International Kootenay Lake Board of Control

2013 Annual Report to the International Joint Commission

Grohman Narrows

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Kootenay Lake Board of Control members toured BC Hydro's Kootenay Canal Dam and generating station facility on the Kootenay River and viewed the Grohman Narrows channel constriction, downstream of Kootenay Lake, on September 12, 2013. BC Hydro's Kootenay Canal generating station was completed in 1976 with a 580 MW generating capacity from four vertical shaft turbine-generator units. The canal forebay draws from the Corra Linn Dam headpond (FortisBC) with a compensation arrangement through the Kootenay Canal Plant Agreement (1975). Grohman Narrows is a natural channel constriction in the Kootenay River, upstream of the Corra Linn Forebay, which is currently being examined by BC Hydro for potential channel capacity improvement and greater flexibility for the management of Kootenay Lake levels.

2013 Annual Report

This Annual Report covers the operations of Corra Linn Dam by the Applicant to the IJC Order (FortisBC) and the associated effects on the water level of Kootenay Lake. FortisBC operates Corra Linn Dam on the Kootenay River approximately 22 kilometres upstream from its confluence with the Columbia River, and downstream from the West Arm of Kootenay Lake. FortisBC controls discharge through and around Corra Linn Dam in accordance with requirements of the Order of the International Joint Commission dated November 11, 1938. FortisBC co-operates with BC Hydro, which also manages a lake level control structure (the Kootenay Canal Project) at the lake's outlet.

Kootenay Lake 2013 Summary

Throughout 2013, FortisBC operated Corra Linn Dam in a manner consistent with that prescribed by the 1938 Kootenay Lake Order.

The minimum instantaneous water level was observed at 15:01 PST on April 01, 2013 at elevation 530.10 metres[1] (1739.17 feet), reaching elevation 1739.32 feet specified for April 01, 2013 in condition 6 of the 1938 Order.

The Board and the Applicant jointly determined the date of the commencement of the spring rise as April 09, 2013. The maximum instantaneous water level for the lake at Queens Bay was subsequently observed at 5:31 PST on June 25, 2013 at elevation 533.20 metres (1749.35 feet). Kootenay Lake discharged 26 cubic kilometres (21.1 million acre-feet) of water in 2013, with an average flow of 824 cubic metres per second (29,100 cubic feet per second).

[1] All elevations are referred to G.S.C. 1928 datum.

Board Membership

The Board members during 2013 were as follows:

For the United States,

Colonel Bruce Estok, District Engineer, Seattle District,
United States Army, Corps of Engineers, Seattle, Washington;

Mr. Michael Lewis, Director, Idaho Water Science Center,
United States Geological Survey, Boise, Idaho;

and for Canada,

Mr. Bruno Tassone, Manager, Water Survey
Environment Canada, Vancouver, British Columbia October 22, 2012 through December 31, 2012.

Mr. Glen Davidson, Director, Water Management Branch,
BC Ministry of Natural Resource Operations, Victoria, British Columbia.

Board Secretariat,

Ms. Amy Reese and Mr. Gwyn Graham provided secretariat support to the US and Canadian sections, respectively.

Photograph: International Kootenay Lake Board of Control Members, at Nelson B.C, Sept. 2013, (from left to right) Glen Davidson, Bruno Tassone, Col. Bruce Estok, and Michael Lewis.

1938 Kootenay Lake Order Sections 2(4) 2(5) and 2(6)

2(4) …the Applicant shall be permitted to store water in the main body of Kootenay Lake to a maximum elevation of 1745.32, Geodetic Survey of Canada datum, 1928 adjustment (i.e. six feet above zero of the Nelson gauge), in accordance with the rule curve detailed in Sub-section (5).

(5) That after the high water of the spring and early summer flood and when the lake level at Nelson on its falling stage recedes to elevation 1743.32, Geodetic Survey of Canada datum, 1928 adjustment, the gates of the dam may be so operated as to retain it at said level until August 31st, and after said date, the level of the main body of the lake may be raised to elevation 1745.32, which shall be the maximum storage level until January 7, and thereafter it shall be lowered so that it shall not exceed elevation 1744 on February 1, elevation 1742.4 on March 1, and elevation 1739.32 (i.e. zero of the Nelson gauge) on or about April 1, except under extraordinary natural high inflow conditions, when sufficient gates shall be opened and remain open throughout such period of excess so as to lower the level of the main body of Kootenay Lake to the storage level at that time obtaining as above defined.

(6) ...throughout the period of flood flow in each and every year, (i.e. from the commencement of the spring rise in March or April until the level of the lake at Nelson returns to elevation 1743.32, Geodetic Survey of Canada, 1928 adjustment, on the falling stage), a sufficient number of gates and sluiceways of the dam shall be opened to provide, in conjunction with the flow through the turbines, for the lowering of the main body of Kootenay Lake ... by at least the amounts ... as follows:

Discharge from Kootenay Lake under original conditions (in second feet) [vs.] Amount of lowering to be affected on the main body of Kootenay Lake (in feet)

10,000	*1.0*
25,000	*1.3*
50,000	*1.7*
75,000	*2.1*
100,000	*2.6*
125,000	*3.0*
150,000	*3.2*
175,000	*3.5*
200,000	*3.8*
225,000	*4.0*

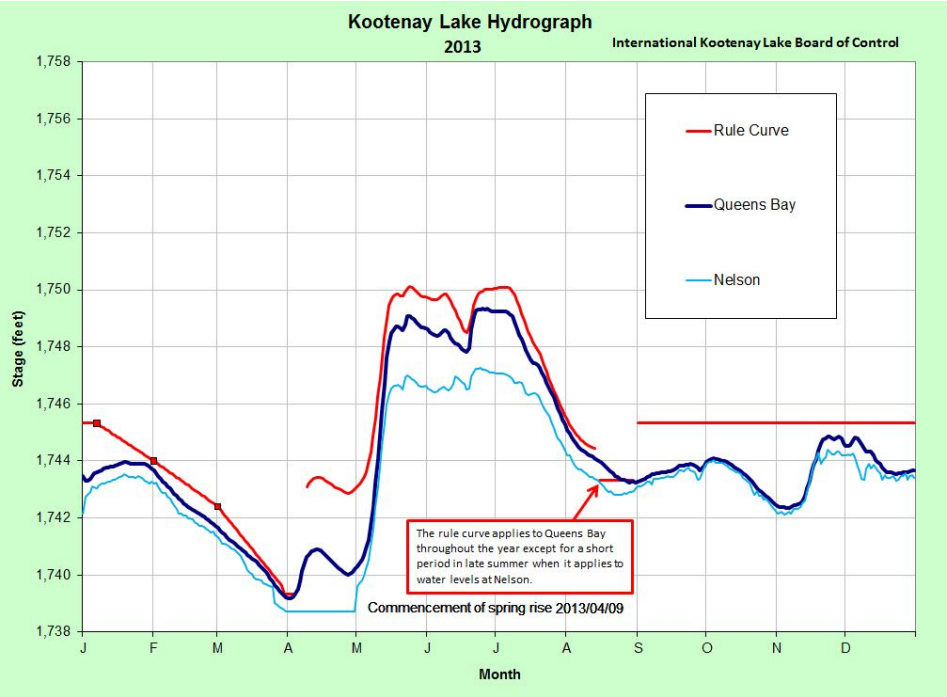
Lake Regulation

Figure 1 presents observed calendar-year 2013 water levels on Kootenay Lake and the elevations specified in the November 11, 1938 IJC Order. There were two peak water level period in the summer of 2013. The first peak was largely driven by snow-melt. The second and more pronounced peak lake level was also the maximum lake level recorded in 2013 and associated with the same system responsible for extreme rainfall and catastrophic flooding in the Calgary area of Alberta during this period.

The maximum instantaneous water level of 533.202 metres (1749.35 feet) for the lake at Queens Bay was reached on June 25, 2013 at 05:31 PST. The minimum instantaneous water level was observed on April 01, 2013 at 15:01 PST, elevation 530.099 metres (1739.17 feet). Relative to the 83-year period of record (1931 to 2013, with two years missing; 1934 and 1947), this year's maximum water level ranked 53rd highest, and the minimum was the 48th lowest annual minimum. Over the period of record, water levels in the lake have ranged from a high of 537.04 metres (1761.95 feet) in 1961 to a low of 529.56 metres (1737.41 feet) in 1944.

Kootenay Lake discharged 26 cubic kilometres (21.1 million acre-feet) of water this year through Corra Linn Dam and the Kootenay Canal Plant, with an average flow of 824 m^3/s (29,100 cfs). Relative to the 75 years of available discharge data, the annual volume of flow out of the lake was 30th highest over this period of record. Total lake outflow has ranged from a high of 33.8 km^3 (27.4 million acre-feet) in 1954 to a low of 13.8 km^3 (11.2 million acre-feet) in 1944. The maximum daily mean outflow was 1,940 m^3/s (68.500 cfs) on June 25, 2013. The minimum was 391 m^3/s (13,800 cfs) on October 02, 2013.

Figure 1



FortisBC has continued to supply the Board with complete records of the regulation of Kootenay Lake as affected by the operations of Corra Linn Dam and the Kootenay Canal Plant. FortisBC attempts to operate the lake within the optimal range of 1738.5 ft to 1749.5 ft, subject to the stipulations of the IJC Order.

In March 2011, Board members received information on a Columbia River Treaty Operating Committee (CRTOC) decision that Treaty facilities would not be required to reduce releases in the event of Kootenay Lake exceeding the IJC rule curve. This CRTOC decision remains in effect for the two upstream projects, Libby and Duncan Dams. This was not an issue in 2013, since hydrologic conditions allowed the IJC April 1, 2013 (on or about) low water target of 1739.32 ft to be met.

The Board and the Applicant jointly determined the commencement of the spring rise to be 12:00 PST on April 9, 2013.

FortisBC undertakes preventative maintenance of its water level recorders twice each year. FortisBC is still working to secure firm

land access rights to the Queen's Bay water gauge but in the meantime FortisBC has boat access to this station.

According to the 1938 Order, FortisBC must pay farmers on the Kootenai Flats in Idaho up to $3,000.00 for additional pumping costs related to dike seepage from higher water levels during storage periods. A number of years ago, FortisBC made a separate agreement with the State for an additional pumping cost payments based on actual receipts. FortisBC paid the Idaho farmers $30,000 in April 2013 to cover 2012 pumping costs.

Following inspections of Corra Linn dam spillgates in 2012 by contracted engineers, FortisBC has submitted a detailed engineering project request to the British Columbia Utilities Commission (BCUC) for access, isolation and seismic stability upgrade of the entire spillway. Currently there is almost $1 million for the study with the possibility of a $25 million project in 2017 - 2018, pending outcomes. FortisBC also reported that on July 13, 2013, the Corra Linn Unit 2 failed due to a fault at the generator leads and remained out of service through September with an expected 6-month delay in bringing the unit back on line.

FortisBC also reported on the initiative to maintain lower lake elevations in September 2012 in support of a Kokanee shoal spawning study. Preliminary study results indicate less redd dewatering/exposure with this operation (35% 2012 vs. 83% dewatered redds in previous years. This compares to an estimate of 12% red exposure prior to Corra Linn/IJC 1938). Given apparent inter-annual cycles in Kokanee fish population and the influence spawning from year to year, there will likely be strong interest to repeat this mode of operations for Kootenay Lake again for subsequent big spawning years.

Board Meetings

The Board held its annual and public meetings in Nelson, BC on September 12, 2013. The minutes were delivered to the Commission prior to the IJC's 2013 Fall semi-annual meeting and are available on the IJC's IKLBC website. Board secretaries provided a presentation of hydrologic conditions in 2013, showing FortisBC to be in compliance with the requirements of the IJC Order.

The Board received a presentation from BC Hydro on current feasibility studies regarding channel capacity improvement at Grohman Narrows. BC Hydro has conducted extensive channel characterization studies and is planning further cost-benefit analysis.

The Board also received a presentation from the Columbia River Treaty Hydromet Committee (CRTHC) on studies and work on establishing additional gage stations to support CRT operations. Four to six station locations were recommended after a one year study with the US National Resource Conservation Service (NRCS) and arrangements are being made for cooperative funding between BC Hydro and BPA to build and support these proposed stations in the Canadian portion of the basin.

For the Board's public meeting, an overview of the IJC Order and the related compliance requirements for operation of Corra Linn Dam was provided, as well as a summary of hydrologic conditions in 2013 affecting Kootenay Lake levels, including upstream operations at Duncan and Libby Dams (CRT operations). There were two high water peaks in the summer of 2013 on Kootenay Lake but overall less extreme high water conditions than experienced in 2012. The Kootenay Lake hydrograph showed that Corra Linn Dam was in compliance with the IJC rule curve in 2013.

Public questions centered around potential implications and impacts of Grohman narrows dredging, as proposed by BC Hydro, particularly regarding potential erosion and sediment transport issues downstream of the narrows. While the 1938 IJC Order actually stipulated dredging for channel improvement purposes, the potential scope of work is still hypothetical at this point and not yet clear what implications there could be regarding the IJC Order. The Board will continue to follow the BC Hydro studies and provide feedback to the IJC on potential implications related to the IJC Order, if any. Some public comments were in favour of the channel improvement to achieve greater certainty in meeting the IJC low water target, as well as limiting high water events. There were additional questions around the influence of Libby Dam operations on high water conditions for Kootenay Lake. These questions were answered through additional explanation of the Kootenay Lake and Libby Dam hydrographs, which showed the effect of discharge from Libby Dam for sturgeon flows in May above the baseline flood management flows, as well as below historic unregulated flow rates. The Board also answered hypothetically posed questions, such as the process of addressing non-compliance by the applicant under the IJC Order and FortisBC questions regarding flexibility of the IJC Order in the context of climate change. A full record of questions and answers from the public meeting is available on the IJC's IKLBC website.