Columbia Region Operations

Gillian Kong, Operation Planning Engineer - GSO

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May 2022

Columbia Basin Map

- Canada has 15% of the basin area, but produces, on average, 38% of total basin runoff
- Snowmelt contributes about 70% of the annual runoff
- Rain on snow can produce high peak flows
- 50% of the worst Columbia flood flows (1894) at Portland came from Canada.
- northern basins (Mica & Revelstoke) have highest and most consistent runoff
- runoff in southern basins is lower and more uncertain
- Columbia River Treaty – a 1961 agreement between Canada and U.S. to improve on power and flood control benefits in both countries

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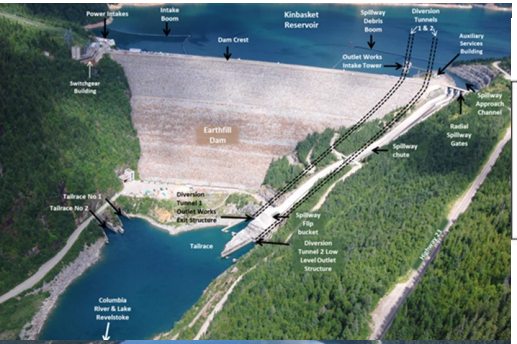
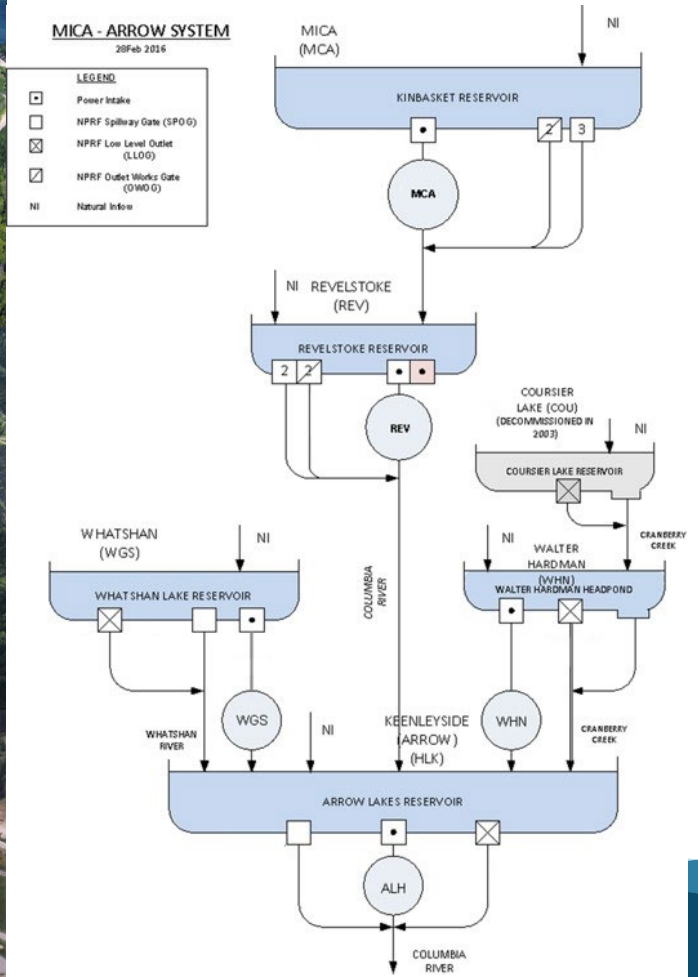
System Schematic





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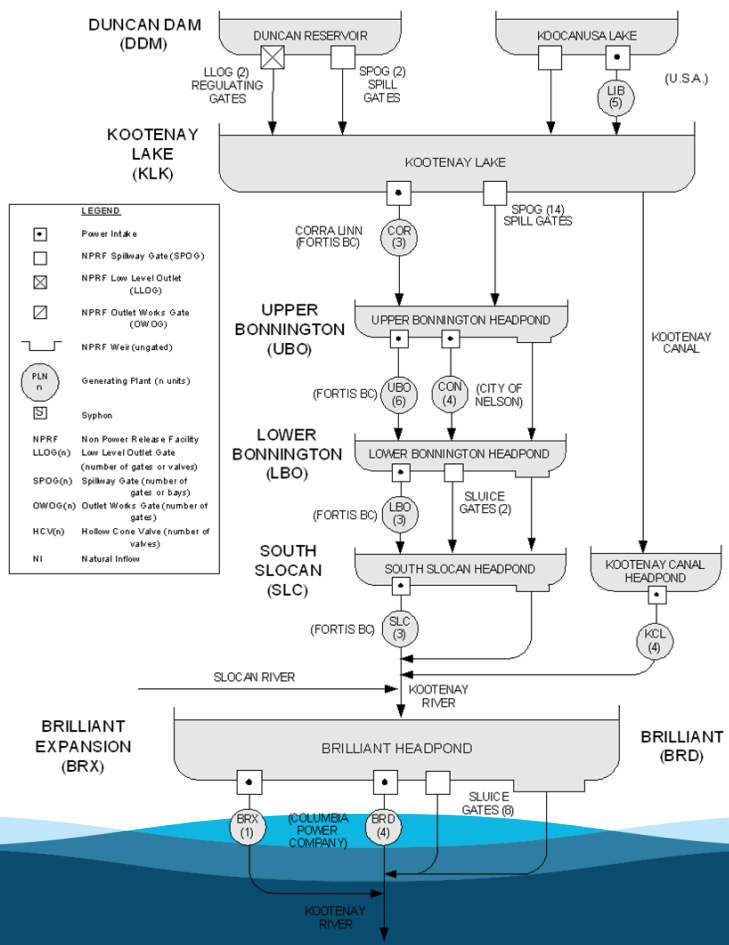
System Schematic & General Layout

KOOTENAY RIVER SYSTEM



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Current Operations Outlook

- Several atmospheric weather events in fall/winter set near to record high precipitation and with it brought heavy snow in the Columbia/Kootenay basin.
- Wet spring and continued late season snow resulted in at or near record high accumulations for this time of year in the Col/Koot basin.
- The May 1st Water Supply Forecast varies between 105 to 117% of normal for the Canadian Columbia basin.
- Basin inflows at or near record low in Apr and May due to unusually delayed freshet this year.
- High snowpack and a compressed freshet could mean higher than normal peak flows and levels this spring and summer
- BC Hydro is preparing for high forecast inflows by drafting our reservoirs as deep as required prior to the freshet.
- It is possible to see elevated water levels and discharges this spring and summer depending on actual runoff.

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Current Operations Outlook

- Spring and summer water levels and discharges depend on a variety of factors.
  - A slow snowmelt and dry summer weather could mean near normal operations for the Columbia and Kootenay facilities.
  - A rapid snowmelt and heavy rainfalls could mean spill releases and above normal reservoir levels and discharges across the summer and fall
- Nonregulated rivers and creeks such as Lardeau River is subject to increased local flood risk.
- Kootenay River flows are forecast to peak in June.
- Lower Columbia flows/levels are expected to peak in June/July.
- Upper Columbia Kinbasket reservoir will see levels peak in August
- BC Hydro will continue to closely monitor conditions and share information as it becomes available.

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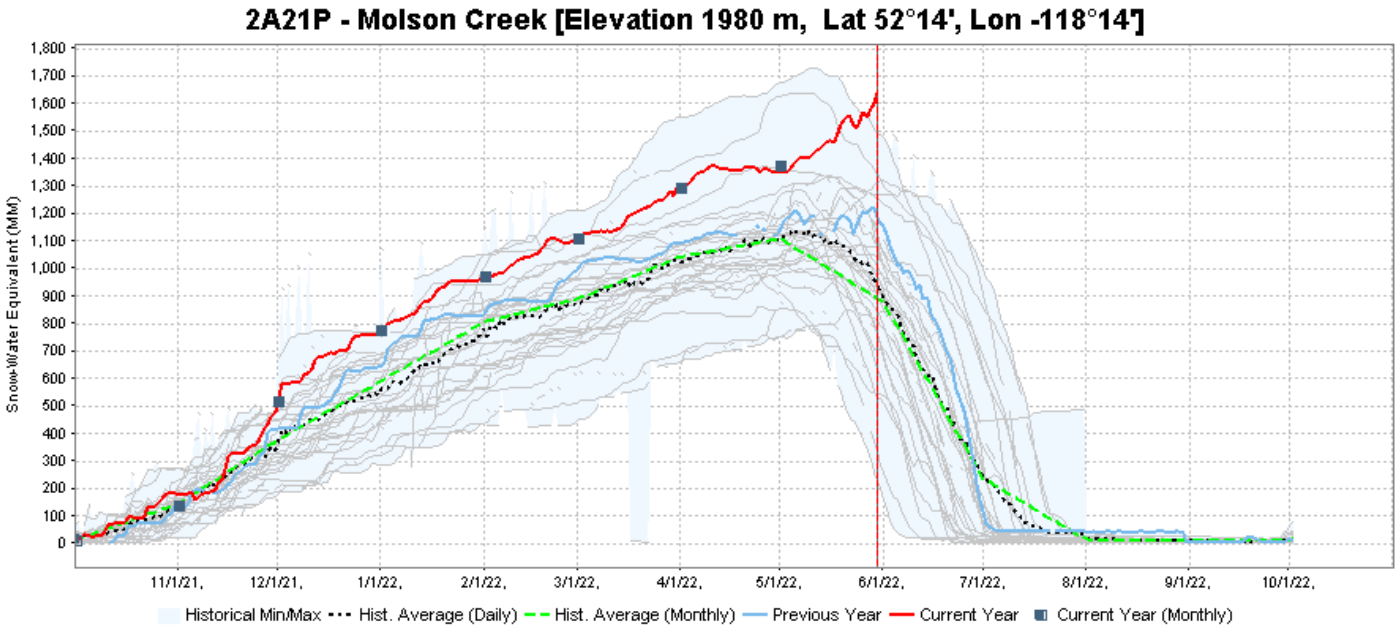
Columbia Snowpack

Molson Creek El. 1935 m (Mica):



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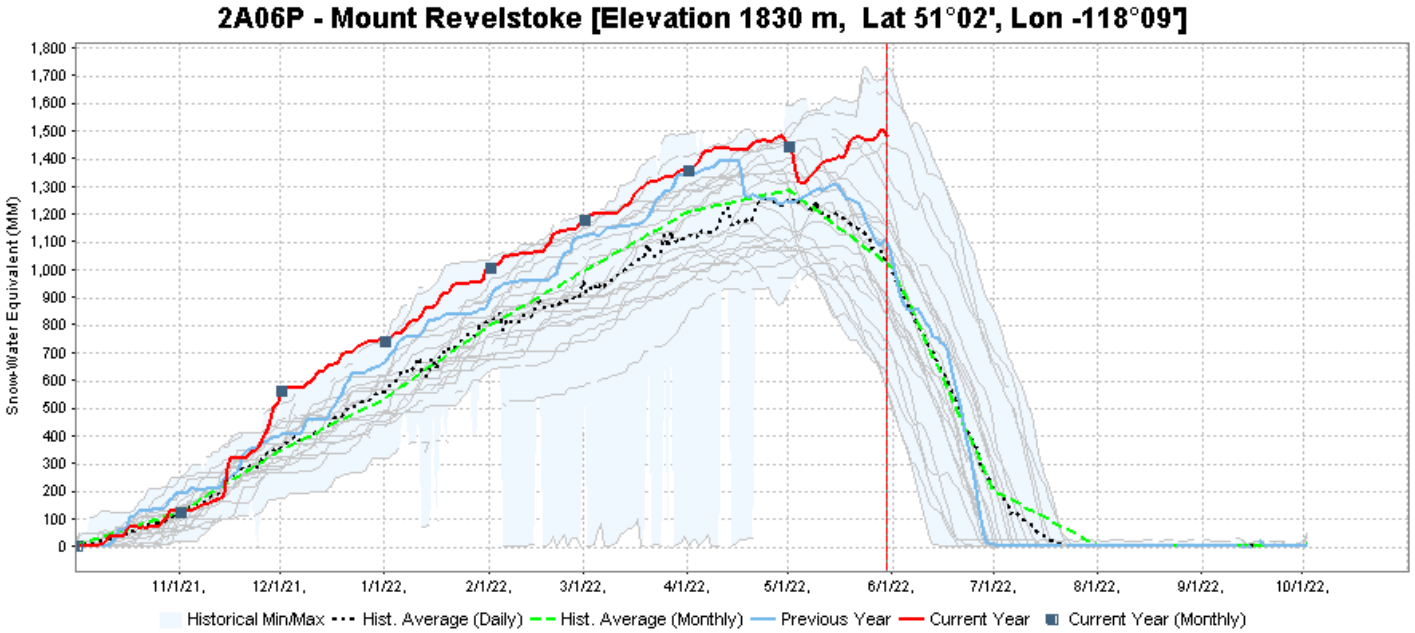
Columbia Snowpack

St. Leon El. 1800 m (ARD):



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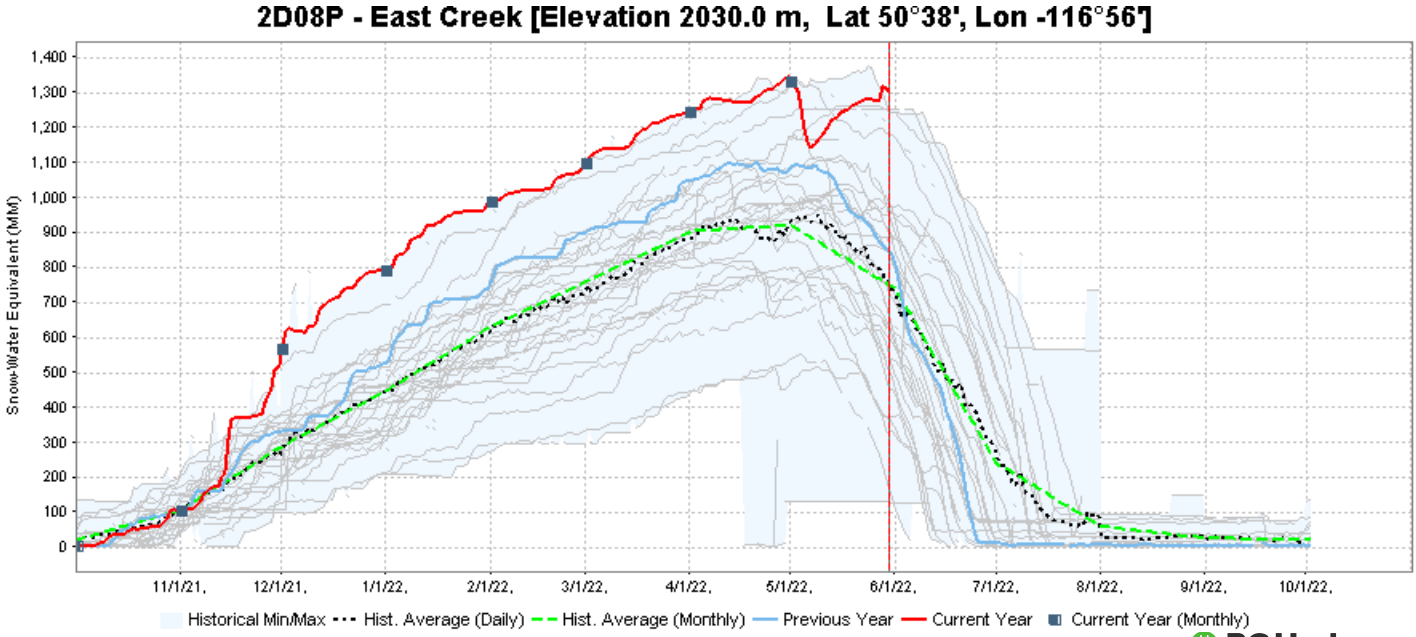
Kootenay Snowpack

East Creek El. 2030 m (DCN):



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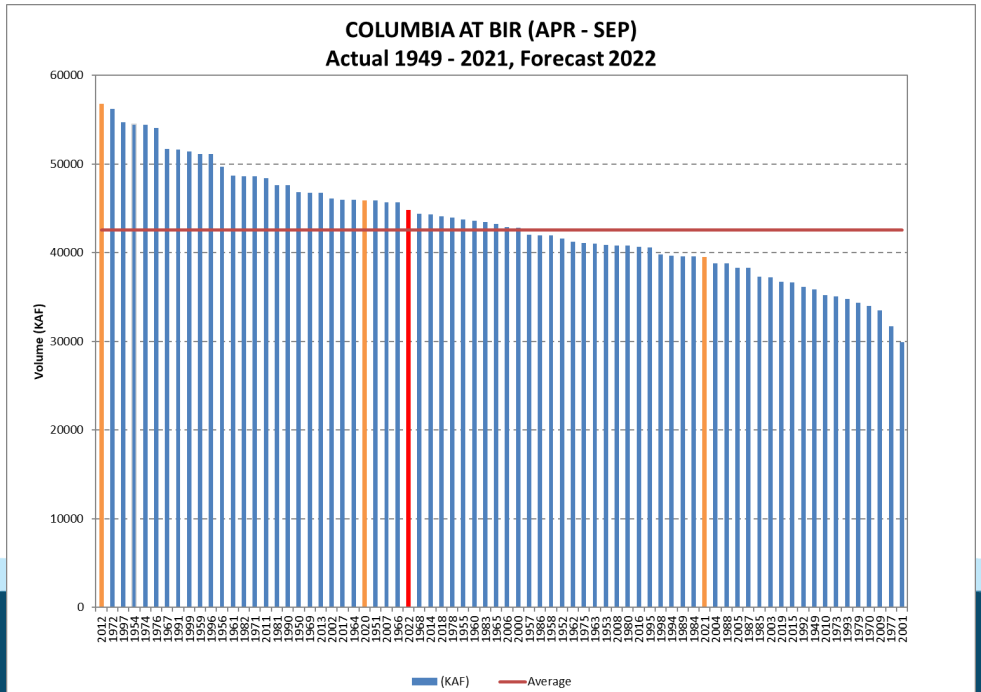
Canadian Columbia Water Supply

May 1st May-Sep 2022 BCH WSF

- Mica: 113%
- Revelstoke: 112%
- Arrow: 117%
- Duncan: 111%
- Kootenay Lake: 105%

Normal is based on 1991 – 2020



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Reservoir Operations

- Operating controls:
  - Dam Safety
  - Columbia River Treaty
  - BC Hydro's water licenses

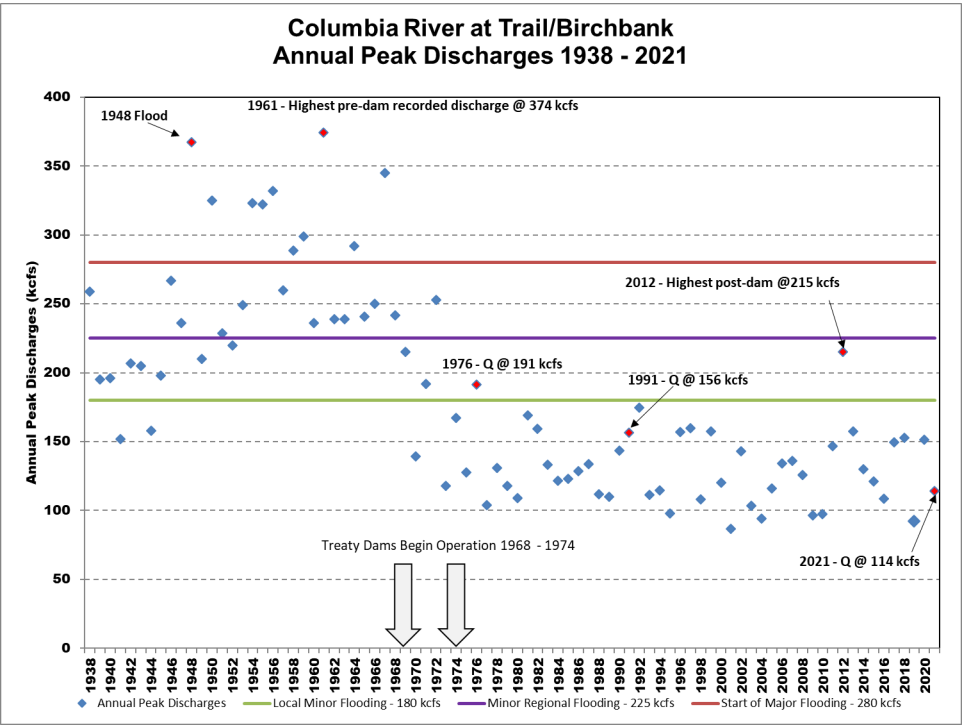
- Operational considerations:
  - flood risk mitigation
  - economic energy production
  - commercial, environmental, and social interests as defined under the Water Use Plan

- Operational design:
  - Facilities are designed to safely pass the PMF with the existing discharge facilities
  - Spill through dam spillway and outlet works is anticipated under high inflow conditions
  - Dams are designed to store a predetermined amount of water

Flood Risk Management

- Under high inflow events, reservoirs are drafted as deep as required prior to the start of freshet
- During refill, BC Hydro may undertake spill and/or surcharge our reservoirs by 1 – 2 ft to control reservoir refill and reduce peak flows downstream.
- GSO shares forecast information and coordinates internally when flood risk increases.
- Under large inflow events, BC Hydro also coordinates flood risk management operations with the U.S. under the Columbia River Treaty.
- Presence of dam significantly reduces flood peaks but cannot eliminate likelihood of flooding.
- Flood plain development ultimately remains at risk to large inflow events beyond BC Hydro's control.

Treaty Flood Control Benefits: Birchbank



- All CRT dams provide flood protection at Castlegar/Trail in BC and for Tri-Cities and Portland/Vancouver in U.S.
- Flows at Trail significantly lower with all the CRT dams in place since 1974.
- 1961 → highest pre-dam discharge at 374 kcfs.
- 2012 → highest post-dam discharge at 215 kcfs.
- In 2012, CRT reservoir operation reduced peak river flow by 40%.

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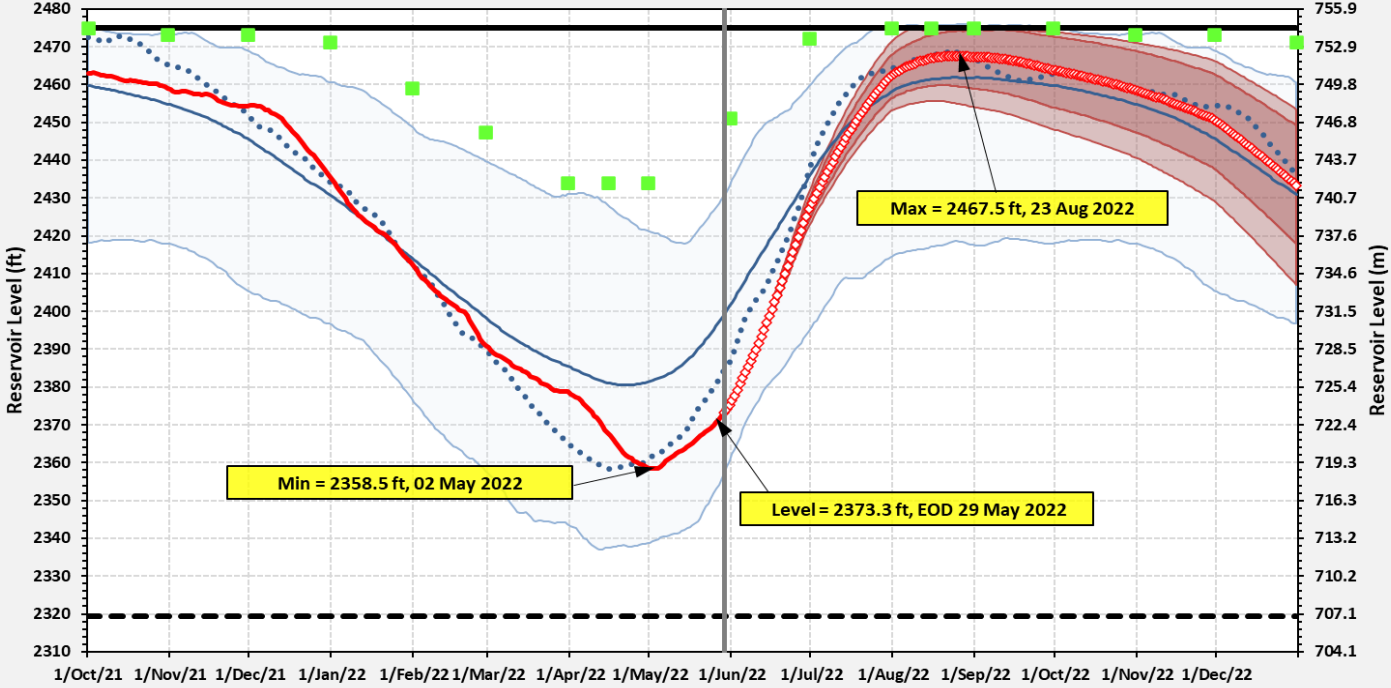
KINBASKET RESERVOIR (MCA) LEVELS

Summary 1976 - 2022

Forecast Date: May 29, 2022



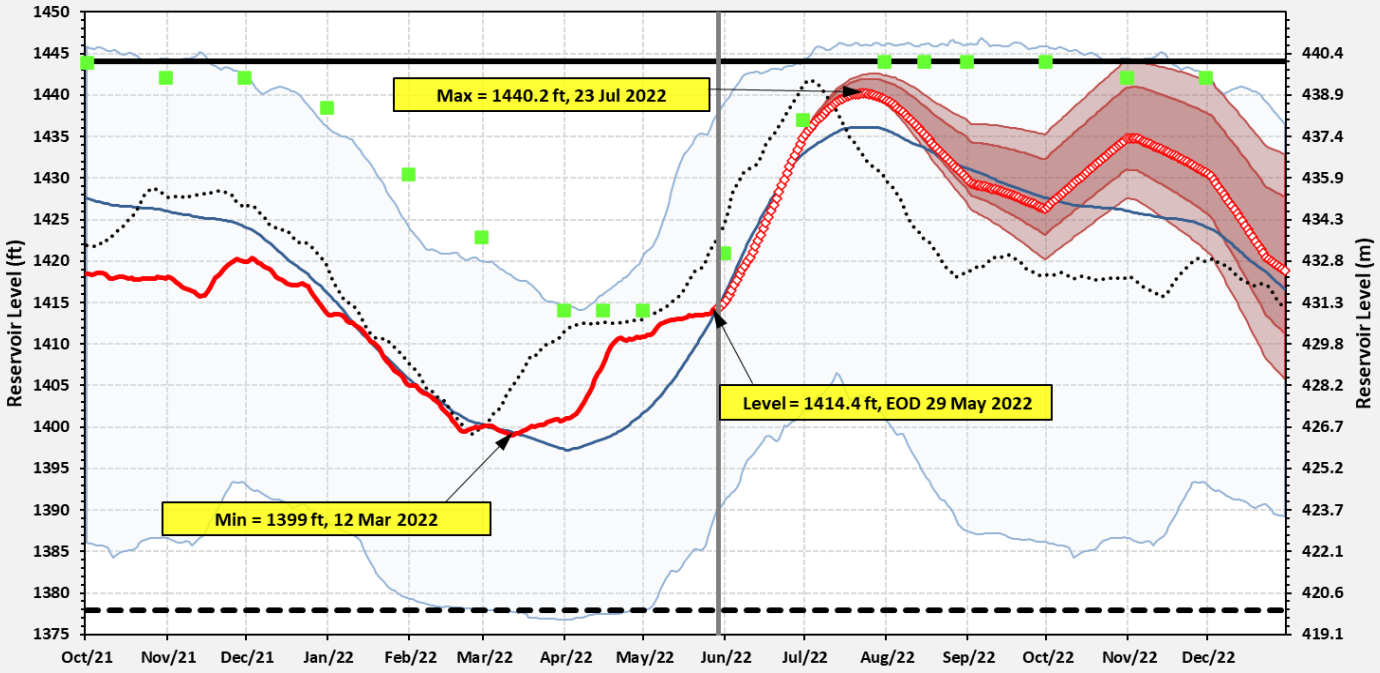
Min-Max Hist Level Range	25%-75%ile Plan Level Range	10%-90%ile Plan Level Range
Max Normal Level	Min Normal Level	Flood Control Level
Mean Level	Prev Yr Level	Actual Level
Expected Plan Level	Current Day	

TSR: May 20, 2022

ESP: May 27, 2022
Forecast Date: May 29, 2022

ARROW LAKES RESERVOIR (ARD) LEVELS

Summary 1968 - 2021 and Actual / Forecast 2022/2023

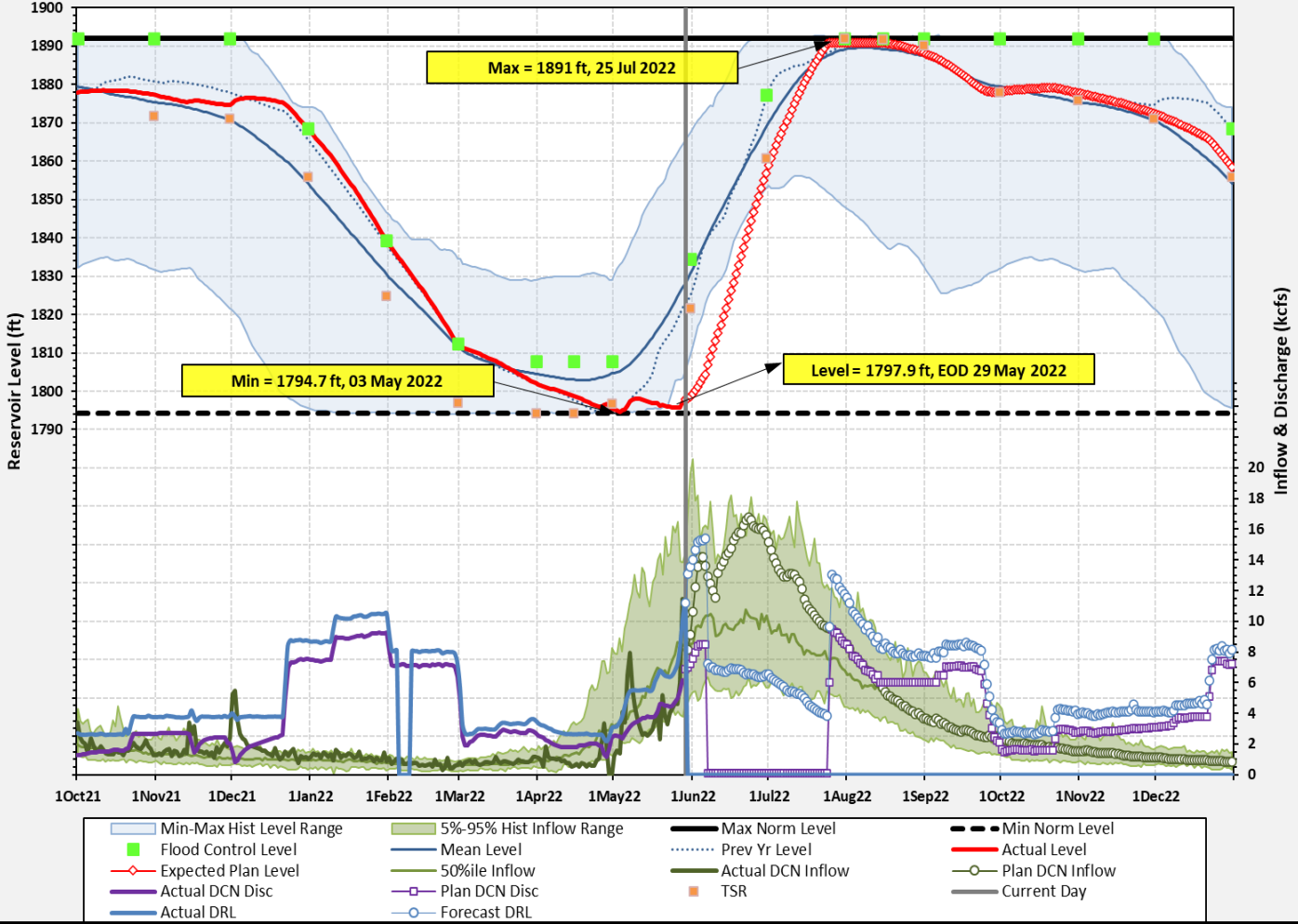


Min-Max Hist Level Range
25%-75%ile Plan Level Range
10%-90%ile Plan Level Range
Max Norm Level
Min Norm Level
Flood Control Level
Mean Level
Previous Year
Actual Level
Expected Plan Level
Current Day

DUNCAN RESERVOIR (DCN) LEVELS & FLOWS

ESP: May 27, 2022
Forecast Date: May 29, 2022

Summary 1967 - 2021 and Actual / Forecast 2022/2023



COLUMBIA RIVER AT BIRCHBANK AVERAGE DAILY DISCHARGE

(Brilliant Project + Brilliant Expansion + Brilliant Spill + Arrow Lakes Hydro + Hugh Keenleyside)