



Kootenay Lake Information Session Duncan Dam Operations

RDCK presentation
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Nelson, B.C.

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Duncan Dam

Duncan Dam Area View



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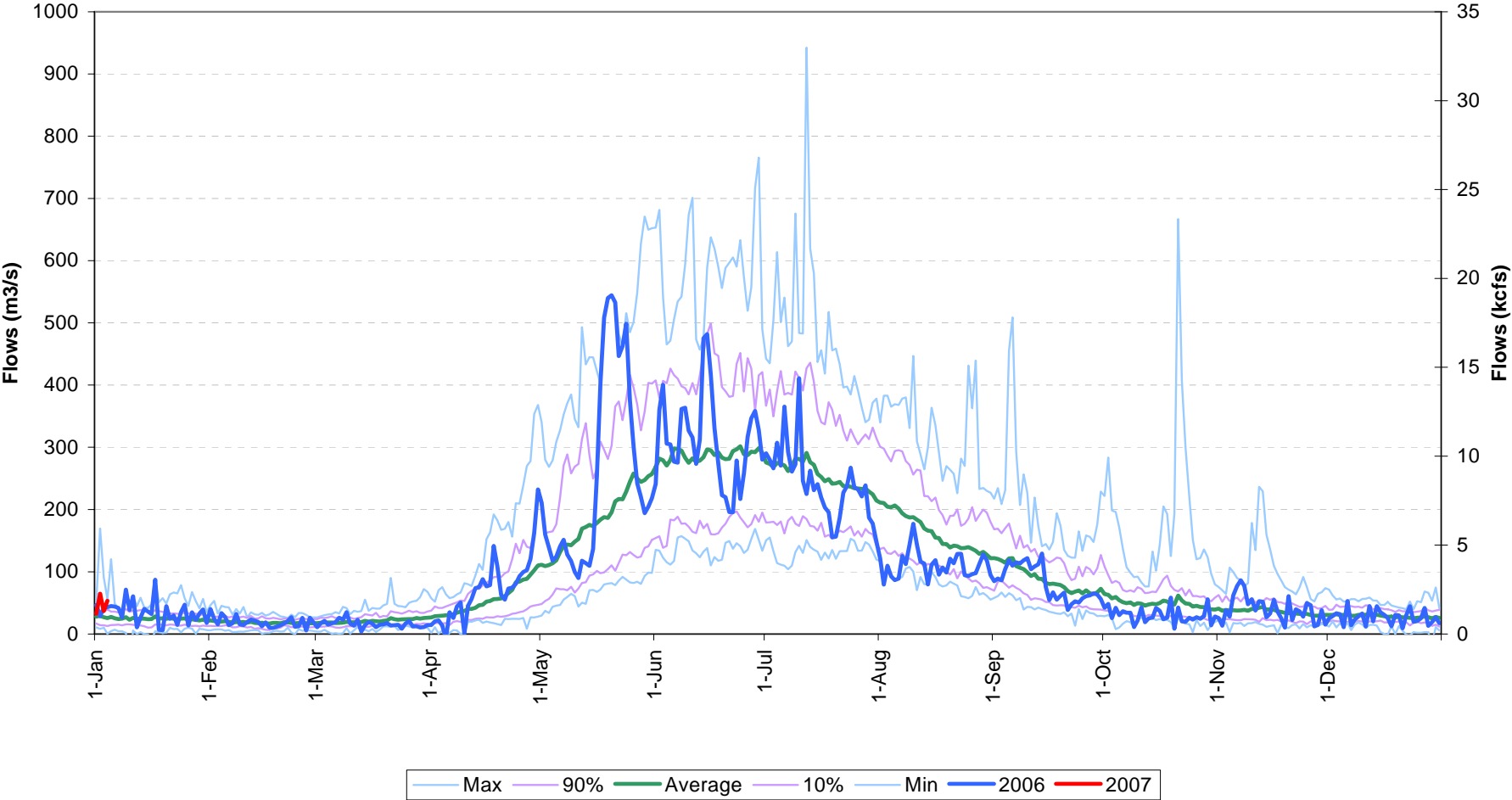
Duncan (DDM) Project Tech Data

- ◆ Completed in 1967; one of the three storage projects built in Canada as a result of the Columbia River Treaty (CRT) (the other two are Mica/Kinbasket and Arrow/Keenleyside Dam)
- ◆ Duncan lake is a storage reservoir – No powerhouse, but improves the amount and timing of power generation at the hydro projects downstream
- ◆ Also provides flood control benefits in Canada and the United States and fish flow regulation in the Duncan river below the dam
- ◆ **Basin Hydrology**
 - ◆ watershed drainage area: 2410 km² (930 mi²); Mean elev. 1800 m (~6000 ft)
 - ◆ regulates ~13% of the runoff in the Kootenay Lake basin (LIB regulates 40%)
 - ◆ heavy precipitation may occur both in summer and winter (snow)
 - ◆ snowmelt inflow dominates; avg. annual inflow: 102 cms (3.6 kcfs)
 - ◆ All releases from DDM discharge into the Duncan river upstream of the confluence with the unregulated Lardeau river. Lardeau's basin represents 65% of DDM drainage area (most WUP flow constraints are at DRL gauge, just below the confluence with the Lardeau river – flooding problems have occurred at Meadow Creek, below DRL)

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Hydrology: Duncan Inflow

Duncan Inflow -
Summary 1968-2006, Actual 2006



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Duncan (DDM) Project Tech Data (cont)

- ◆ **Dam**: Earth-fill, 800 m (2600 ft) long, 40 m (131 ft) high
- ◆ **Reservoir**: Capacity = 1.4 MAF (1,730 km³ or 20,000 cmsd)
 - ◆ Avg. annual inflow = 2 x (available storage)
 - ◆ ~ 20% of the usable storage in the Kootenay R. system (and just under 10% of the Treaty storage in Canada)
 - ◆ Normal Max. Operating elev. = 1892 feet (576.68m)
 - ◆ Minimum Operating elevation = 1794.2 feet (546.87m)
 - ◆ Draft (Max-Min elev.) = 98 feet (29.81m)
- ◆ **Discharge facilities**
 - ◆ 2 x div. tunnels (**LLO**): 6.1 m (20 ft) diameter, 333 m (1092 ft) length
 - Capacity at elev 1892 ft: 18.5 kcfs (525 cms)/tunnel; controlled by radial gates
 - ◆ Gated **spillway**: 2 x vertical lift gates (w x h) 8.7x12.2 m (28.5x40 ft)
 - Capacity at elev 1892 ft = 42 kcfs (1200 cms)

Duncan Basic Operational Constraints

◆ Storage Capacity

- ◆ At the beginning of the freshet and according to the CRT flood control rule curve (FCRC), Duncan reservoir is emptied to elevation 1794.2 feet (thus providing 1.4 MAF of storage for flood protection).
- ◆ A variance from the end of Feb FCRC is usually requested to meet the WUP min flow constraints at the DRL gauge.

◆ Water flows from the dam

- ◆ **Normal Maximum** flows = 10 kcfs (283 cms) – from LLOs
- ◆ **Emergency Maximum** flows = 20 kcfs (566.34 cms). If reservoir is full, inflows must be passed (whatever they are)
- ◆ **Maximum flow rate change** = 4 kcfs (113.3 cms) per day and 1 kcfs/hr (28 cms/hr)
- ◆ **Minimum flows**
 - As required to maintain 2.6 kcfs (73 cms) at DRL gauge year round (WUP/fish)
 - Min average weekly flow from the dam = 0.1 kcfs (~3.0 cms)
 - When the reservoir is filling or when the reservoir reaches 575.8 m, the Minimum flows from the LLOGs shall be the lesser of:
 - 10 kcfs (or 283.17 m³/s)
 - A percentage of the calculated inflows (from 25% to 100%) based on reservoir elevation

◆ WUP decided seasonal elevation and max-min flow ranges at DRL gauge (Duncan r. below Lardeau)

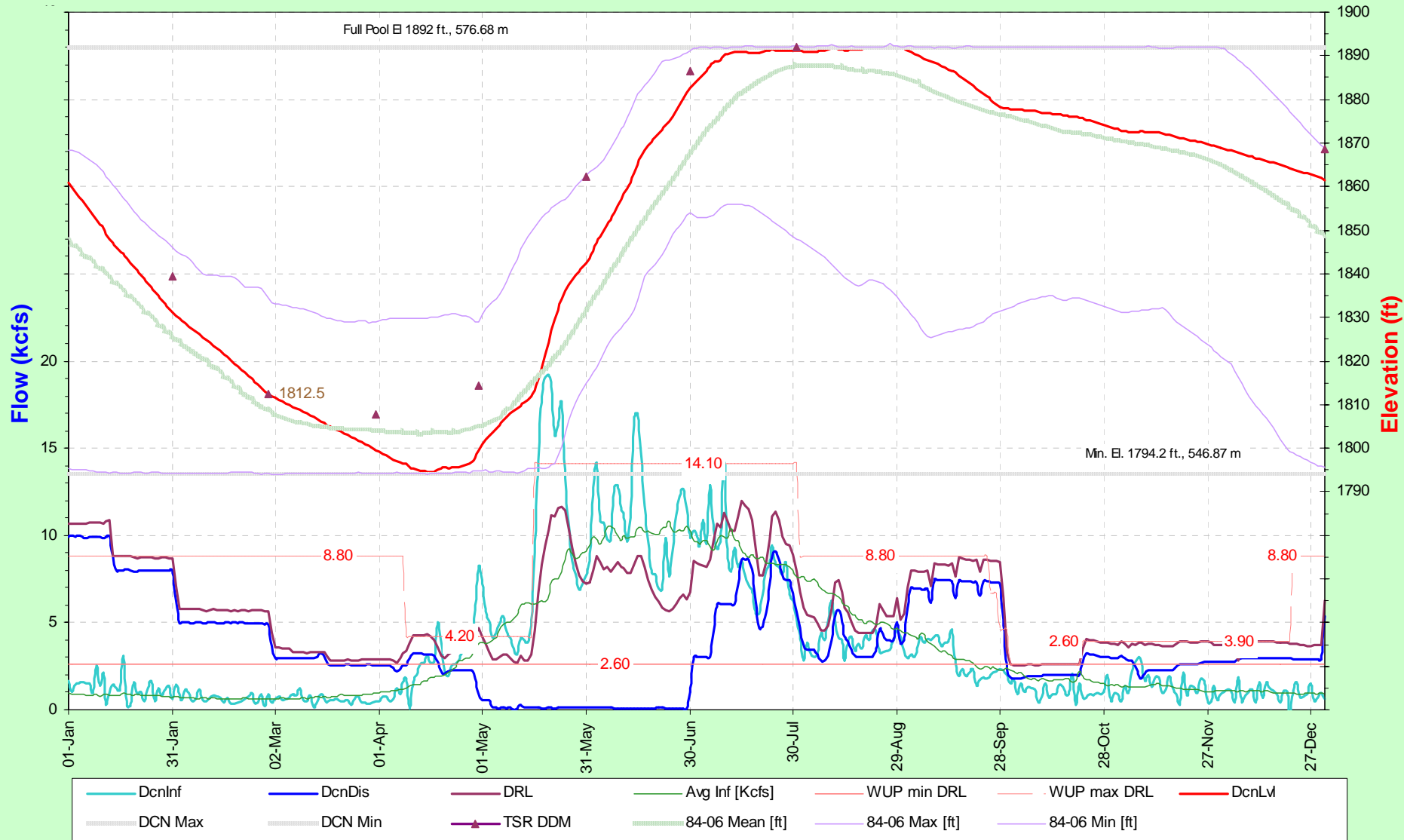
◆ Other Agreements: IJC Order, Canal Plant Agreement, etc.

Spawning Flows @ DRL:

01 Oct - 21 Oct: 2.6 kcfs

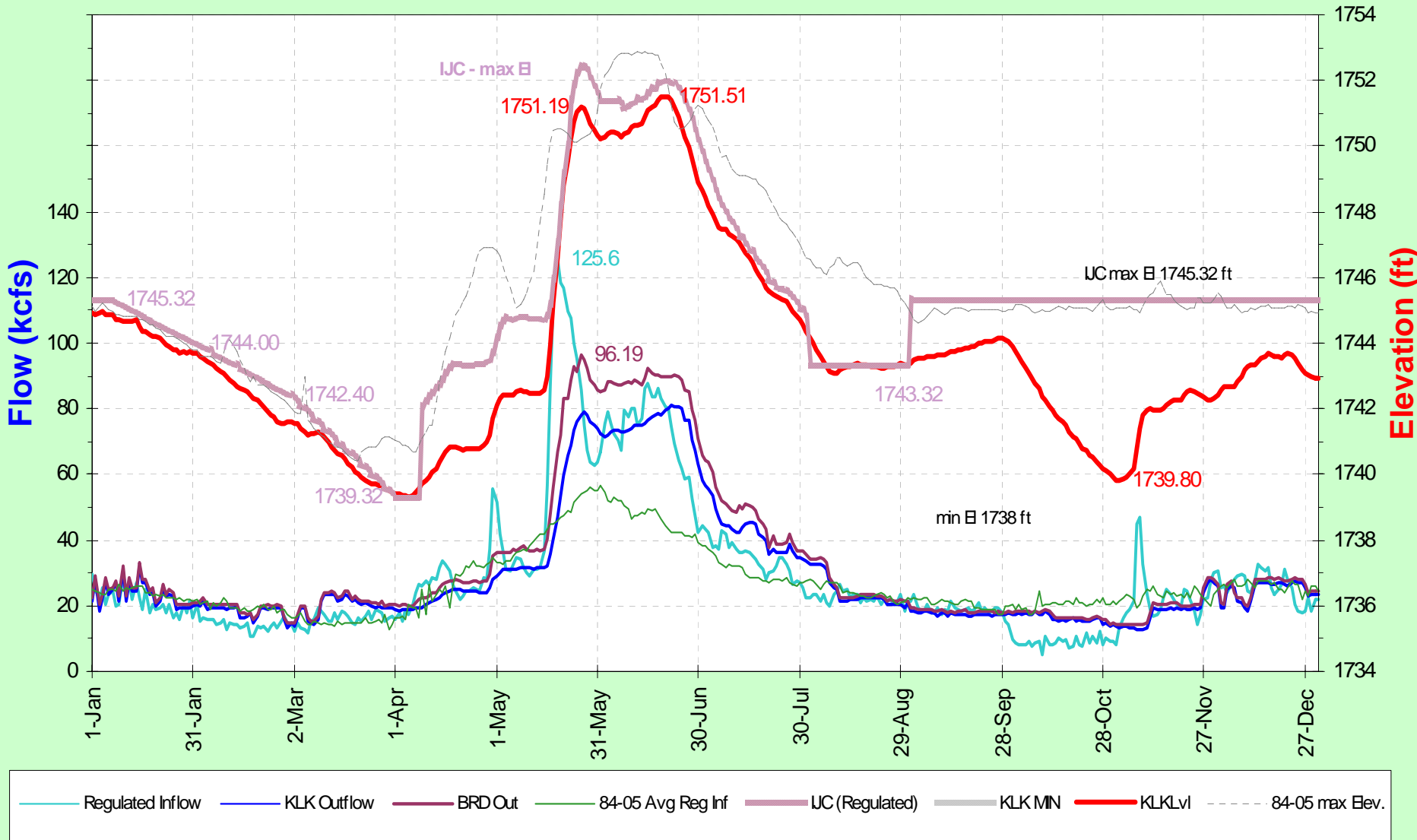
22 Oct - 21 Dec: 3.9 kcfs

Duncan 2006 Operation



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Kootenay 2006 Operation



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Emerging Issues

1. Meeting the CRT Flood Control Rule Curve (FCRC) for the end of February; obtaining the variance from the Corps (usually from 1808 to 1812.5 ft)
2. Maintaining the min 2.6 kcfs flow at DRL (in case of a late freshet) without prematurely emptying the reservoir
3. Emptying DDM reservoir before the freshet without exceeding the WUP max flow or the Kootenay Lake IJC curve (in case of an early “false” local freshet)
4. Maintaining adequate storage buffer space in early July to reduce flooding potential at Meadow Creek
5. Filling the reservoir between 1st and 10 August (without increasing DDM releases in June, when KLK is high, or delaying the start of refill)
6. Drafting DDM reservoir ~ 4 ft (to 1888 ft) after August 10 and maintaining it within one foot until Labour Day
7. Maintaining the exact 2.6 kcfs for kokanee spawning in Oct
8. High discharges in January to assist Arrow with the white fish flows (max WUP flow limit)

Questions?

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