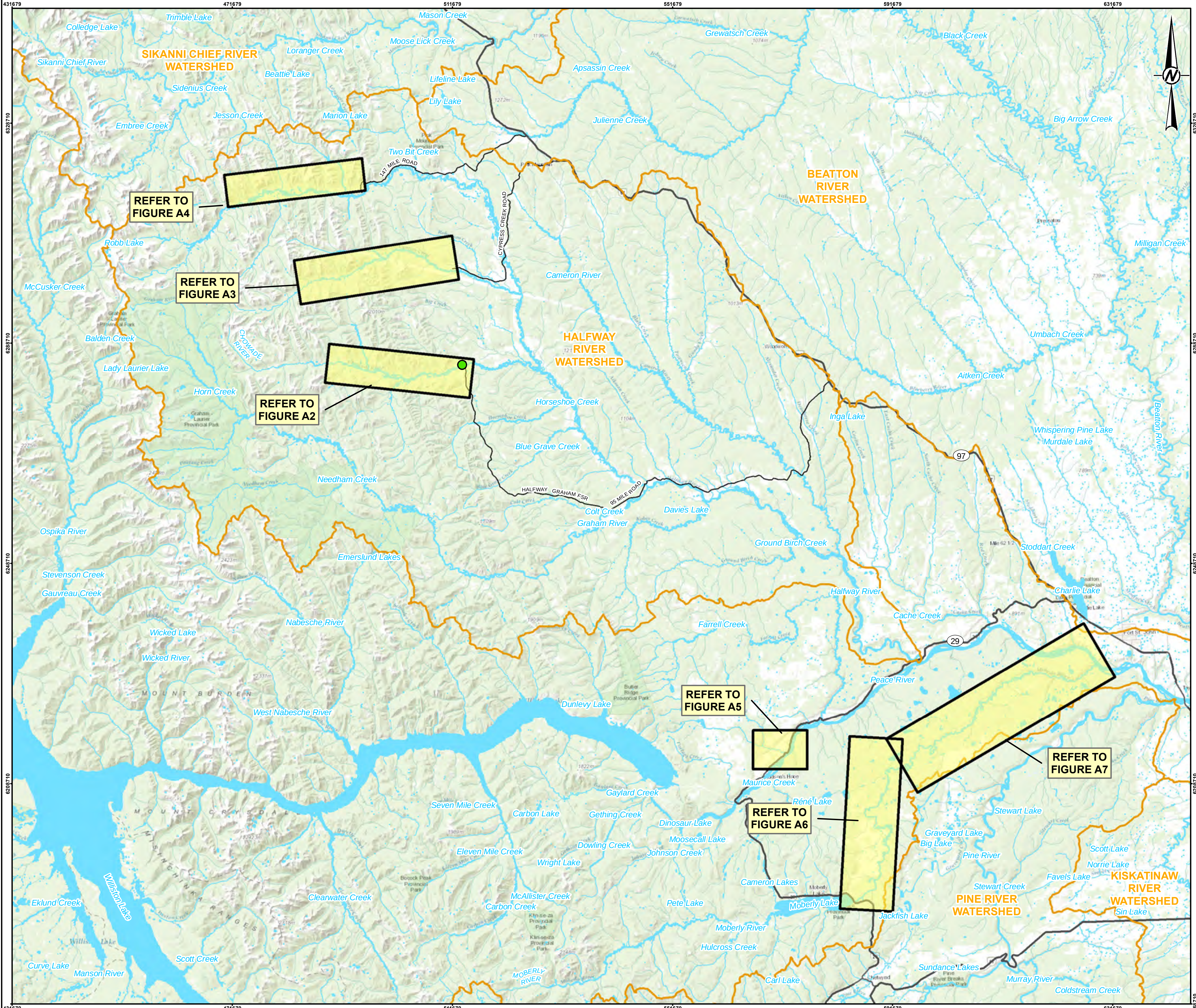
APPENDIX A

Maps and UTM Locations



LEGEND

- CHOWADE RIVER PIT TAG DETECTOR AND RESISTIVITY COUNTER STATION
- MAP INDEX
- MAJOR WATERSHED

BASE MAP FEATURES

- HIGHWAY
- ROAD
- WATERCOURSE
- WATERBODY

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1:700,000 KILOMETRES

REFERENCES

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CLIENT
BC HYDRO

PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c) STUDY AREA, 2016

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-12-15
DESIGNED	DR
PREPARED	JG
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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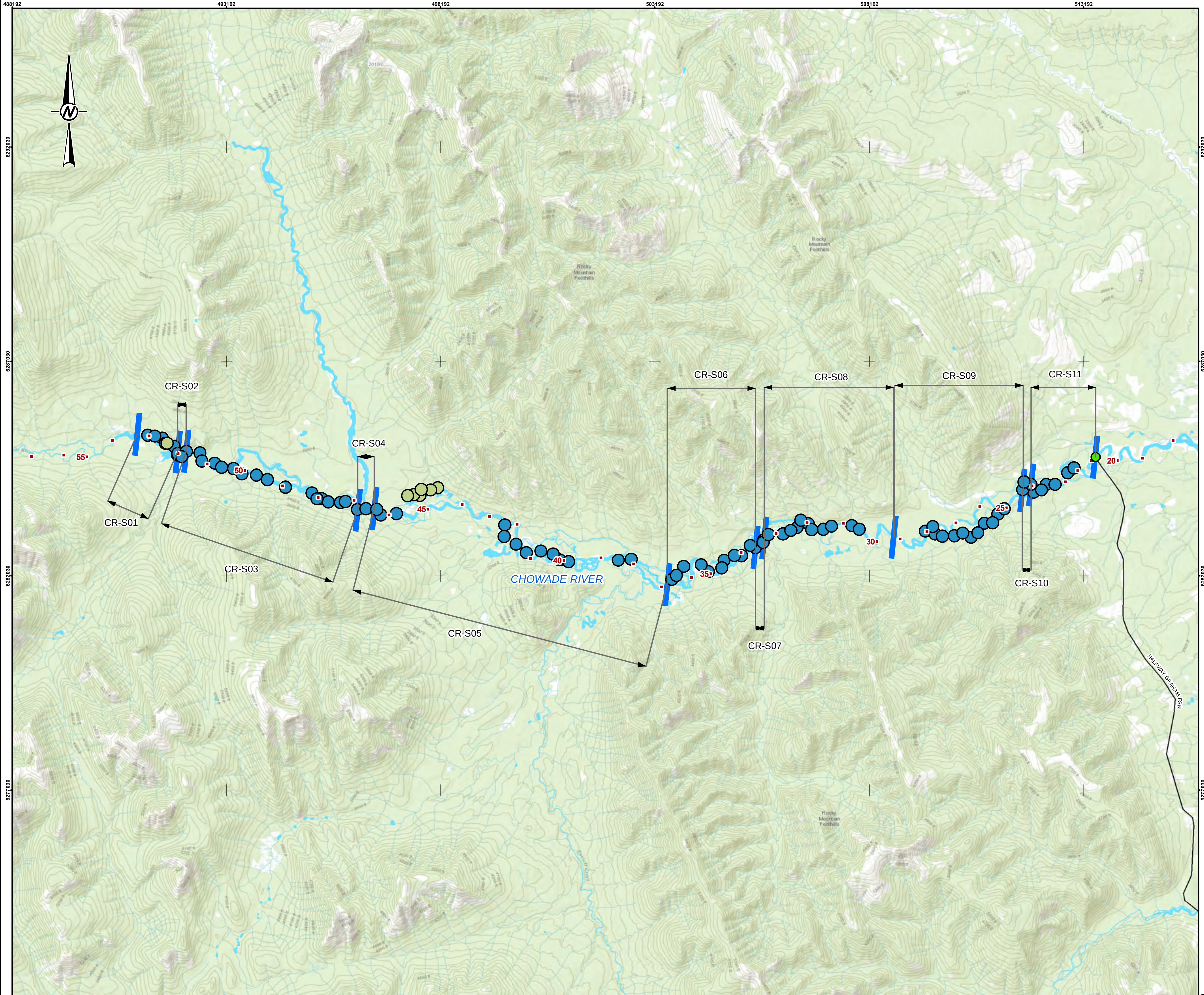

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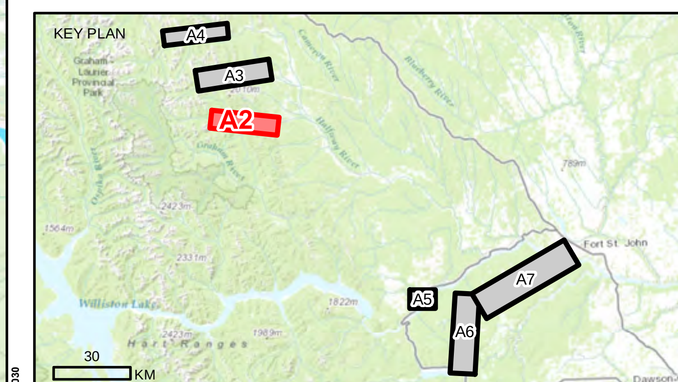
- RIVER KILOMETRE POSTS
- SECTION BREAK
- CHOWADE RIVER PIT TAG DETECTOR AND RESISTIVITY COUNTER STATION

SAMPLE METHOD

- BACKPACK ELECTROFISHER
- SMALL FISH BOAT ELECTROSHOCKER

BASE DATA

- ACCESS ROAD (APPROX.)
- WATERCOURSE
- WATERBODY



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CLIENT

BC HYDRO

PROJECT

SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE

OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) CHOWADE RIVER STUDY AREA, 2016.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-12-21
DESIGNED	DR
PREPARED	JG
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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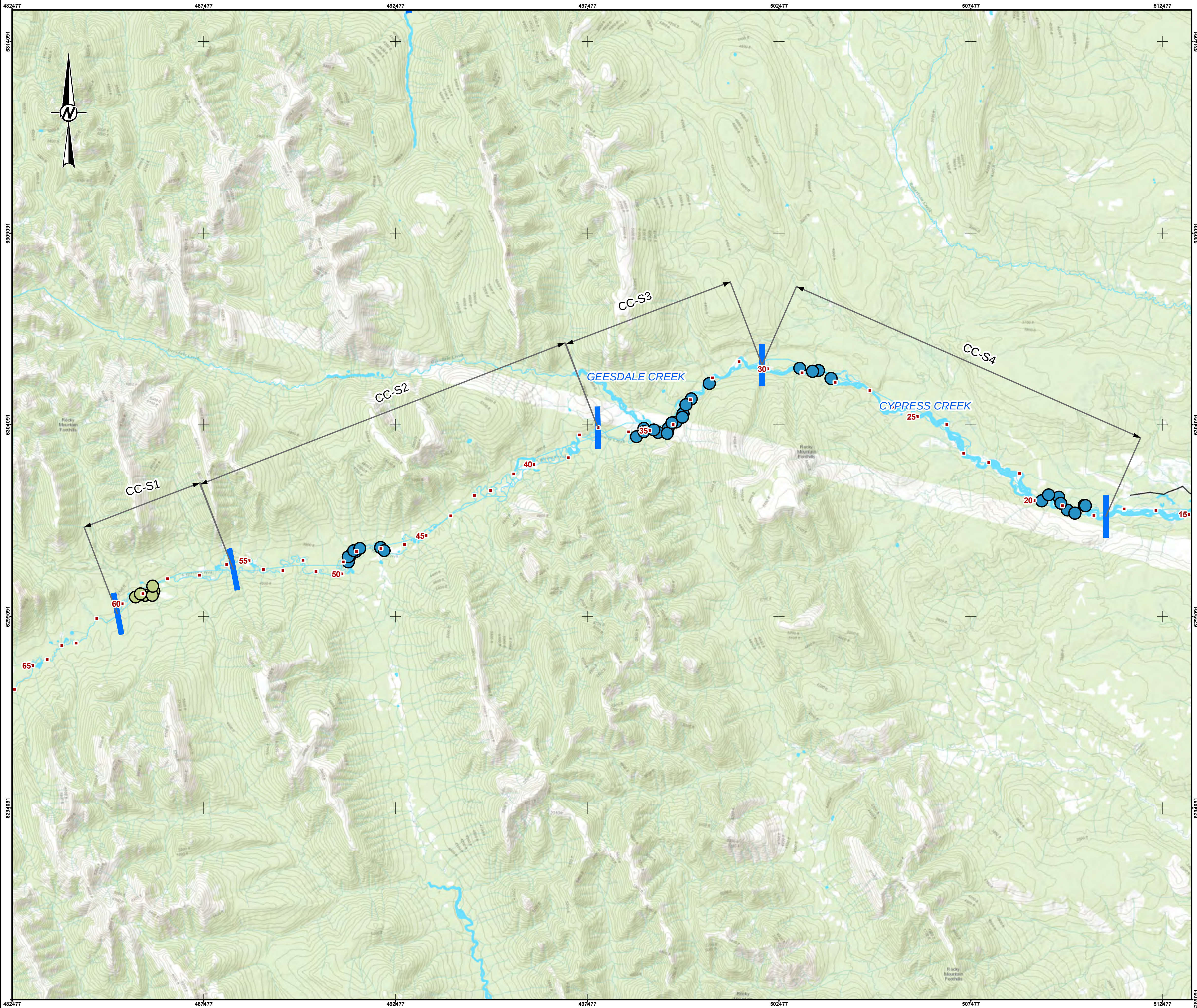

LEGEND

- RIVER KILOMETRE POSTS
- SECTION BREAK

SAMPLE METHOD

- BACKPACK ELECTROFISHER
- SMALL FISH BOAT ELECTROSHOCKER

BASE DATA

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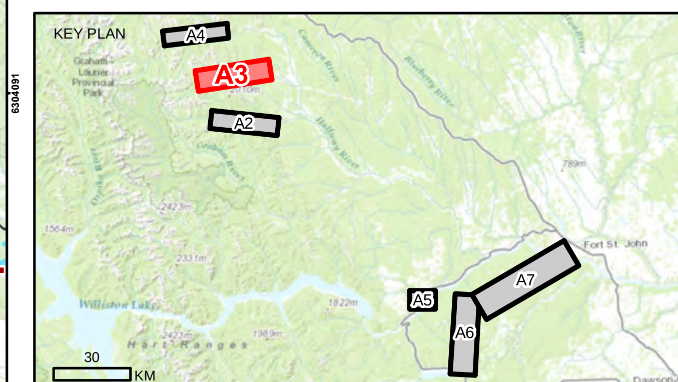
- WATERCOURSE
- WATERBODY



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PROJECT
SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) CYPRESS CREEK STUDY AREA, 2016.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-12-21
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PREPARED	JG
REVIEWED	DF
APPROVED	SR

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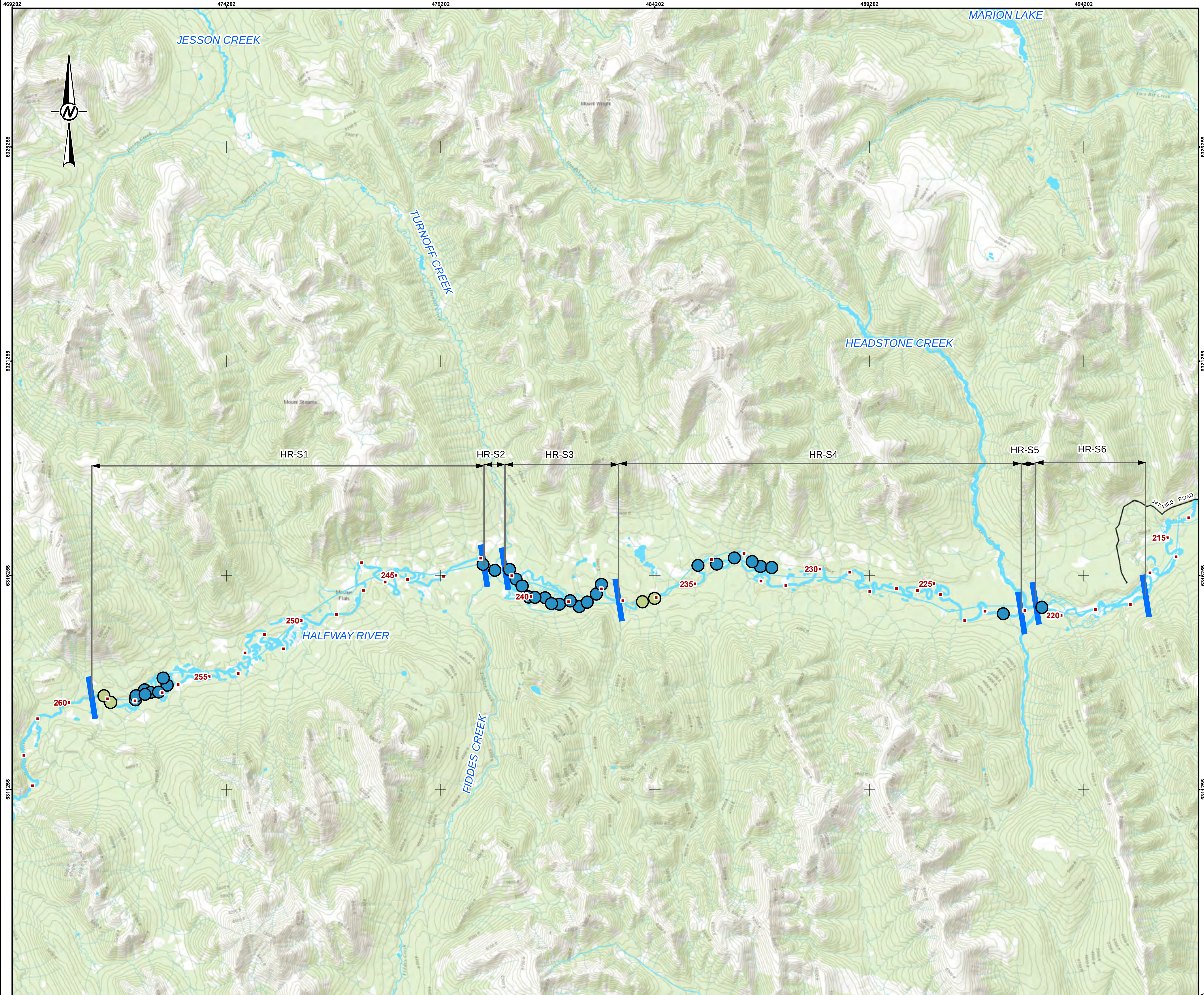

LEGEND

- RIVER KILOMETRE POSTS
- SECTION BREAK

SAMPLE METHOD

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- SMALL FISH BOAT ELECTROSHOCKER

BASE DATA

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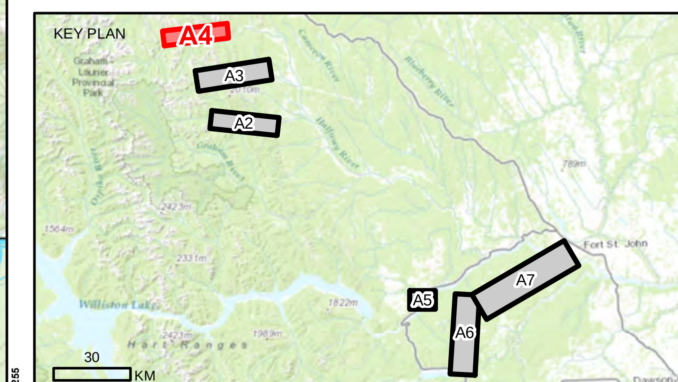
- WATERBODY



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SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE
OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) UPPER HALFWAY RIVER STUDY AREA, 2016.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-12-21
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PREPARED	JG
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
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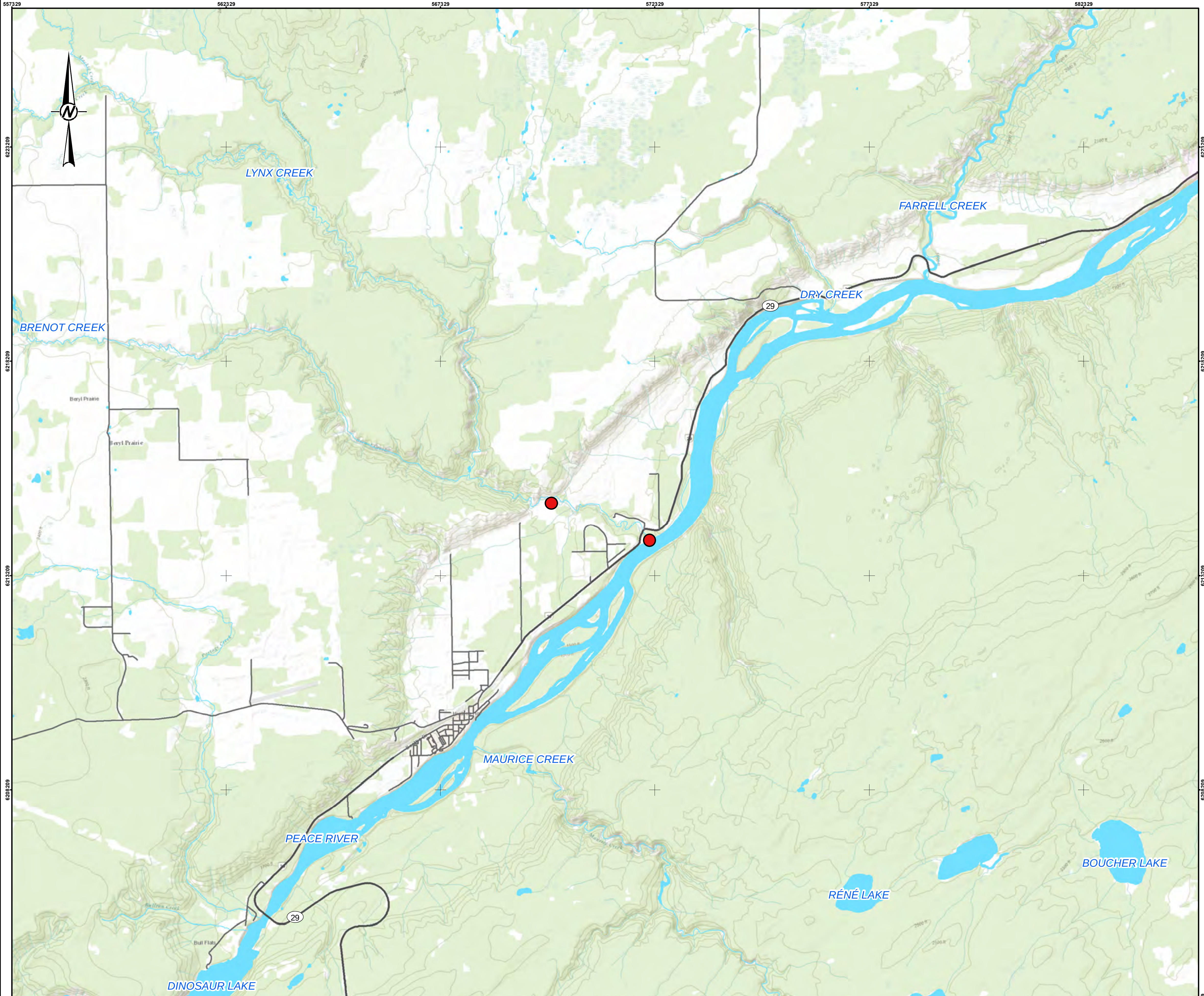

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SECTION BREAK

SAMPLE METHOD

UPSTREAM AND DOWNSTREAM EXTENT OF VISUAL SURVEY

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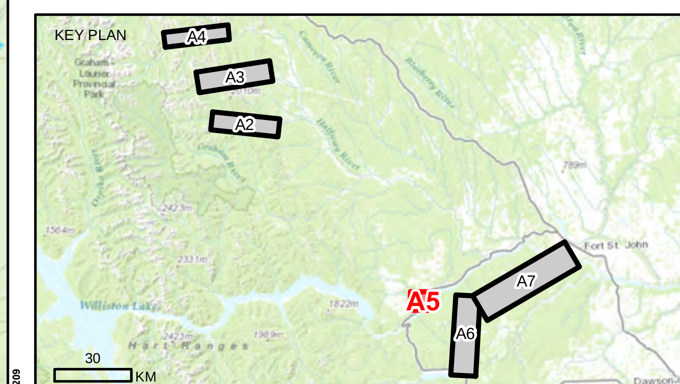
WATERCOURSE

WATERBODY



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PROJECT

SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE

OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) LYNX CREEK STUDY AREA, 2016.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-12-21
DESIGNED	DR
PREPARED	JG
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
1650533	2016/6000	0	A5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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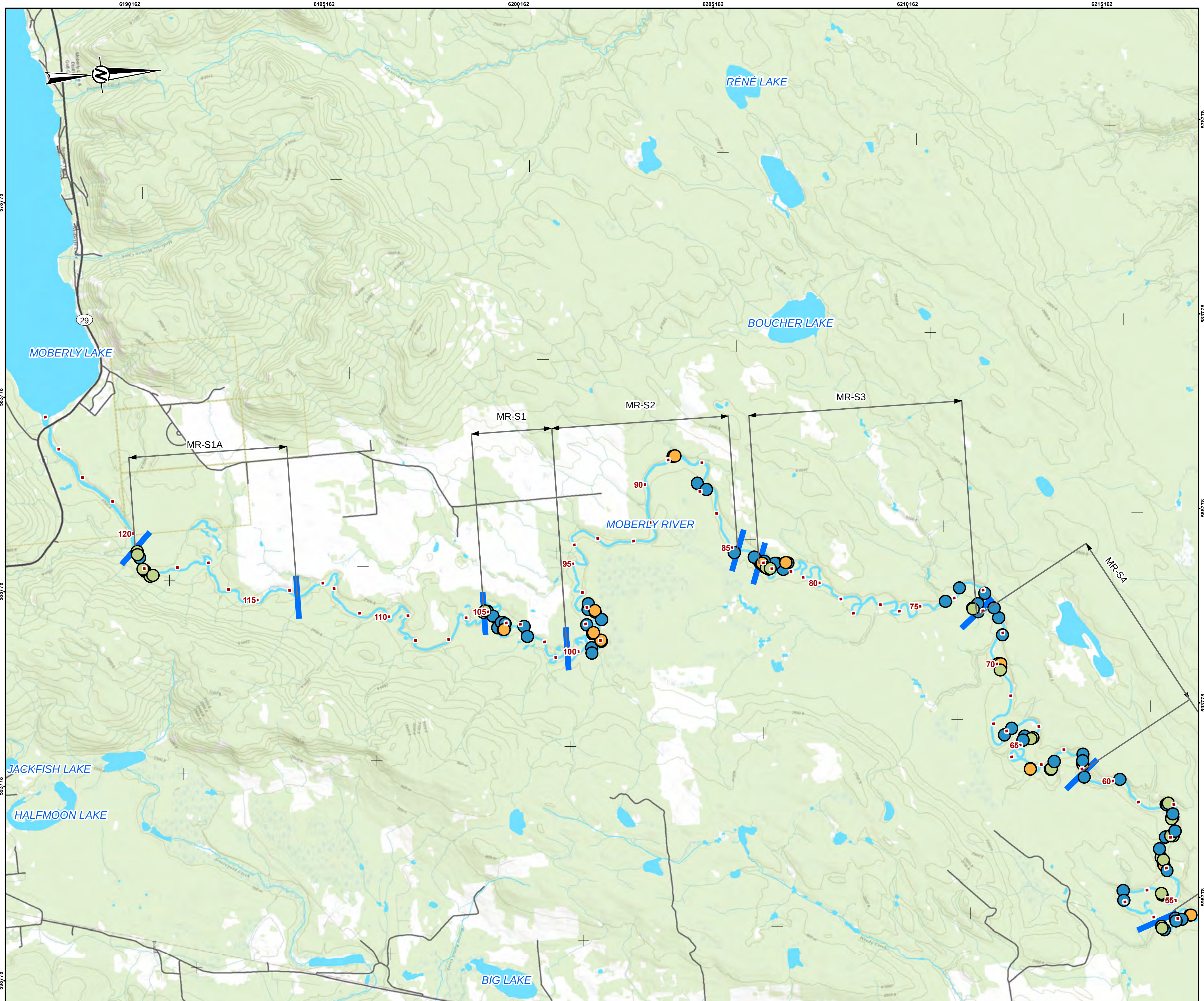


LEGEND

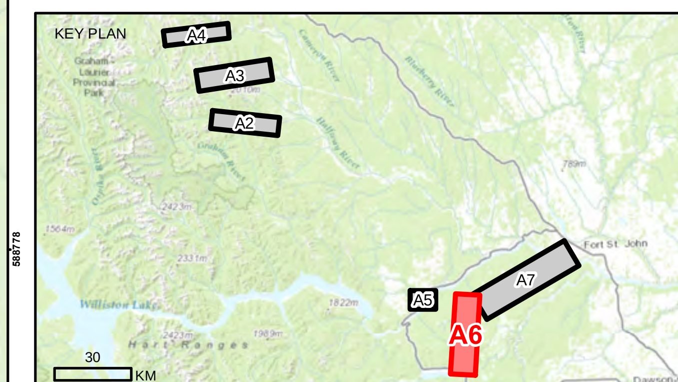
- RIVER KILOMETRE POSTS
- SECTION BREAK

SAMPLE METHOD

- BACKPACK ELECTROFISHER
- BEACH SEINE
- SMALL FISH BOAT ELECTROSHOCKER

BASE DATA

- ACCESS ROAD (APPROX.)
- WATERCOURSE
- WATERBODY



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1:100,000 KILOMETRES

REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATERSHED DATA OBTAINED FROM THE GOVERNMENT OF BRITISH COLUMBIA
3. BASEDATA SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.

CLIENT

BC HYDRO

PROJECT

SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE

OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c) MOBERLY RIVER STUDY AREA, 2016.

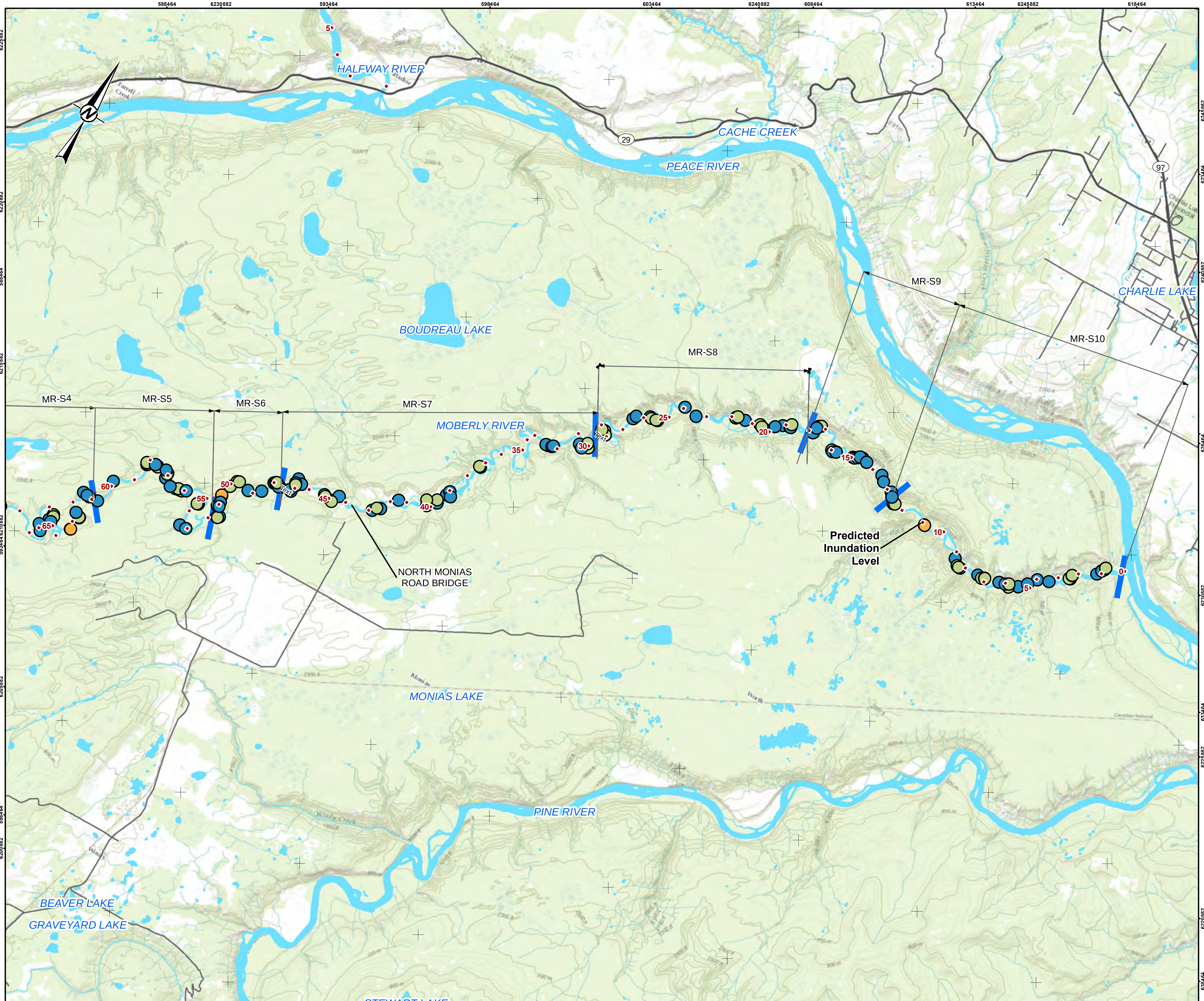
CONSULTANT

Golder Associates

YYYY-MM-DD	2016-12-21
DESIGNED	DR
PREPARED	JG
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
1650533	2016/6000	0	A6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

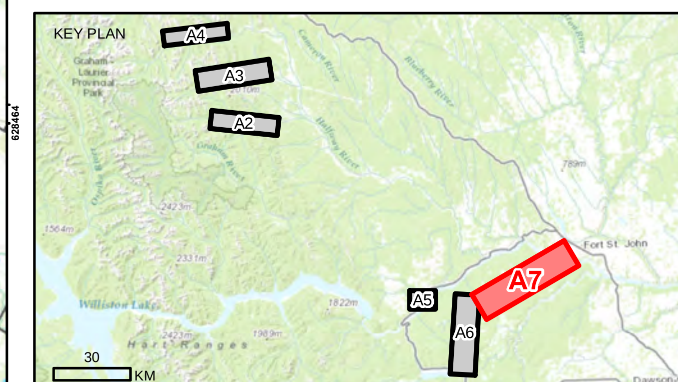
- RIVER KILOMETRE POSTS
- SECTION BREAK

SAMPLE METHOD

- BACKPACK ELECTROFISHER
- BEACH SEINE
- SMALL FISH BOAT ELECTROSHOCKER

BASE DATA

- ACCESS ROAD (APPROX.)
- WATERCOURSE
- WATERBODY



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REFERENCES

1. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATERSHED DATA OBTAINED FROM THE GOVERNMENT OF BRITISH COLUMBIA
3. BASEDATA SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESR I JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.

CLIENT

BC HYDRO

PROJECT

SITE C RESERVOIR TRIBUTARIES FISH POPULATION INDEXING SURVEY (Mon-1b, Task 2c)

TITLE

OVERVIEW OF THE SITE C RESERVOIR TRIBUTARIES FISH POPULATI0N INDEXING SURVEY (Mon-1b, Task 2c) MOBERLY RIVER STUDY AREA, 2016.

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-12-21
DESIGNED	DR
PREPARED	JG
REVIEWED	DF
APPROVED	SR

PROJECT NO.	CONTROL	REV.	FIGURE
1650533	2016/6000	0	A7

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APPENDIX B

Catch and Effort Data

Table B1 Summary of beach seine sites sampled in the Moberly River during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

River Section	Site Name	Length Sampled (m)	Width Sampled (m)	Area Sampled (m²)
1	MBS01-01	50	1.0	50
2	MBS02-01	25	1.5	38
2	MBS02-03	40	1.5	60
2	MBS02-02	35	2.0	70
2	MBS02-04	40	1.5	60
3	MBS03-02	50	3.0	150
3	MBS03-01	25	2.7	68
3	MBS03-03	35	4.0	140
4	MBS04-01	50	4.0	200
4	MBS04-02	20	3.0	60
4	MBS04-03	25	4.0	100
5	MBS05-01	40	2.5	100
6	MBS06-01	40	4.0	160
10	MBS10-01	20	2.7	54
Total				**1,309**

Table B2 Catch and percent composition of the total catch by river in the Halfway River watershed sampled by backpack electrofishing ('Backpack') and small fish boat electroshocking ('Boat') during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Species	Life Stage[a]	Chowade River				Cypress Creek				Upper Halfway River			
		# Backpack	# Boat	# Total	% Catch	# Backpack	# Boat	# Total	% Catch	# Backpack	# Boat	# Total	% Catch
Arctic Grayling	Adult	0	4	**4**	**0.9**	0	0	**0**	**0.0**	0	0	**0**	**0.0**
	Immature	0	0	**0**	**0.0**	0	1	**1**	**0.5**	0	0	**0**	**0.0**
	YOY	0	0	**0**	**0.0**	0	0	**0**	**0.0**	0	0	**0**	**0.0**
	Total	**0**	**4**	**4**	**0.9**	**0**	**1**	**1**	**0.5**	**0**	**0**	**0**	**0.0**
Bull Trout	Adult	0	11	**11**	**2.4**	1	13	**14**	**6.7**	1	6	**7**	**6**
	Immature	3	7	**10**	**2.2**	21	7	**28**	**13.4**	13	3	**16**	**13.7**
	YOY	89	1	**90**	**19.9**	0	0	**0**	**0**	0	0	**0**	**0**
	Total	**92**	**19**	**111**	**24.5**	**22**	**20**	**42**	**20.1**	**14**	**9**	**23**	**19.7**
Mountain Whitefish	Adult	0	168	**168**	**37.2**	0	68	**68**	**32.5**	0	69	**69**	**59**
	Immature	0	54	**54**	**11.9**	0	52	**52**	**24.9**	0	2	**2**	**1.7**
	YOY	0	1	**1**	**0.2**	0	1	**1**	**0.5**	0	0	**0**	**0**
	Total	**0**	**223**	**223**	**49.3**	**0**	**121**	**121**	**57.9**	**0**	**71**	**71**	**60.7**
Rainbow Trout	Adult	0	53	**53**	**11.7**	0	9	**9**	**4.3**	0	8	**8**	**6.8**
	Immature	0	13	**13**	**2.9**	0	21	**21**	**10.0**	0	1	**1**	**0.9**
	YOY	0	0	**0**	**0.0**	0	0	**0**	**0.0**	0	0	**0**	**0.0**
	Total	**0**	**66**	**66**	**14.6**	**0**	**30**	**30**	**14.3**	**0**	**9**	**9**	**7.7**
Slimy Sculpin	**All**	**25**	**23**	**48**	**10.6**	**1**	**14**	**15**	**7.2**	**13**	**1**	**14**	**12**

[a] Life stage was assigned based on body length. Fish were classified as Adults when longer than 249 mm and Immature when less than 250 mm, but this category did not include YOY fish. The maximum size of YOY fish varied by species and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

Table B3 Catch and percent composition of the total catch in the Moberly River sampled by backpack electrofishing ('Backpack'), beach seine ('Seine'), and small fish boat electrofishing ('Boat') during the Site C Reservoir Tributary Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

Species	Life Stage[a]	# Backpack	# Seine	# Boat	# Total	% Catch
Arctic Grayling	Adult	0	0	3	**3**	**0.1**
	Immature	2	0	13	**15**	**0.4**
	YOY	44	1	42	**87**	**2.1**
	Total	**46**	**1**	**58**	**105**	**2.6**
Burbot	Adult	0	0	3	**3**	**0.1**
	Immature	2	0	0	**2**	**<0.1**
	YOY	2	0	0	**2**	**<0.1**
	Total	**4**	**0**	**3**	**7**	**0.1**
Bull Trout	Adult	0	0	0	**0**	**0.0**
	Immature	0	0	2	**2**	**<0.1**
	YOY	0	0	0	**0**	**0.0**
	Total	**0**	**0**	**2**	**2**	**0.0**
Kokanee	Adult	1	0	0	**1**	**<0.1**
	Immature	0	0	0	**0**	**0.0**
	YOY	0	0	0	**0**	**0.0**
	Total	**1**	**0**	**0**	**1**	**0.0**
Largescale Sucker	Adult	0	0	2	**2**	**<0.1**
	Immature	3	0	12	**15**	**0.4**
	YOY	1	0	1	**2**	**<0.1**
	Total	**4**	**0**	**15**	**19**	**0.4**
Longnose Sucker	Adult	0	0	25	**25**	**0.6**
	Immature	68	0	146	**214**	**5.1**
	YOY	227	122	33	**382**	**9.1**
	Total	**295**	**122**	**204**	**621**	**14.8**
Mountain Whitefish	Adult	3	0	134	**137**	**3.3**
	Immature	6	0	157	**163**	**3.9**
	YOY	86	14	385	**485**	**11.5**
	Total	**95**	**14**	**676**	**785**	**18.7**
Northern Pike	Adult	1	0	2	**3**	**0.1**
	Immature	0	13	6	**19**	**0.5**
	YOY	0	0	0	**0**	**0.0**
	Total	**1**	**13**	**8**	**22**	**0.6**
Northern Pikeminnow	Adult	1	0	2	**3**	**0.1**
	Immature	4	0	17	**21**	**0.5**
	YOY	3	10	0	**13**	**0.3**
	Total	**8**	**10**	**19**	**37**	**0.9**
White Sucker	Adult	1	0	6	**7**	**0.2**
	Immature	0	0	18	**18**	**0.4**
	YOY	2	1	1	**4**	**0.1**
	Total	**3**	**1**	**25**	**29**	**0.7**
Slimy Sculpin	**All**	**62**	**86**	**13**	**161**	**3.8**
Finescale Dace	**All**	**1**	**0**	**1**	**2**	**<0.1**
Flathead Chub	**All**	**0**	**0**	**1**	**1**	**<0.1**
Lake Chub	**All**	**90**	**21**	**6**	**117**	**2.8**
Longnose Dace	**All**	**454**	**228**	**11**	**693**	**16.5**
Redside Shiner	**All**	**308**	**459**	**120**	**887**	**21.1**
Unidentified Sucker	**All**	**113**	**456**	**8**	**577**	**13.7**
Troutperch	**All**	**5**	**115**	**24**	**144**	**3.4**
Total		**1490**	**1526**	**1194**	**4210**	**100**

[a] Life stage was assigned based on body length. Fish were classified as Adults when longer than 249 mm and Immature when less than 250 mm, but this category did not include YOY fish. The maximum size of YOY fish varied by species and was selected based on modes observed in length-frequency histograms and corroborated with length-at-age data when possible.

APPENDIX C

Habitat Data

Table C1 Habitat variables measured in the Halfway River watershed and the Moberly River during the Site C Reservoir Tributaries Fish Population Indexing Survey (Mon-1b, Task 2c), 2016.

River	River Section	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Substrate		Cover Type - Percent of Available Cover (%)								
								Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Chowade River	CR-S01	CR-MC-52.2-18-Aug-2016	18-Aug-16	6.4	430	Bottom	Medium	Gravel	Cobble	10	60	20	10					
Chowade River	CR-S01	CR-MC-52.5-18-Aug-2016	18-Aug-16	6.4	430		Medium	Gravel	Cobble	15	1	1	2	5	0	15	59	2
Chowade River	CR-S01	CR-MC-52.7-18-Aug-2016	18-Aug-16	6.4	430		Medium	Gravel	Cobble	15	1	1	2	5	0	15	59	2
Chowade River	CR-S01	CR-MC-53.0-17-Aug-2016	17-Aug-16	5.9	460	Bottom	Medium	Cobble	Gravel	15	2	2				5	76	
Chowade River	CR-S02	CR-MC-51.9-18-Aug-2016	18-Aug-16	7.5	430		Medium	Boulder	Cobble	50	3	5				2	30	10
Chowade River	CR-S02	CR-MC-52.0-18-Aug-2016	18-Aug-16	6.4	430	Bottom	Medium	Cobble	Gravel	43	10	5	5			5	32	
Chowade River	CR-S03	CR-MC-47.4-20-Aug-2016	20-Aug-16	8.6	440	Bottom	Medium	Gravel	Cobble	45	5	3	2	2			40	3
Chowade River	CR-S03	CR-MC-47.9-20-Aug-2016	20-Aug-16	8.6	440	Bottom	Medium	Cobble	Gravel	30	5		5				55	5
Chowade River	CR-S03	CR-MC-48.2-19-Aug-2016	19-Aug-16	8.3	430	Bottom		Cobble	Gravel	40	2	3	5	5			45	
Chowade River	CR-S03	CR-MC-48.9-19-Aug-2016	19-Aug-16	8.3	430	Bottom	Medium	Cobble	Gravel	75	5	5		5			10	
Chowade River	CR-S03	CR-MC-49.8-19-Aug-2016	19-Aug-16	8.3	430	Bottom	Medium	Cobble	Gravel	40	2	1		2			55	
Chowade River	CR-S03	CR-MC-50.2-18-Aug-2016	18-Aug-16	7.8	430		Medium	Cobble	Boulder	20	1	2		30		2	45	
Chowade River	CR-S03	CR-MC-50.8-18-Aug-2016	18-Aug-16	7.8	430	Bottom	Medium	Cobble	Boulder	85		5		10				
Chowade River	CR-S03	CR-MC-51.4-18-Aug-2016	18-Aug-16	7.8	430	Bottom	Medium	Cobble	Gravel	10	3	2		10		1	74	
Chowade River	CR-S04	CR-MC-46.5-20-Aug-2016	20-Aug-16	9.9	420			Cobble	Gravel	15	1	1	1	5	1		76	
Chowade River	CR-S04	CR-MC-46.8-20-Aug-2016	20-Aug-16			Bottom	High	Cobble	Gravel	15	10	5	5				55	10
Chowade River	CR-S05	CR-MC-38.7-23-Aug-2016	23-Aug-16	9.1	440	Bottom	Medium	Gravel	Cobble	24	5	2	3				61	5
Chowade River	CR-S05	CR-MC-40.1-22-Aug-2016	22-Aug-16	8.8	440	Bottom	Medium	Gravel	Cobble	31	3	2					62	2
Chowade River	CR-S05	CR-MC-40.6-22-Aug-2016	22-Aug-16	8.8	440	Bottom	Medium	Cobble	Gravel	25	2	3		10			60	
Chowade River	CR-S05	CR-MC-41.5-22-Aug-2016	22-Aug-16	8.3	440	Bottom	Medium	Cobble	Gravel	10	3	2	1	2			80	2
Chowade River	CR-S05	CR-MC-42.4-22-Aug-2016	22-Aug-16	8.3	440	Bottom	Medium	Gravel	Cobble	27	2	1		5		2	60	3
Chowade River	CR-S05	CR-MC-46.1-20-Aug-2016	20-Aug-16	9.9	420		Medium	Cobble	Gravel	5	3	2	5	10			75	
Chowade River	CR-S05	CR-SC-45.0-24-Aug-2016	24-Aug-16	9.5	420	Bottom	Medium	Gravel	Cobble	5	10			20			65	
Chowade River	CR-S05	CR-SC-45.1-24-Aug-2016	24-Aug-16	9.5	420	Bottom	Low	Gravel	Cobble	5	20	10	10	15			40	
Chowade River	CR-S05	CR-SC-45.3-24-Aug-2016	24-Aug-16	8.9	430	Bottom	Low	Gravel	Cobble	5	20	15	20	5			35	
Chowade River	CR-S06	CR-MC-34.0-24-Aug-2016	24-Aug-16	9.0	440		Medium	Gravel	Cobble	5	7	3		5			70	10
Chowade River	CR-S06	CR-MC-34.5-24-Aug-2016	24-Aug-16	8.1	430	Bottom	Medium	Gravel	Cobble	5	3	2		5			80	5
Chowade River	CR-S06	CR-MC-35.2-24-Aug-2016	24-Aug-16	8.1	430	Bottom	Medium	Cobble	Gravel	28	5	1	3	2			56	5
Chowade River	CR-S06	CR-MC-36.1-23-Aug-2016	23-Aug-16	10.1	440	Bottom		Cobble	Gravel	20	10	2	3	5			50	10
Chowade River	CR-S06	CR-MC-36.5-23-Aug-2016	23-Aug-16	10.3	440	Bottom	Medium	Cobble	Gravel	5	2	1	1	5			81	5
Chowade River	CR-S07	CR-MC-33.4-19-Aug-2016	19-Aug-16	13.0	430	Bottom	Medium	Gravel	Cobble	3	5			25			67	
Chowade River	CR-S07	CR-MC-33.6-19-Aug-2016	19-Aug-16	12.4	430	Bottom	Medium	Gravel	Cobble	5	5	2		20			68	
Chowade River	CR-S08	CR-MC-30.8-20-Aug-2016	20-Aug-16	11.5	420	Bottom	Medium	Gravel	Cobble	5	15			20			60	
Chowade River	CR-S08	CR-MC-31.3-20-Aug-2016	20-Aug-16	11.0	420	Bottom	Medium	Cobble	Gravel	5	15			15			65	
Chowade River	CR-S08	CR-MC-31.8-20-Aug-2016	20-Aug-16	11.0	430	Bottom	Medium	Cobble	Gravel	5	10			25			60	
Chowade River	CR-S08	CR-MC-32.2-20-Aug-2016	20-Aug-16	11.0	420	Bottom	Medium	Cobble	Gravel	5	5		2	25			63	
Chowade River	CR-S08	CR-MC-32.8-20-Aug-2016	20-Aug-16	10.0	420	Bottom	Medium	Cobble	Gravel	5	5	2		5			83	
Chowade River	CR-S09	CR-MC-25.2-23-Aug-2016	23-Aug-16	10.0	420	Bottom	Medium	Cobble	Gravel	5	20			10			65	
Chowade River	CR-S09	CR-MC-26.1-22-Aug-2016	22-Aug-16	10.0	420	Bottom	Medium	Gravel	Cobble	5	20			20			55	
Chowade River	CR-S09	CR-MC-26.5-22-Aug-2016	22-Aug-16	10.0	420	Bottom	Medium	Cobble	Gravel	5	10			45			40	
Chowade River	CR-S09	CR-MC-27.3-22-Aug-2016	22-Aug-16	10.0	420	Bottom	Medium	Cobble	Gravel	5	15			20			60	
Chowade River	CR-S09	CR-MC-27.8-22-Aug-2016	22-Aug-16	10.0	430	Bottom	Medium	Gravel	Cobble	5	20			25			50	
Chowade River	CR-S09	CR-MC-28.0-22-Aug-2016	22-Aug-16	10.5	440	Bottom	Medium	Gravel	Cobble	15	15			10			60	
Chowade River	CR-S10	CR-MC-24.1-23-Aug-2016	23-Aug-16	10.0	420	Bottom	Medium	Gravel	Cobble	5	20			20			55	
Chowade River	CR-S10	CR-MC-24.3-23-Aug-2016	23-Aug-16	10.0	420	Bottom	Medium	Cobble	Gravel	5	20			20			55	
Chowade River	CR-S11	CR-MC-22.2-23-Aug-2016	23-Aug-16	11.0	430	Bottom	Medium	Gravel	Cobble	30	5	5					30	30
Chowade River	CR-S11	CR-MC-23.5-23-Aug-2016	23-Aug-16	10.0	420	Bottom	Low	Cobble	Boulder	45	5	5				5	30	10
Chowade River	CR-S11	CR-MC-23.8-23-Aug-2016	23-Aug-16	10.0	420	Bottom	Medium	Cobble	Gravel	5	15			30			50	
Cypress Creek	CC-S1	CC-MC-58.4-25-Aug-2016	25-Aug-16	5.8	480	Bottom	Low	Cobble	Gravel	65		5		20			10	
Cypress Creek	CC-S1	CC-MC-58.7-25-Aug-2016	25-Aug-16	5.8	480	Bottom	Medium	Boulder	Cobble	75	10		5		10			
Cypress Creek	CC-S1	CC-MC-59.1-25-Aug-2016	25-Aug-16	5.8	480	Bottom	Medium	Boulder	Cobble	80			10		10			
Cypress Creek	CC-S2	CC-MC-41.8-25-Aug-2016	25-Aug-16	9.8	470	Bottom	Low	Organics	Sand		5		15			80		
Cypress Creek	CC-S2	CC-MC-48.0-25-Aug-2016	25-Aug-16	9.8	460	Bottom		Sand	Silt		5		95					
Cypress Creek	CC-S2	CC-MC-48.2-25-Aug-2016	25-Aug-16	10.0	470	Bottom	Low	Gravel	Sand	5	15	5	10	10			55	
Cypress Creek	CC-S2	CC-MC-48.8-25-Aug-2016	25-Aug-16	9.1	470	Bottom	Low	Gravel	Sand	5		5	10	5			75	
Cypress Creek	CC-S3	CC-MC-33.0-25-Aug-2016	25-Aug-16	10.5	440	Bottom	Medium	Cobble	Gravel	29	4	1	10	4			48	4
Cypress Creek	CC-S3	CC-MC-33.4-25-Aug-2016	25-Aug-16	9.9	450	Bottom	Medium	Cobble	Gravel	10	2	1		20			65	2
Cypress Creek	CC-S3	CC-MC-33.8-25-Aug-2016	25-Aug-16	8.9	460		Medium	Cobble	Gravel	30	3	2		5			60	
Cypress Creek	CC-S3	CC-MC-34.1-25-Aug-2016	25-Aug-16	7.9	460	Bottom	Medium	Cobble	Gravel	23	1	1		5			65	5
Cypress Creek	CC-S3	CC-MC-34.6-24-Aug-2016	24-Aug-16	10.2	460		Medium	Cobble	Gravel	20	1	1		30			45	3
Cypress Creek	CC-S3	CC-MC-35.2-24-Aug-2016	24-Aug-16	10.2	470	Bottom	Medium	Gravel	Cobble	20	2	0		20			56	2
Cypress Creek	CC-S3	CC-MC-35.6-24-Aug-2016	24-Aug-16	10.2	470	Bottom	Medium	Gravel	Cobble	22	5	3	3	2			55	10
Cypress Creek	CC-S4	CC-MC-18.4-06-Aug-2016	6-Aug-16	10.5	390	1.00	Medium	Cobble	Silt	25	5	5		5				60
Cypress Creek	CC-S4	CC-MC-18.8-06-Aug-2016	6-Aug-16	10.5	360	1.00		Cobble	Silt	60	10	15		5				10
Cypress Creek	CC-S4	CC-MC-19.5-06-Aug-2016	6-Aug-16	10.4	410	0.40	Medium	Cobble	Gravel	10	50		40					
Cypress Creek	CC-S4	CC-MC-19.8-06-Aug-2016	6-Aug-16	10.5	390	1.00	Medium	Cobble	Gravel	55	10	5		5	2	3	10	10
Cypress Creek	CC-S4	CC-MC-28.6-25-Aug-2016	25-Aug-16	11.5	440			Cobble	Gravel	40	3	2		20			30	5
Cypress Creek	CC-S4	CC-MC-29.1-25-Aug-2016	25-Aug-16	11.2	440			Cobble	Gravel	30	1	1		50			17	1

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

…continued.

Table C1 Continued.

River	River Section	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Substrate		Cover Type - Percent of Available Cover (%)								
								Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Halfway River	HR-S1	HR-S1-1-26-Aug-2016	26-Aug-16	10.5	480	Bottom	Medium	Cobble	Bedrock	60				30			10	
Halfway River	HR-S1	HR-S1-2-26-Aug-2016	26-Aug-16	10.5	480	Bottom	Low	Gravel	Cobble	10	10		5	20			55	
Halfway River	HR-S1	HR-S1-3-26-Aug-2016	26-Aug-16	10.5	480	Bottom	Medium	Gravel	Sand	5	15		10	15			55	
Halfway River	HR-S1	HR-S1-4-26-Aug-2016	26-Aug-16	10.5	480	Bottom	Low	Gravel	Sand	5	15						80	
Halfway River	HR-S1	HR-S1-5-26-Aug-2016-SC1	26-Aug-16	10.5	480	Bottom	Low	Gravel	Sand	5	20		5	10			60	
Halfway River	HR-S2	HR-S2-1-28-Aug-2016	28-Aug-16	7.5	480	0.80	Low	Cobble	Boulder	5	5			40			50	
Halfway River	HR-S2	HR-S2-2-28-Aug-2016	28-Aug-16	7.5	480	0.70		Boulder	Cobble	40				30			20	10
Halfway River	HR-S3	HR-S3-1-28-Aug-2016	28-Aug-16	7.5	470	Bottom	Medium	Cobble	Boulder	15	5			60			20	
Halfway River	HR-S3	HR-S3-2-28-Aug-2016	28-Aug-16	7.5	470	0.80	Medium	Cobble	Boulder	10	20			40			30	
Halfway River	HR-S3	HR-S3-3-28-Aug-2016	28-Aug-16	7.5	470	0.80	Medium	Cobble	Gravel	10	10	5		25			50	
Halfway River	HR-S3	HR-S3-4-28-Aug-2016	28-Aug-16	7.5	470	0.80	Medium	Cobble	Gravel	30				15			45	10
Halfway River	HR-S3	HR-S3-5-28-Aug-2016	28-Aug-16	7.5	470	Bottom	Medium	Gravel	Cobble	50							50	
Halfway River	HR-S3	HR-S3-6-28-Aug-2016	28-Aug-16	7.5	470	0.70	Medium	Gravel	Cobble	40							30	30
Halfway River	HR-S4	HR-S4-1-26-Aug-2016	26-Aug-16	9.8	490			Boulder	Gravel	51		1		5			38	5
Halfway River	HR-S4	HR-S4-2-26-Aug-2016	26-Aug-16	10.6	480	Bottom	Low	Gravel	Sand	5	1	1		10			52	31
Halfway River	HR-S4	HR-S4-3-28-Aug-2016	28-Aug-16	6.9	480	0.60	Medium	Cobble	Gravel	10	3	2		5			40	40
Halfway River	HR-S4	HR-S4-4-28-Aug-2016	28-Aug-16	6.9	480	0.60	Medium	Cobble	Gravel	10	5	5		10			40	30
Halfway River	HR-S5	HR-S5-5-28-Aug-2016	28-Aug-16	8.0	480	Bottom	Medium	Cobble	Gravel	20	2	3		10			60	5
Halfway River	HR-S6	HR-S6-6-28-Aug-2016	28-Aug-16	8.3	480	1.00	Medium	Cobble	Gravel	10	3	2		40			35	10
Halfway River	HR-S6	HR-S6-7-28-Aug-2016	28-Aug-16	8.3	480	1.00	Medium	Cobble	Gravel	17	3	2		10		10	53	5
Moberly River	MR-S1A	MBP1A-01	8-Sep-16	13.6	210	0.50												
Moberly River	MR-S1A	MBP1A-02	8-Sep-16	14.1	200	0.50												
Moberly River	MR-S1A	MBP1A-03	8-Sep-16	14.0	200	0.50												
Moberly River	MR-S1A	MEF1A-01	8-Sep-16	13.6	210	1.00	Medium	Cobble	Gravel	10				40			30	20
Moberly River	MR-S1	MBP01-01	8-Sep-16	13.4	200	0.55												
Moberly River	MR-S1	MBS01-01	9-Sep-16	13.4	200	0.55												
Moberly River	MR-S1	MEF01-01	9-Sep-16	13.4	200	0.55	Medium	Gravel	Sand	26	0	11	0	0	0	11	52	0
Moberly River	MR-S1	MEF01-02	9-Sep-16	13.3	200	0.55	Medium	Sand	Gravel			50						50
Moberly River	MR-S1	MEF01-03	9-Sep-16	13.4	200	0.55	Medium	Sand	Gravel		40					40		20
Moberly River	MR-S1	MEF01-04	9-Sep-16	13.6	200	0.55	Medium	Sand	Gravel						20			80
Moberly River	MR-S2	MBS02-01	10-Sep-16	12.6	200	0.35												
Moberly River	MR-S2	MBS02-02	10-Sep-16	13.4	200	0.36												
Moberly River	MR-S2	MBS02-03	10-Sep-16	13.4	200	0.36												
Moberly River	MR-S2	MBS02-04	10-Sep-16	12.7	200	0.36												
Moberly River	MR-S2	MEF02-01	10-Sep-16	12.7	210	0.36	Low	Silt	Sand		1	1				2	96	
Moberly River	MR-S2	MEF02-02	10-Sep-16	12.7	210	0.36	Low	Silt	Sand		2	3			10	1	84	
Moberly River	MR-S2	MEF02-03	10-Sep-16	12.7	210	0.35	Low	Silt	Sand							2	98	
Moberly River	MR-S2	MEF02-04	10-Sep-16	12.7	200	0.36	Medium	Silt	Gravel	15	3	2		20	10		50	
Moberly River	MR-S2	MEF02-05	10-Sep-16	12.7	200	0.36	Medium	Silt	Sand	0	31	16	0	6	16	0	0	31
Moberly River	MR-S3	MBP03-01	11-Sep-16	12.6	210	0.47												
Moberly River	MR-S3	MBP03-02	11-Sep-16	12.9	210	0.47												
Moberly River	MR-S3	MBP03-03	11-Sep-16	13.2	210	0.35												
Moberly River	MR-S3	MBP03-04	10-Sep-16	13.1	210	0.34												
Moberly River	MR-S3	MBS03-01	11-Sep-16	12.6	210	0.47												
Moberly River	MR-S3	MBS03-02	11-Sep-16	12.6	210	0.47												
Moberly River	MR-S3	MBS03-03	11-Sep-16	12.9	210	0.45												
Moberly River	MR-S3	MEF03-01	11-Sep-16	10.8	270	0.50	Low	Organics	Silt		10	5			15		70	
Moberly River	MR-S3	MEF03-02	11-Sep-16	12.6	210		Medium	Silt	Gravel	5	7	3		10	15		55	5
Moberly River	MR-S3	MEF03-03	11-Sep-16	12.6	210	0.45	Medium	Gravel	Silt	10	6	4		5	5		70	
Moberly River	MR-S3	MEF03-04	11-Sep-16	12.6	210	0.45	Medium	Silt	Gravel	5	10	5		10	10		55	5
Moberly River	MR-S3	MEF03-05	11-Sep-16	12.8	220	0.45		Silt	Gravel	0	29	14	0	0	57	0	0	0
Moberly River	MR-S3	MEF03-06	11-Sep-16	12.8	220	0.45		Cobble	Gravel	50					20		30	
Moberly River	MR-S4	MBP04-01	12-Sep-16	12.6	210	0.32												
Moberly River	MR-S4	MBP04-02	12-Sep-16	12.9	210	0.42												
Moberly River	MR-S4	MBP04-03	12-Sep-16	13.0	210	0.40												
Moberly River	MR-S4	MBS04-01	12-Sep-16	12.6	210	0.32												
Moberly River	MR-S4	MBS04-02	12-Sep-16	12.6	210	0.42												
Moberly River	MR-S4	MBS04-03	12-Sep-16	12.9	210	0.42												
Moberly River	MR-S4	MEF04-01	12-Sep-16	11.9	210		Medium	Cobble	Gravel	40	6	4		15	10		25	
Moberly River	MR-S4	MEF04-02	12-Sep-16	11.9	210		Medium	Cobble	Silt	25	3	2		15	5		35	15
Moberly River	MR-S4	MEF04-03	12-Sep-16	11.9	210	0.32	Medium	Silt	Sand	0	3	2		5	15		45	30
Moberly River	MR-S4	MEF04-04	12-Sep-16	12.7	210	0.32	Medium	Gravel	Silt	30	6	4		10	20		30	
Moberly River	MR-S4	MEF04-05	12-Sep-16	11.9	210	0.32	Low	Silt	Gravel	40	10			5	5		40	
Moberly River	MR-S4	MEF04-06	12-Sep-16	11.9	210	0.32	High	Cobble	Gravel	40	5			10	5		40	
Moberly River	MR-S5	MBP05-01	12-Sep-16	12.9	210	0.36												
Moberly River	MR-S5	MBP05-02	13-Sep-16	13.1	210	0.43												
Moberly River	MR-S5	MBP05-03	13-Sep-16	13.1	210	0.43												
Moberly River	MR-S5	MBP05-04	13-Sep-16	13.1	210	0.42												
Moberly River	MR-S5	MBP05-05	13-Sep-16	13.4	210	0.42												
Moberly River	MR-S5	MBS05-01	13-Sep-16	13.4	240	0.42												
Moberly River	MR-S5	MEF05-01	12-Sep-16	13.1	210	0.32	High	Cobble	Gravel	50	5			10	15		20	
Moberly River	MR-S5	MEF05-03	13-Sep-16	12.6	210		Medium	Silt	Cobble	5	3	2		5	10		75	
Moberly River	MR-S5	MEF05-04	13-Sep-16	12.6	210	0.42	Medium	Cobble	Gravel	30	6	4		15	15		25	5
Moberly River	MR-S5	MEF05-05	13-Sep-16	12.6	210	0.42	Medium	Cobble	Gravel	50		1		20			29	

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

…continued.

Table C1 Concluded.

River	River Section	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Instream Velocity[a]	Substrate		Cover Type - Percent of Available Cover (%)								
								Dominant	Sub-dominant	Interstices	Large Woody Debris	Small Woody Debris	Cutbank	Turbulence	Terrestrial Vegetation	Aquatic Vegetation	Shallow Water	Deep Water
Moberly River	MR-S5	MEF05-06	13-Sep-16	13.7	210	0.42		Cobble	Gravel	40	5	5		10	5		35	
Moberly River	MR-S6	MBP06-01	13-Sep-16	13.6	210	0.42												
Moberly River	MR-S6	MBP06-02	13-Sep-16	13.9	210	0.28												
Moberly River	MR-S6	MBP06-03	14-Sep-16	12.9	210	0.32												
Moberly River	MR-S6	MBP06-04	14-Sep-16	12.9	210	0.32												
Moberly River	MR-S6	MBS06-01	13-Sep-16	14.1	210	0.42												
Moberly River	MR-S6	MEF05-02	13-Sep-16	12.6	210		Medium	Cobble	Gravel	25	3	2		10	10		50	
Moberly River	MR-S6	MEF06-01	13-Sep-16	13.7	210	0.42	Medium	Cobble	Gravel	40	6	4		10	5		35	
Moberly River	MR-S6	MEF06-02	13-Sep-16	13.7	210	0.42	Low	Gravel	Cobble	30	1	1		5			63	
Moberly River	MR-S6	MEF06-03	14-Sep-16		210		Medium	Cobble	Gravel	50	3	2		10	5		30	
Moberly River	MR-S6	MEF06-04	14-Sep-16	13.5	210	0.32	Medium	Gravel	Cobble	30	1	1		15			53	
Moberly River	MR-S7	MBP07-01	14-Sep-16	14.1	210	0.32												
Moberly River	MR-S7	MBP07-02	14-Sep-16	14.1	210	0.32												
Moberly River	MR-S7	MBP07-03	14-Sep-16	14.6	210	0.32												
Moberly River	MR-S7	MBP07-04	14-Sep-16	14.6	210	0.32												
Moberly River	MR-S7	MBP07-05	15-Sep-16	12.9	210	0.31												
Moberly River	MR-S7	MBP07-06	15-Sep-16	12.9	210	0.31												
Moberly River	MR-S7	MBP07-07	15-Sep-16	14.9	210	0.31												
Moberly River	MR-S7	MBP07-08	15-Sep-16	14.7	210	0.31												
Moberly River	MR-S7	MBP07-09	15-Sep-16	14.7	220	0.31												
Moberly River	MR-S7	MEF07-01	14-Sep-16	13.5	210	0.32		Cobble	Gravel	40		1		20			39	
Moberly River	MR-S7	MEF07-02	14-Sep-16	13.5	210	0.32		Cobble	Gravel	35	3	2		20	5		35	
Moberly River	MR-S7	MEF07-03	14-Sep-16	13.6	210	0.32	Medium	Cobble	Gravel	30		1		10			59	
Moberly River	MR-S7	MEF07-04	14-Sep-16	14.6	210	0.32		Cobble	Gravel	40	3	2		40			15	
Moberly River	MR-S7	MEF07-05	14-Sep-16	14.6	210	0.32	Medium	Cobble	Gravel	60				5			35	
Moberly River	MR-S7	MEF07-06	14-Sep-16	14.6	210	0.32	Medium	Cobble	Gravel	40	1	1		30			27	1
Moberly River	MR-S7	MEF07-07	15-Sep-16	12.9	210	0.31	Medium	Cobble	Gravel	40	5	5		2			48	
Moberly River	MR-S7	MEF07-08	15-Sep-16	12.9	210	0.31		Cobble	Gravel	40	1	2		2			55	
Moberly River	MR-S7	MEF07-09	15-Sep-16	12.9	210	0.31	Medium	Gravel	Cobble	60							40	
Moberly River	MR-S7	MEF07-10	15-Sep-16	12.9	210	0.31	Medium	Cobble	Gravel	50				1			49	
Moberly River	MR-S8	MBP08-01	16-Sep-16	13.0	220	0.41												
Moberly River	MR-S8	MBP08-02	16-Sep-16	13.1	210	0.41												
Moberly River	MR-S8	MBP08-03	16-Sep-16	13.6	220	0.41												
Moberly River	MR-S8	MBP08-04	16-Sep-16	13.6	220	0.41												
Moberly River	MR-S8	MBP08-05	16-Sep-16	13.6	210	0.41												
Moberly River	MR-S8	MBP08-06	16-Sep-16	13.9	210	0.41												
Moberly River	MR-S8	MEF08-01	16-Sep-16	13.0	220	0.41	Low	Cobble	Sand	15				2			83	
Moberly River	MR-S8	MEF08-02	16-Sep-16	13.0	220	0.41		Gravel	Cobble	30				2			68	
Moberly River	MR-S8	MEF08-03	16-Sep-16	13.8	220		Medium	Gravel	Cobble	60	5	10			5		20	
Moberly River	MR-S8	MEF08-04	16-Sep-16	13.8	220	0.41	Low	Gravel	Cobble	60	5	5		10			20	5
Moberly River	MR-S8	MEF08-05	16-Sep-16	13.8	220	0.41		Gravel	Cobble	50	5	5		10			30	
Moberly River	MR-S8	MEF08-06	16-Sep-16	13.8	220	0.41	Low	Cobble	Gravel	30	1	1		2	1		65	
Moberly River	MR-S9	MBP09-01	17-Sep-16	12.6	220	0.32												
Moberly River	MR-S9	MBP09-02	17-Sep-16	13.9	210	0.32												
Moberly River	MR-S9	MBP09-03	17-Sep-16	13.9	210	0.32												
Moberly River	MR-S9	MEF09-01	17-Sep-16	12.6	220	0.32	Low	Cobble	Gravel	30	3	2		2	1		62	
Moberly River	MR-S9	MEF09-02	17-Sep-16	12.6	220	0.32	Medium	Gravel	Sand	40				20			40	
Moberly River	MR-S9	MEF09-03	17-Sep-16	12.6	220	0.32		Gravel	Sand	20	5	5		5			60	5
Moberly River	MR-S9	MEF09-04	17-Sep-16	12.6	220	0.32	Medium	Cobble	Gravel	50				5			45	
Moberly River	MR-S9	MEF09-05	17-Sep-16	12.6	220	0.32	Medium	Cobble	Gravel	60				10			25	5
Moberly River	MR-S9	MEF09-06	17-Sep-16	14.3	220	0.32	Low	Cobble	Gravel	40				2			58	
Moberly River	MR-S10	MBP10-01	17-Sep-16	14.3	220	0.32												
Moberly River	MR-S10	MBP10-02	18-Sep-16	11.9	220	0.29												
Moberly River	MR-S10	MBP10-03	18-Sep-16	12.0	230	0.29												
Moberly River	MR-S10	MBP10-04	18-Sep-16	12.9	230	0.29												
Moberly River	MR-S10	MBP10-05	18-Sep-16	13.7	230	0.25												
Moberly River	MR-S10	MBP10-06	18-Sep-16	14.1	230	0.25												
Moberly River	MR-S10	MBS10-01	17-Sep-16	14.3	220	0.32												
Moberly River	MR-S10	MEF10-01	18-Sep-16	12.0	230	0.26	Medium	Cobble	Gravel	20	10	5		2			63	
Moberly River	MR-S10	MEF10-02	18-Sep-16	12.0	230	0.26	Low	Cobble	Gravel	30	2	2		1			65	
Moberly River	MR-S10	MEF10-03	18-Sep-16	12.5	230	0.26		Cobble	Gravel	40	2	1		2			55	
Moberly River	MR-S10	MEF10-04	18-Sep-16	12.5	230	0.26	Medium			80	10			10				
Moberly River	MR-S10	MEF10-05	18-Sep-16	12.5	230	0.26	Medium	Cobble	Gravel	30	5			5			55	5
Moberly River	MR-S10	MEF10-06	18-Sep-16	13.7	230	0.25	Low	Gravel	Cobble	10							90	
Moberly River	MR-S10	MEF10-07	18-Sep-16	12.9	230	0.25	Low			25		1		2	1		71	

[a] A categorical ranking of water velocity (high = greater than 1.0 m/s; medium = 0.5 to 1.0 m/s; low = less than 0.5 m/s)

Table C2 Habitat variables measured at backpack electrofishing and beach seine sites on the Moberly River during the Site C Reservoir Tributaries Fish Population Index Survey (Mon-1b, Task 2c), 2016.

River	Method	River Section	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Cover Type - Percent of Available Cover (%)						D90	Embeddedness (L/M/H)	Compaction (L/M/H)	Depth (m)			Velocity (m/s)			Percent Substrate						Bank Sampled (LDB/RDB/MID)	Bank Habitat	Instream Habitat
								Overhang	Rock	LOD	Terr. Veg.	Sub. Veg.	Emerg. Veg.				Near	Mid	Far	Near	Mid	Far	Organics	Silt/Clay	Sand	Gravel	Cobble	Boulder			
Moberly River	Backpack Electrofisher	MR-S1A	MBP1A-01	8-Sep-16	13.6	210	0.5		30			5			L	L	0.25	0.45	0.80	0.41	0.70	0.88	5		5	45	45		RDB		
Moberly River	Backpack Electrofisher	MR-S1A	MBP1A-02	8-Sep-16	14.1	200	0.5		30	5		5		50	M	M	0.18	0.40	0.70	0.22	0.55	0.87		5	5	45	40	5	LDB		
Moberly River	Backpack Electrofisher	MR-S1A	MBP1A-03	8-Sep-16	14.0	200	0.5		25	5	5	5	5	65	M	M	0.20	0.33	0.43	0.82	0.78	1.04	5	5	15	45	10	20	LDB		
Moberly River	Backpack Electrofisher	MR-S1	MBP01-01	8-Sep-16	13.4	200	0.55			5			2	10	H	L	0.26	0.44	0.65	0.39	0.29	0.19	5	10	50	35			LDB		
Moberly River	Backpack Electrofisher	MR-S3	MBP03-01	11-Sep-16	12.6	210	0.47	5		20			2	12	H	M	0.28	0.33	0.40	0.23	0.49	0.72	5		30	60	5		RDB	Riffle	Run
Moberly River	Backpack Electrofisher	MR-S3	MBP03-02	11-Sep-16	12.9	210	0.47	5		15	5	5	2	8	H	L	0.19	0.23	0.23	0.00	0.17	0.26	5		60	35			LDB	SC	Run
Moberly River	Backpack Electrofisher	MR-S3	MBP03-03	11-Sep-16	13.2	210	0.35						2	7	M	L	0.07	0.02	0.47	0.00	0.23	0.72	5		20	75			LDB	Glide	Run
Moberly River	Backpack Electrofisher	MR-S3	MBP03-04	10-Sep-16	13.1	210	0.34		20				2	12	M	L									15	70	15		LDB	Glide	Run
Moberly River	Backpack Electrofisher	MR-S4	MBP04-01	12-Sep-16	12.6	210	0.32	5	5	5	5			16	L	L	0.13	0.15	0.12	0.57	0.68	0.62	5		20	65	10		RDB	SC-riffle	BG-Riffle
Moberly River	Backpack Electrofisher	MR-S4	MBP04-02	12-Sep-16	12.9	210	0.42	5	10				5	18	M	M	0.14	0.22	0.35	0.51	0.59	0.99	5		40	25	30		RDB	Riffle	Run
Moberly River	Backpack Electrofisher	MR-S4	MBP04-03	12-Sep-16	13.0	210	0.4	5		10				13	M-H	L	0.90	0.15	0.11	0.22	0.89	0.56	10		50	35	5		LDB	SC	Run
Moberly River	Backpack Electrofisher	MR-S5	MBP05-01	12-Sep-16	12.9	210	0.36			5			2	17	M	M	0.30	0.38	0.35	0.07	0.25	0.37	5		15	50	30		LDB	SC	Run
Moberly River	Backpack Electrofisher	MR-S5	MBP05-02	13-Sep-16	13.1	210	0.43	20		20				10	M	L	0.29	0.44	0.22	0.86	1.08	1.06	15		20	40	25		MID	MID	Riff
Moberly River	Backpack Electrofisher	MR-S5	MBP05-03	13-Sep-16	13.1	210	0.43			5			5	18	M	H	0.28	0.39	0.63	0.30	0.54	0.64	5		50	20	25		RDB	Glide	Run
Moberly River	Backpack Electrofisher	MR-S5	MBP05-04	13-Sep-16	13.1	210	0.42		15				2	15	M	L	0.14	0.22	0.34	0.36	0.51	0.74	10		25	25	40		LDB	Riffle	Riffle
Moberly River	Backpack Electrofisher	MR-S5	MBP05-05	13-Sep-16	13.4	210	0.42	2		15							0.11	0.16	0.42	0.44	0.54	0.79	15		30	20	35		RDB	Riffle	riffle
Moberly River	Backpack Electrofisher	MR-S6	MBP06-01	13-Sep-16	13.6	210	0.42	5				5	2	12	H	M	0.09	0.17	0.42	0.22	0.41	0.63	5		15	40	40			SC	Run
Moberly River	Backpack Electrofisher	MR-S6	MBP06-02	13-Sep-16	13.9	210	0.28			5				7	M	L	0.22	0.33	0.44	0.38	0.66	0.96	5	5	35	45	10		RDB	Riffle	Run
Moberly River	Backpack Electrofisher	MR-S6	MBP06-03	14-Sep-16	12.9	210	0.32		5	5				12	M	L	0.10	0.20	0.34	0.26	0.54	0.71			30	45	25		RDB	RIFF	RIFF
Moberly River	Backpack Electrofisher	MR-S6	MBP06-04	14-Sep-16	12.9	210	0.32	20	5	5				20	H	H	0.30	0.24	0.35	0.33	0.29	0.66			10	30	60		RDB	EDDY	RIFF
Moberly River	Backpack Electrofisher	MR-S7	MBP07-01	14-Sep-16	14.1	210	0.32		5	20				21	H	H	0.26	0.24	0.30	0.31	0.34	0.51	20		35	15	20	10	RDB	Glide	RIFFLE
Moberly River	Backpack Electrofisher	MR-S7	MBP07-02	14-Sep-16	14.1	210	0.32	5		2			5	15	M	L	0.09	0.21	0.14	0.55	0.79	0.82	5		25	35	30	5	RDB	RIFF	RIFF
Moberly River	Backpack Electrofisher	MR-S7	MBP07-03	14-Sep-16	14.6	210	0.32	5		25				12	M	L	0.35	0.43	0.30	0.16	0.86	0.39	5		15	40	35	5	RDB	RIFF	RUN
Moberly River	Backpack Electrofisher	MR-S7	MBP07-04	14-Sep-16	14.6	210	0.32							18	L	L													LDB	SC	RIFF/BG
Moberly River	Backpack Electrofisher	MR-S7	MBP07-05	15-Sep-16	12.9	210	0.31		15	10				20	H	H	0.20	0.24	0.30	0.27	0.43	0.37	10		50	15	20	5	LDB	SC	RIFF
Moberly River	Backpack Electrofisher	MR-S7	MBP07-06	15-Sep-16	12.9	210	0.31			5				10	L	L	0.47	0.44	0.47	0.47	0.98	0.95			25	50	25		LDB	SC	RUN/RIFFLE
Moberly River	Backpack Electrofisher	MR-S7	MBP07-07	15-Sep-16	14.9	210	0.31	15		10			5	15	L	L	0.42	0.47	0.24	0.22	0.31	0.49	10		25	50	15		RDB	SC	RIFF/RUN
Moberly River	Backpack Electrofisher	MR-S7	MBP07-08	15-Sep-16	14.7	210	0.31			5			5	11	M/H	M	0.09	0.17	0.34	0.23	0.44	0.16	5		35	50	10		RDB	SC	RIFF
Moberly River	Backpack Electrofisher	MR-S7	MBP07-09	15-Sep-16	14.7	220	0.31	5		5			5	9	M	L	0.15	0.17	0.16	0.24	0.38	0.52	5		25	38	32		RDB	Glide	RUN
Moberly River	Backpack Electrofisher	MR-S8	MBP08-01	16-Sep-16	13.0	220	0.41	5		5			2	35	M	C	0.12	0.30	0.09	0.42	0.92	0.07	10		30	25	30	5	RDB	SC-RIFF	BG
Moberly River	Backpack Electrofisher	MR-S8	MBP08-02	16-Sep-16	13.1	210	0.41	2		15			5	25	H	M	0.32	0.48	0.48	0.05	0.47	0.22	15		25	25	30	5	RDB	SC	RIFF/BG
Moberly River	Backpack Electrofisher	MR-S8	MBP08-03	16-Sep-16	13.6	220	0.41	5		5				18	M	M	0.19	0.24	0.36	0.63	1.01	0.76	10		30	20	40		RDB	SC	BG-RIFF
Moberly River	Backpack Electrofisher	MR-S8	MBP08-04	16-Sep-16	13.6	220	0.41			10				20	H	M	0.20	0.25	0.23	0.69	0.73	0.59	10		20	20	50		LDB	SC-RIFF	GLIDE-BC
Moberly River	Backpack Electrofisher	MR-S8	MBP08-05	16-Sep-16	13.6	210	0.41	5		10			15	22	M	M	0.12	0.21	0.24	0.78	1.03	1.17	10		25	25	40		SC	SC-RIFF	RIFF
Moberly River	Backpack Electrofisher	MR-S8	MBP08-06	16-Sep-16	13.9	210	0.41			10			5	17	H	M	1.50	0.40	0.43	0.38	0.27	0.42	10		40	30	20		LDB	SC-RIFF	RUN
Moberly River	Backpack Electrofisher	MR-S9	MBP09-01	17-Sep-16	12.6	220	0.32	15					2	7	M	L	0.34	0.15	0.40	0.18	0.89	0.52	15		20	50	15		RDB	SC-RIFF	RIFF

LDB = Left Downstream Bank; RDB = Right Downstream Bank; MID = Mid Channel; SC = Side Channel; BC = Back Channel; BG = Boulder Garden

…continued.

Table C2 Concluded.

River	Method	River Section	Site Name	Sample Date	Water Temp. (°C)	Water Cond. (µS/cm)	Secchi Depth (m)	Cover Type - Percent of						D90	Embeddedness (L/M/H)	Compaction (L/M/H)	Depth (m)			Velocity (m/s)			Percent Substrate						Bank Sampled (LDB/RDB/MID)	Bank Habitat	Instream Habitat
								Overhang	Rock	LOD	Terr. Veg.	Sub. Veg.	Emerg. Veg.				Near	Mid	Far	Near	Mid	Far	Organics	Silt/Clay	Sand	Gravel	Cobble	Boulder			
Moberly River	Backpack Electrofisher	MR-S9	MBP09-02	17-Sep-16	13.9	210	0.32			2			2	12	M	L	0.15	0.25	0.15	0.75	0.50	0.32	5		40	40	15		LDB	SC-RIFF	RIFF/RUN
Moberly River	Backpack Electrofisher	MR-S9	MBP09-03	17-Sep-16	13.9	210	0.32	5		5			2	16	M	L	0.40	0.35	0.10	0.03	0.16	0.04	5		40	40	15		LDB	SC	RIFF
Moberly River	Backpack Electrofisher	MR-S10	MBP10-01	17-Sep-16	14.3	220	0.32			5				21	M	M	0.10	0.15	0.13	0.28	0.27	0.80	5		25	40	30		LDB	SC-RIFF	BG
Moberly River	Backpack Electrofisher	MR-S10	MBP10-02	18-Sep-16	11.9	220	0.29		5	2			2	26	M	M	0.22	0.28	0.37	0.17	0.52	0.27	10		30	10	40	10	RDB	SC	run
Moberly River	Backpack Electrofisher	MR-S10	MBP10-03	18-Sep-16	12.0	230	0.29	5		2			5	18	M	M							10		40	25	25		RDB	SC	riffle
Moberly River	Backpack Electrofisher	MR-S10	MBP10-04	18-Sep-16	12.9	230	0.29			10				9	M	M	0.20	0.20	0.29	0.29	0.53	0.37	10		40	30	20		RDB	SC	riffle
Moberly River	Backpack Electrofisher	MR-S10	MBP10-05	18-Sep-16	13.7	230	0.25			10			5	19	M	M	0.28	0.28	0.35	1.04	0.62	1.23	10		25	25	40		RDB	SC	riffle/run
Moberly River	Backpack Electrofisher	MR-S10	MBP10-06	18-Sep-16	14.1	230	0.25	5		5			5	18	L	L	0.21	0.25	0.17	0.19	0.45	0.32	10		25	35	30		LDB	SC	run
Moberly River	Beach Seine	MR-S1	MBS01-01	9-Sep-16	13.4	200	0.55							10	H	L	0.25	0.40	0.60	0.00	0.00	0.18		10	60	30			RDB		
Moberly River	Beach Seine	MR-S2	MBS02-01	10-Sep-16	12.6	200	0.35			5	5	2	2	5	H	L							15	10	65	10			RDB		
Moberly River	Beach Seine	MR-S2	MBS02-02	10-Sep-16	13.4	200	0.36						5	5	H	L	0.25	0.56	0.69				5	5	88	2			RDB		
Moberly River	Beach Seine	MR-S2	MBS02-03	10-Sep-16	13.4	200	0.36				10	10	10	Sa	H	L							10		90				RDB		
Moberly River	Beach Seine	MR-S2	MBS02-04	10-Sep-16	12.7	200	0.36	2			5	2	2	16	H	M							5	5	60	25	5		LDB	Back eddy	
Moberly River	Beach Seine	MR-S3	MBS03-01	11-Sep-16	12.6	210	0.47					2	10	5	H	M	0.37	0.59	0.26	0.00	0.00	0.00	2	2	80	16			LDB	Pool	Run
Moberly River	Beach Seine	MR-S3	MBS03-02	11-Sep-16	12.6	210	0.47			5			2	8	H	M	0.21	0.48	0.57	0.00	0.00	0.00	5		70	25			RDB	BW	Run
Moberly River	Beach Seine	MR-S3	MBS03-03	11-Sep-16	12.9	210	0.45						5	SA	H	L				0.00	0.00	0.00	5		95				LDB		
Moberly River	Beach Seine	MR-S4	MBS04-01	12-Sep-16	12.6	210	0.32					10	15	Sa	H	L	0.18	0.32	0.53	0.00	0.06	0.25	37		63				LDB	Glide	Riffle/Run
Moberly River	Beach Seine	MR-S4	MBS04-02	12-Sep-16	12.6	210	0.42						5	Sa	H	L	0.51	0.69	0.72	0.00	0.00	0.00	5		95				RDB	BC-SC	Run
Moberly River	Beach Seine	MR-S4	MBS04-03	12-Sep-16	12.9	210	0.42				5	5	5	5	H	M	0.35	0.36	0.23				5		80	15			RDB	Back eddy	Run
Moberly River	Beach Seine	MR-S5	MBS05-01	13-Sep-16	13.4	240	0.42						5	18	M/H	L	0.36	0.39	0.24	0.00	0.00	0.00	5		40	10	45		RDB	BW-snye	BW-run
Moberly River	Beach Seine	MR-S6	MBS06-01	13-Sep-16	14.1	210	0.42							5	M	L	0.22	0.33	0.44	0.18	0.28	0.45			60	40			RDB	Back eddy	Run
Moberly River	Beach Seine	MR-S10	MBS10-01	17-Sep-16	14.3	220	0.32							21	H	M	0.35	0.42	0.50	0.00	0.00	0.00	8		67	25			LDB	BC	BG

LDB = Left Downstream Bank; RDB = Right Downstream Bank; MID = Mid Channel; SC = Side Channel; BC = Back Channel; BG = Boulder Garden

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