BRITISH COLUMBIA ENERGY REGULATOR

2024/2025 Annual Summary Report

Water Monitoring of Small Watersheds Program
Project Number: ER-Water-2019-01

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Background

The collection of streamflow data (i.e. hydrometric information) has been declining over the past 20 years by the Water Survey of Canada; historically in northeast BC (NEBC) there was over 50 active hydrometric stations compared to the ~20 active stations today. The active stations are primarily collecting streamflow data for the larger systems such as the Kiskatinaw River or Halfway River which leaves a data gap for the smaller, tributary systems. This data gap represents a challenge with water licence requests on many of these smaller watersheds which have little to no hydrologic data to support decisions.

The BC Energy Regulator (BCER), Ministry of Water, Land and Resource Stewardship (WLRS), and various other users, rely on the Northeast Water Tool (NEWT) to support water licence and short-term water use approval application decisions. The hydrologic model underlying NEWT relies on empirical (statistical) hydrologic regionalization methods; this approach is affected by the scalability of available data, where the representativeness over short time periods of weak spatial transferability to watersheds without streamflow data can severely limit the accuracy of estimates. It is widely accepted and acknowledged that NEWT is not without limitations and one of its greatest includes a higher degree of uncertainty for smaller basins, as data for calibration at this scale is limited.

The First Nation (FN) communities within Treaty Eight each have expressed water as their highest priority and concern. A specific concern relates to water withdrawals from small watersheds, the lack of data, and the reliance on NEWT for water management decisions given its potential limitations.

This project was designed to help address the small watershed data gap and FN concerns by collecting streamflow data in three smaller watersheds in NEBC. Once the data is processed it will be integrated into the hydrometric network and be used to inform future water allocation and watershed management. The long-term objective is to build stronger relationships with FNs, facilitate mutual knowledge transfer, gather streamflow information in smaller watersheds, and to update the hydrologic model supporting NEWT.

Funding for the Water Monitoring of Small Watersheds program is provided by the BC Oil and Gas Research and Innovation Society (BC OGRIS). The program was initiated in 2019, monitoring three watersheds (Osborn River, Le Bleu Creek, and Martin Creek), with the addition of a fourth (Blueberry River) in 2020. The program saw some changes for the 2024 monitoring season, with Beaver Creek replacing Martin Creek, removal of Le Bleu Creek, addition of three existing stations previously funded by Geoscience BC (Doig River, Blueberry River, and Hulcross Creek) and upgrading of the Osborn River station. These changes resulted in a total of six systems being monitored under the program, which is currently funded until the end of 2025.

The project is being led by Ryan Rolick and Mahesh Khadka with the BCER, with support from Barry Ortman with Peace Country Technical Services Ltd. We would like to thank the Blueberry River First Nations (BRFN), Doig River First Nation (DRFN), Prophet River First Nation (PRFN), and Saulteau First Nations (SFN) for their participation in the program.

Summary of Activities

Prior to spring freshet, the equipment was installed on April 17 in the Blueberry River and Aitken Creek (BRFN), the Osborn River and Doig River (DRFN) on April 18, and Hulcross Creek (SFN) on April 19 to begin capture of open water measurements for the 2024 season. The team was able to visit each of these sites a minimum of five times to collect instream flow measurements and download sensor data.

The site at Beaver Creek was established on October 18, 2023, with an initial site visit for sensor install planned for May 15, 2024. Unfortunately, due to early season wildfire evacuations in the far north, the team was not able to conduct their initial site visit until June 14, reducing field visits to three for this station. Overall, there was excellent participation from each of the community's staff and members. SFN Guardians continued their participation in the monitoring program this year.

The location of the six stations and respective upstream watersheds are shown in Figure 1: Hulcross Creek for SFN, Upper Aitken Creek and Blueberry River for BRFN, Osborn River and Doig River for DRFN, and Beaver Creek for PRFN (upstream watershed yet to be delineated).

Over the past five years, BCER staff have been very successful at building positive relationships with the First Nation communities. Scheduling can often be a challenge as many of the participants are busy with other field programs in the summer, so it is essential that the field program is set out in advance to ensure successful participation.

Field pictures and streamflow at each site can be found in Figures 2 through 7.

As of December 13, 2024, all of the information, data and photos collected during the 2024 field season has been shared with the communities and data from the stations is publicly available through the Water Portal (http://waterportal.geoweb.bcogc.ca/) and provincial Aquarius database.

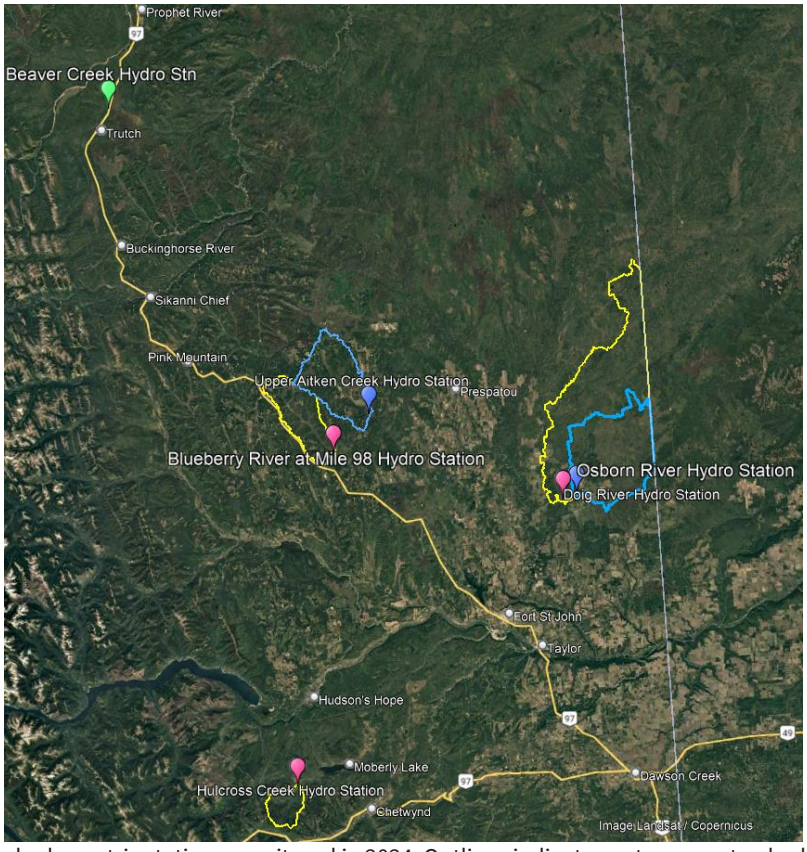


Figure 1. Location of the six hydrometric stations monitored in 2024. Outlines indicate upstream watershed areas and markers indicate monitoring station location. Note that the upstream watershed for Beaver Creek has not yet been delineated.

a. Early season for measurement in preparation for spring melt, April 17, 2024.

b. Mid season low flows, June 13, 2024.

c. Early season low flow measurement, May 16, 2024.

d. Late season low flows, October 17, 2024.

Figure 2. Hulcross Creek with SFN field season photos.

a. Steaming out the inlet hose for sensor installation for spring melt, April 18, 2024

b. Benchmark surveying, June 11, 2024.

c. Downstream beaver dam causing high water, July 15, 2024.

d. End of season flow measurement, October 18, 2024.

Figure 3. Osborn River with DRFN field season photos.

a. Early season during spring melt, April 18, 2024

b. Early season measurement, June 11, 2024.

c. Mid season low flows, July 15, 2024.

d. Late season low flows, September 18, 2024.

Figure 4. Doig River with DRFN field season photos.

a. Early season ice conditions during equipment installation, April 17, 2024.

b. High streamflow conditions, July 11, 2024.

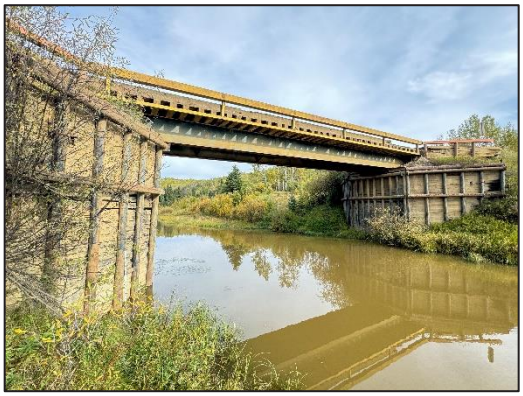
c. The beaver dam downstream of the sensor persists, May 13, 2024.

d. Late season streamflow conditions, October 16, 2024.

Figure 5. Upper Aitken Creek at Mile 98 Road with BRFN field season photos.

a. Early season ice conditions during equipment installation, April 17, 2024.

b. High streamflow measurement, July 11, 2024.



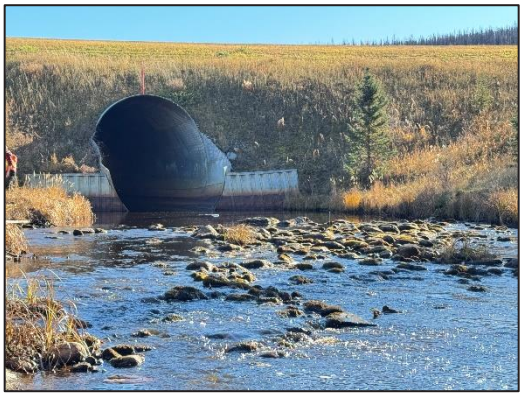
c. Late season stream conditions, September 16, 2024.

d. End of season water level survey, October 16, 2024.

Figure 6. Blueberry River at Mile 98 Road with BRFN field season photos.

a. Highway culvert outlet and sensor gauge pool, June 14, 2024.

b. Smoky streamflow measurement, July 10, 2024.



c. End of season low flows, October 15, 2024.

d. End of season streamflow measurement, October 15, 2024.

Figure 7. Beaver Creek at Alaska Highway with PRFN field season photos.

Deliverables

Daily streamflow hydrographs were derived based on the information collected during the 2024 field season in Upper Aitken Creek, Blueberry River, Osborn River, Doig River, Hulcross Creek and Beaver Creek. Figures 8 – 13 show stream discharge over the monitoring periods at each hydrometric station. For the locations with several years of monitoring data (all excluding Beaver Creek), previous seasons and historical averages were also plotted for a year-to-year comparison of seasonal flow progression.

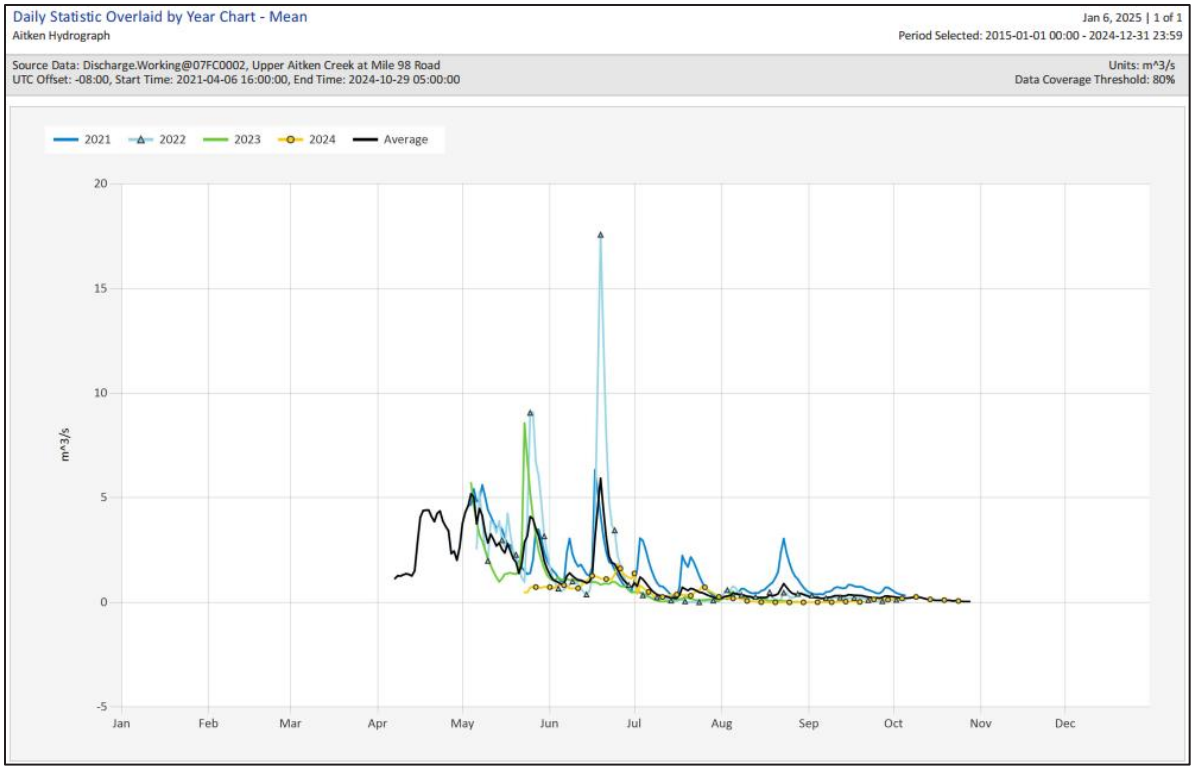


Figure 8. 2021 – 2024 seasonal and average discharge in Upper Aitken Creek at Mile 98 Road.

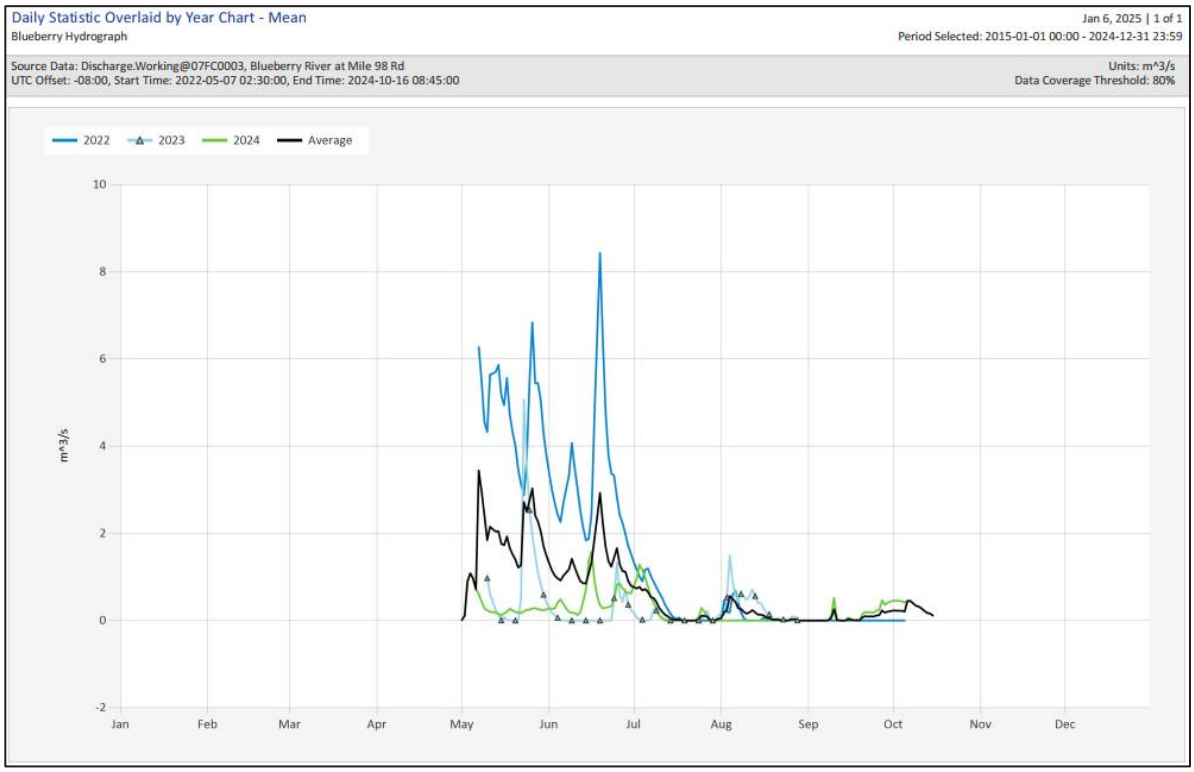


Figure 9. 2022 – 2024 seasonal and average discharge in Blueberry River at Mile 98 Road.

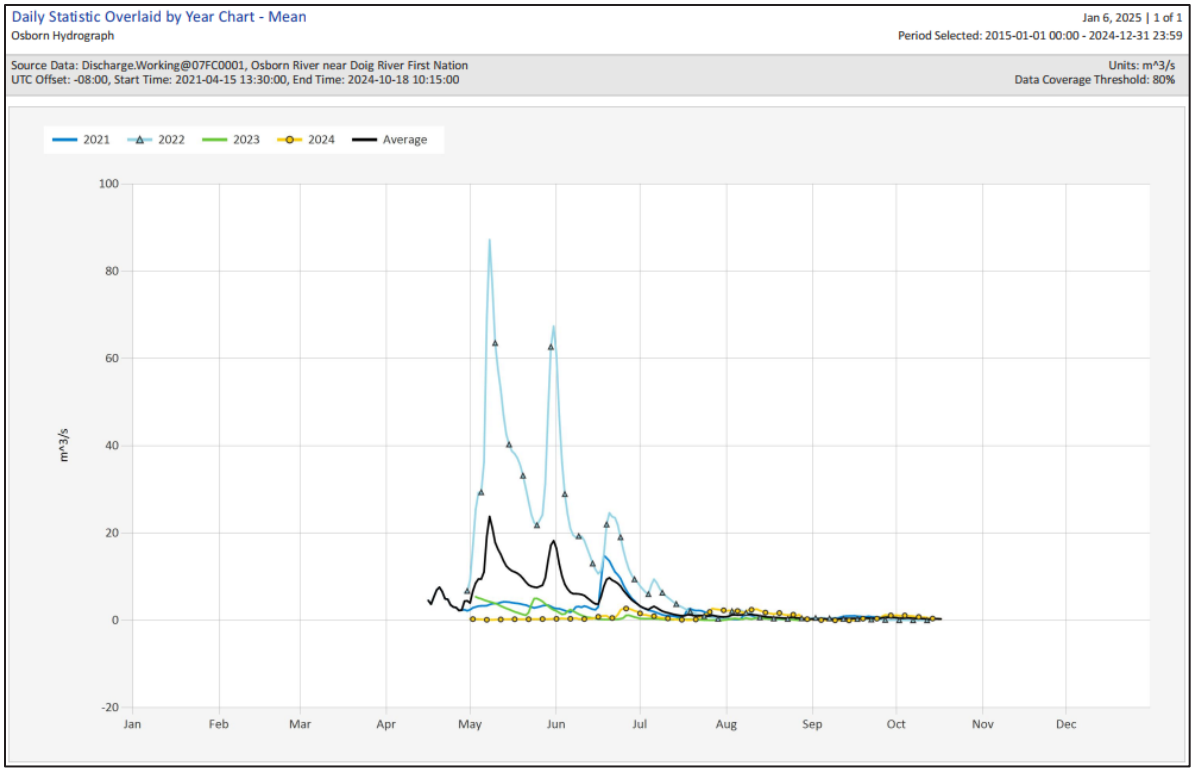


Figure 10. 2021 – 2024 seasonal and average discharge in Osborn River near Doig River First Nation.

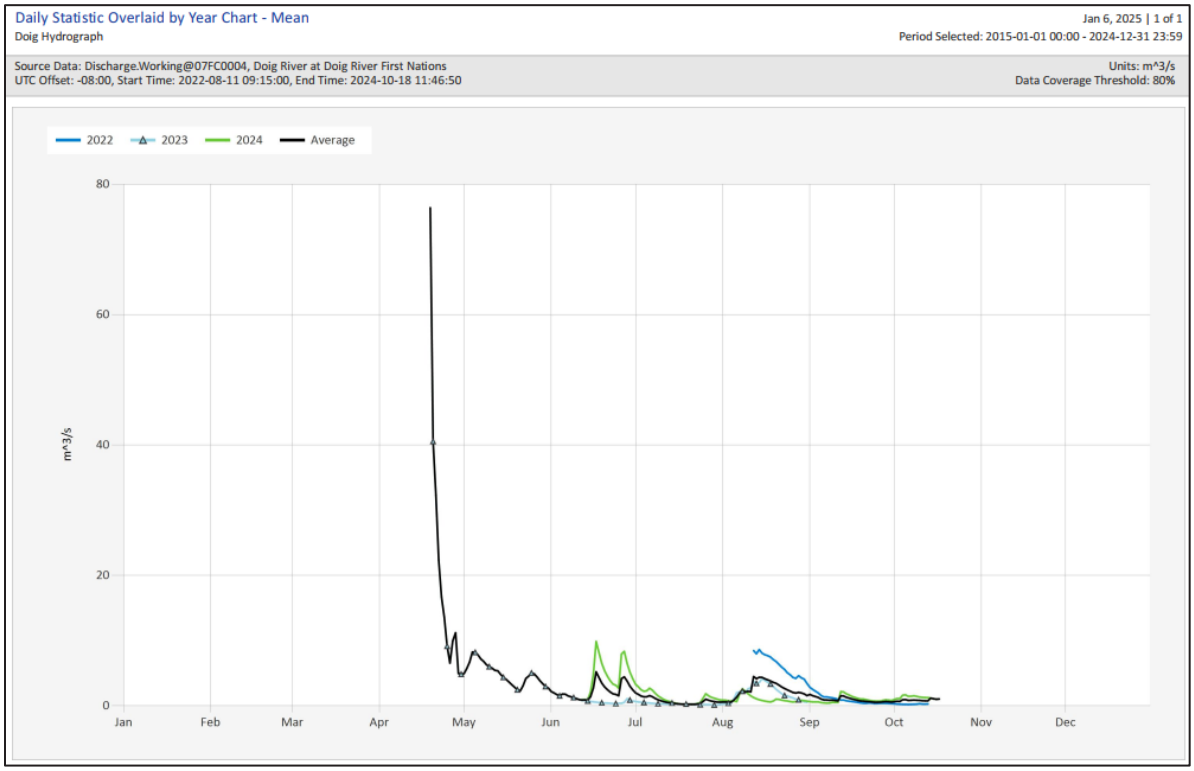


Figure 11. 2022 – 2024 seasonal and average discharge in Doig River at Doig River First Nation.

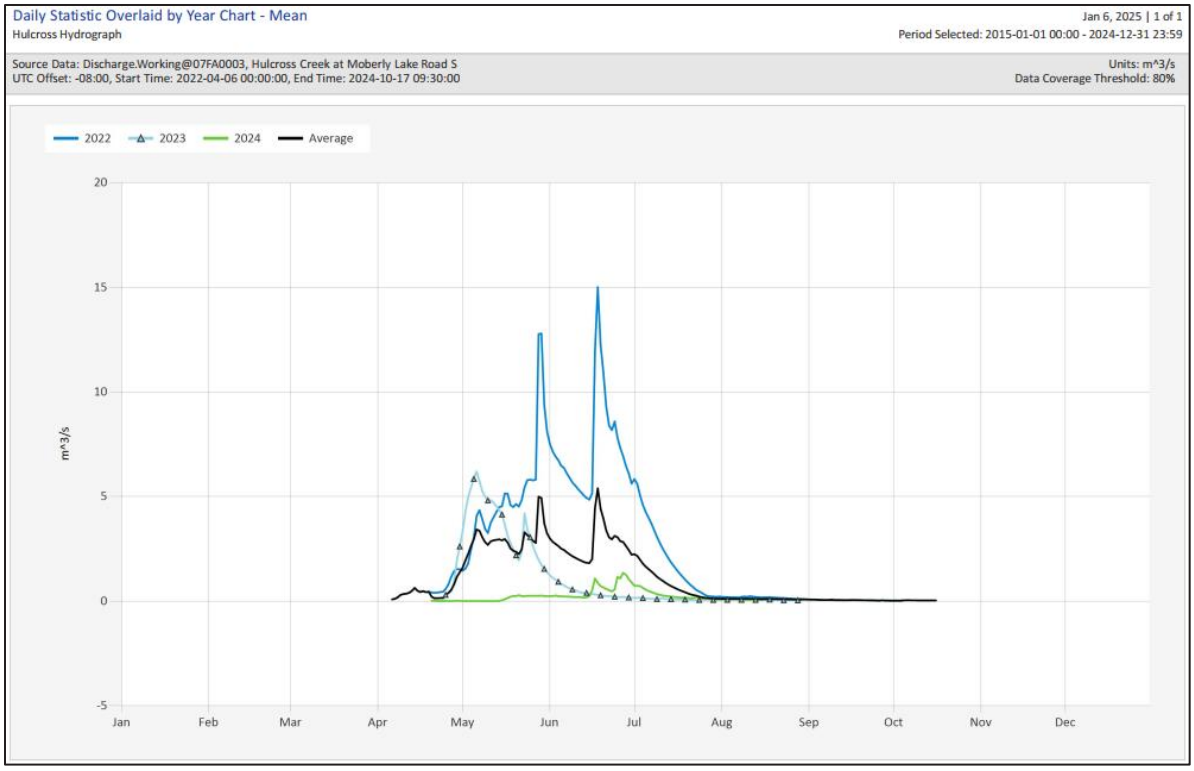


Figure 12. 2022 – 2024 seasonal and average discharge in Hulcross Creek at Moberly Lake Rd S.

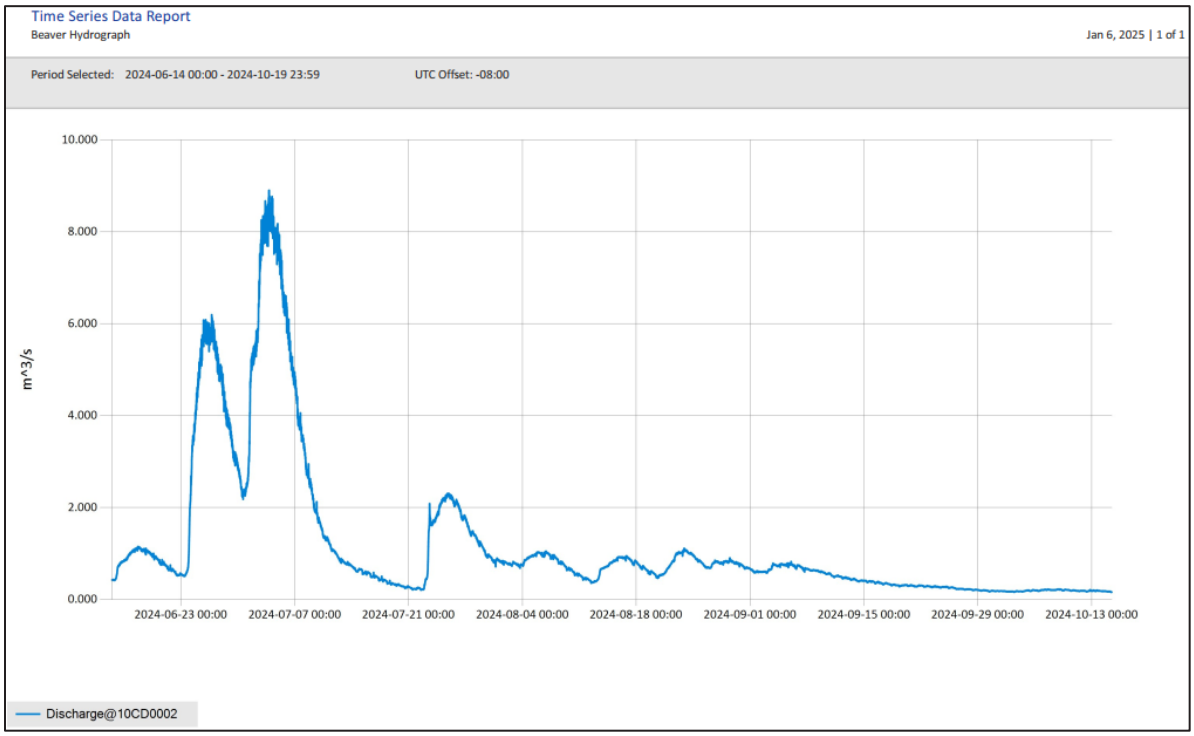


Figure 13. 2024 discharge in Beaver Creek at Alaska Highway.

A common trend seen across all stations, especially those with a historical record was the impacts of the ongoing drought experienced over the last several years in northeast BC. This resulted in very low flows persisting for much of the monitoring season and much more muted responses to precipitation inputs.

Streamflow in Upper Aitken Creek from mid May through to late October ranged from approximately 0.00 m^3/s to 4.68 m^3/s, in response to snowmelt and rain events, with the peak event occurring on July 1. Impacts of the ongoing drought across the region can be seen in comparison of peak flows, whereby the peak event in 2024 was 4.68 m^3/s compared with 19.2 m^3/s and 10.2 m^3/s in 2022 and 2023, respectively. An ongoing challenge with this station is measuring water flows amidst ongoing beaver activity and poor road conditions restricting site access at times. Timing of visits to this site is crucial moving forward, if heavy precipitation is expected, scheduling of visits may change to ensure site access. Currently, the impacts of beavers at this site have been noted and are addressed accordingly as needed.

Blueberry River streamflow from early May through to late October ranged from approximately 0.00 m^3/s to 3.76 m^3/s, in response to snowmelt and rain events, with the peak event occurring on June 15. Impacts of the ongoing drought across the region can be seen in comparison of peak flows, whereby the peak event in 2024 was 3.76 m^3/s compared with 9.18 m^3/s and 5.53 m^3/s in 2022 and 2023, respectively. Low flows over the last couple years of monitoring have presented favourable conditions for beaver activity and water levels at this site are now controlled by a developing downstream beaver dam. The team is hopeful that a shift to more regular high flows in 2025 will encourage the beavers to move elsewhere.

Osborn River streamflow from early May through to late October ranged from approximately 0.00 m^3/s to 2.88 m^3/s, in response to snowmelt and rain events. Peak flows occurred on June 24, with a secondary peak of equal magnitude on July 27 in response to heavy rains. Similar to Aitken Creek and Blueberry River, low flows persisted for the majority of the monitoring season due to the ongoing drought. Annual comparison of peak flows shows the peak event in 2024 of 2.88 m^3/s compared with 91.0 m^3/s and 5.92 m^3/s in 2022 and 2023, respectively. Similarly with Aitken Creek and Blueberry River, this site has also begun to experience the impacts of beavers, and these are addressed accordingly during hydrograph generation.

Streamflow in Doig River from early June through to late October ranged from approximately 0.18 m^3/s to 10.7 m^3/s, in response to snowmelt and rain events. Peak flows occurred on June 17, with a secondary peak of similar magnitude on June 26 in response to heavy rains. Flows for the remainder of the monitoring season were punctuated by several rapid rises and falls of low magnitude in response to precipitation events. Annual comparison of peak flows shows the peak event in 2024 of 10.7 m^3/s compared with 113 m^3/s in 2023.

Streamflow in Hulcross Creek from mid April through to late October ranged from approximately 0.00 m^3/s to 2.33 m^3/s, in response to snowmelt and rain events. Peak flows occurred on June 17, with a secondary peak on June 27 in response to heavy rains. Annual comparison of peak flows shows the peak event in 2024 of 2.33 m^3/s compared with 19.7 m^3/s and 6.59 m^3/s in 2022 and 2023, respectively.
An unexpected challenge with this station in 2024 was vandalism, where the solar panel was destroyed by gunshots. A testament to the strength of the solar panel was that it continued to feed power to the station and thus did not result in a loss of data before it was able to be replaced.

Beaver Creek streamflow from mid June through to late October ranged from approximately 0.17 m^3/s to 8.90 m^3/s, in response to snowmelt and rain events. Peak flows occurred on July 3, with flows punctuated by secondary peaks on June 26 and July 25 in response to heavy rains. Flows for the remainder of the monitoring season were punctuated by several low magnitude rises in response to precipitation events. Although there is no historical record at this station, it can be assumed that these peak flows are likely well below what can be expected as average, due to the ongoing drought in the region.

Participant Comments

Appendix A is the 2024 Annual Report from BRFN. Ian Ruttenberg provides some excellent recommendations and comments, pointing out the importance of this station to their overall environmental monitoring program and the potential for BRFN to take over management of these stations in the future.

Conclusions

All the stations are ready for equipment re-installation pre-freshet in 2025 to capture the peak flows. The Osborn River station has been upgraded to a more permanent installation and is ready to collect data in a more streamlined fashion for the upcoming 2025 field season. There will be a greater effort to ensure the Beaver Creek station is visited at a greater frequency in the upcoming monitoring season. Overall, the project is a success and the data/information being collected will continue to support water management decisions and the First Nation communities are excited to be part of the project. The BCER is grateful to BC OGRIS for their ongoing commitment to funding this program and increase the dataset of small watershed streamflow information within northeast BC.