



May 20, 2016

File: 76975-35/Bridge

Maureen DeHaan
Water Resource Specialist
BC Hydro
9 - 6911 Southpoint Dr
Burnaby BC V3N 4X8

Via Email: Maureen.DeHaan@bchydro.com

Dear Ms. DeHaan:

Re: Section 93 Order – Terzaghi Target Flow Release and Annual Water Budget

This Order supersedes the Order issued to BC Hydro on April 20, 2016.

British Columbia Hydro and Power Authority is the operator of the Terzaghi Dam. A Section 87 & 88 Order dated March 30, 2011 under the *Water Act* directs the implementation of the operating parameters and procedures of the Bridge River Water Use Plan.

Clause 8 of the Order reads as follows:

8. For the period between May 1, 2011 and April 1, 2015, the licensee shall discharge from Terzaghi Dam to the Bridge River the equivalent to an annual water budget of 6.0 cubic metres per second (cms) and target the following monthly flows:

<i>DATE</i>	<i>TARGET FLOW (CMS)*</i>	<i>DATE</i>	<i>TARGET FLOW (CMS)*</i>
<i>Jan 1</i>	<i>1.5</i>	<i>Aug 2</i>	<i>11.0</i>
<i>Feb 1</i>	<i>2.0</i>	<i>Aug 8</i>	<i>9.3</i>
<i>Mar 1</i>	<i>3.0</i>	<i>Aug 9</i>	<i>7.7</i>
<i>Apr 1</i>	<i>6.0</i>	<i>Aug 16</i>	<i>6.4</i>
<i>Apr 15</i>	<i>8.5</i>	<i>Aug 17</i>	<i>5.1</i>
<i>Apr 23</i>	<i>11.0</i>	<i>Aug 23</i>	<i>4.1</i>
<i>May 1</i>	<i>11.0</i>	<i>Aug 24</i>	<i>3.0</i>
<i>May 7</i>	<i>13.0</i>	<i>Sept 1</i>	<i>3.0</i>
<i>May 21</i>	<i>14.0</i>	<i>Oct 1</i>	<i>1.5</i>
<i>Jun 1</i>	<i>15.0</i>	<i>Nov 1</i>	<i>1.5</i>
<i>Jul 1</i>	<i>15.0</i>	<i>Dec 1</i>	<i>1.5</i>
<i>Aug 1</i>	<i>12.9</i>		

**The transition between target monthly flows may occur up to ±5 days of the beginning of each month. Target monthly flows less than 5.0 cms may vary instantaneously by ±0.25cms from the target flow. Target monthly flows greater than 5.0cms may vary instantaneously by ±5%. The total annual flow will be determined on a calendar year basis and may vary ±5%.*



A variance order was granted to BC Hydro on May 8, 2012, which gave BC Hydro the approval to implement the above target flow schedule at Terzaghi Dam, which has an annual water budget of 6.0cms. BC Hydro has been directed by the Comptroller of Water Rights, in a letter dated May 28, 2015, to operate under this annual water budget until a decision under Clause 9 of the Bridge WUP Section 87 & 88 Order dated March 30, 2011 under the *Water Act* is made. Clause 9 requires the determination of a long term flow release strategy for Terzaghi Dam.

In a letter dated March 2, 2016, you requested a variance order to the Bridge WUP Order (March 30, 2011) Clause 8 to modify the discharge from Terzaghi Dam to the Bridge River outside the boundaries of an annual water budget of 6.0cms. A variance Order was issued on March 14, 2016, which identified a range of an annual average flow between a budget of 6cms and 22cms. Following the issuance of the March 14, 2016 variance Order, in a letter dated April 14, 2016, you requested an amendment to the variance Order to increase the flows to 55 cms sooner than anticipated, due to above normal inflows and to modify the flows to meet a 22 cms annual water budget. A variance Order was issued on April 20, 2016, which allowed for flows to increase to 55 cms.

In a letter dated May 17, 2016, you requested an amendment to the variance Order issued on April 20, 2016 to increase the upper flow limit due to:

- Additional unplanned generating unit de-rates at Bridge 1 and 2 generating stations which further restricted diversion of water from Carpenter to Seton Reservoir,
- Record or near record inflows to Downton and Carpenter Reservoir across April and May that have front loaded reservoir storage,
- The expressed desire from the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and Department of Fisheries and Oceans to further shape the discharge volume from July into May to June.

As was taken into consideration in the issuance of the March 14, 2016 and the April 20, 2016 variance orders, I recognize that BC Hydro is modifying the operations at Downton Reservoir by lowering the maximum Normal Reservoir level from elevation 749.8m to elevation 734m. I recognize that this is being implemented as an interim dam safety risk reduction measure to address seismic and seepage deficiencies at La Joie Dam until capital improvements can be initiated in 10-15 years.

In addition, I understand that since February 2015 a number of Bridge 1 and 2 Generating Station units have been de-rated and, without a bypass, this has restricted the discharge capacity from 160cms to about 110cms. I note that due to significantly higher inflows, the discharge capacity at Bridge 1 Generating Station is likely to be further de-rated as the transformers are showing signs of stress under the continuous operation at full load and with the higher seasonal temperatures. I understand that due to this, Bridge 1 discharge capacity is now at about 106 cms and could be decreased further or a forced outage could occur. I also understand that upgrades to these units are planned over the next 5-6 years. I recognize that due to the reduction in generating station discharge capacity and the higher than normal reservoir levels at Downton and Carpenter Reservoirs through the fall of 2015, increased discharges in 2016 at Terzaghi Dam down the Lower Bridge River is required in order to move water out of Downton and Carpenter Reservoirs to maintain Downton Reservoir at or below 734 m.

Under the Bridge WUP Order issued March 30, 2011, Section 18 identifies the priorities that BC Hydro is to follow when implementing operations. Dam safety requirements are the first priority, followed by flood routing requirements, and thirdly the Terzaghi target flow schedule. I recognize that the proposed increase to the Terzaghi flow releases differs significantly from that described under Section 9 of the Bridge WUP Order which contemplated a recommended long term flow release strategy from Terzaghi Dam to be not less than annual water budget of 3.0cms and not to exceed an annual water budget of 6.0cms. I note that due to the requirements to manage the dam safety risk at LaJoie Dam and the reduced discharge capacity at Bridge 1 and 2 Generating Stations, the recommended flow strategy as required by Clause 9 of the Bridge WUP Order will need to be deferred.

I acknowledge that the spring snowmelt in the Bridge region is well ahead of the seasonal pattern and with the combination of the above normal snowpack and earlier than normal depletion, glacier melt will become the primary source of uncertainty. I recognize that historical inflows into Downton and Carpenter have ranged from 400 to 900 cms during the months of May to July.

To manage the high level of uncertainty in the forecast of inflows to both reservoirs, which determines the volume of water to be discharged downstream, BC Hydro is requesting to amend the shape and upper boundary of the annual average hydrograph by discharging up to 200 cms, if required. I understand that this is intended to provide the flexibility to manage both Downton and Carpenter Reservoir elevations should the increased water supply forecast continue across the spring and summer and should there be further restrictions in discharge capacity at Bridge Generating Stations. In addition, this will enable maintenance of a working buffer in Carpenter Reservoir to reduce the likelihood of larger spill events down lower Bridger River during summer and fall storms.

I understand that BC Hydro will monitor, observe, and document any potential impacts during the ramp up and environmental monitoring and fish salvage will be under taken during the ramp down. I recognize that the operational conditions and inflows will dictate what the final peak level of the discharge may be, with a peak of 200 cms being a possibility. In addition, I understand that BC Hydro, as informed by discussions with Department of Fisheries (DFO), Ministry of Forests, Lands and Natural Resource Operations (FLNRO) and the St’at’imc on May 13, 2016, will consider the principles as identified at the May 13, 2016 meeting and the WUP Order in the implementation of the request.

The table below outlines the requested Terzaghi hydrograph target flows and depicts the flows to date from March 1- May 20:

Date	Target Flows (cms): Annual Budget 6 cms	Date	Target Flows (cms): Annual Budget ~29 cms
March 1-31	3	March 1-14	3
April 1-13	6	March 15-17	25
April 14-21	8.5	March 18-20	31
April 22- May 5	11	March 21-April 7	37
May 6-19	13	April 8-20	47
May 20-30	14	April 20-May 20	55
May 31- July 30	15	May 21- 22	67
July 31	12.9	May 23- 24	81

Aug 1-6	11	May 25- 26	96
Aug 7	9.3	May 27-29	112
Aug 8-14	7.7	May 30-31	131
Aug 15	6.4	June 1-2	150
Aug 16-21	5.1	June 3-5	175
Aug 22	4.1	June 6-12	200
Aug 23- Sept 29	3	June 13-14	175
Sept 30- Dec 31	1.5	June 15-16	150
Jan 1-31	1.5	June 17-19	131
Feb 1-29	2	June 20- 21	112
		June 22-23	96
		June 24-26	81
		June 27-28	67
		June 29- July 3	55
		July 4- 7	50
		July 8- 13	45
		July 14- 21	40
		July 22	35
		July 23	30
		July 24- Aug 9	24
		Aug 10- 18	20
		Aug 19-23	18
		Aug 24	15
		Aug 25	13
		Aug 26	11
		Aug 27	9.3
		Aug 28	7.7
		Aug 29	6.4
		Aug 30	5.1
		Aug 31	4.1
		Sept 1-12	3.5
		Sept 13-26	2.8
		Sept 27	1.9
		Sept 28	1.2
		Sept 29- Dec 31	0.8
		Jan 1-11	1.5
		Jan 12-23	2
		Jan 24-31	3.5
		Feb 1-7	10
		Feb 8-21	20
		Feb 22- Feb 28	25

I understand that BC Hydro will operate the Terzaghi flows between a 6.0cms and 29.0cms annual water budget. The transition between target flows will occur as outlined in the table above, in addition to meeting the ramping rates as outlined by Clause 10 of the Bridge Water Use Plan Order (March 31, 2011). Target monthly flows less than 5.0 cms may vary instantaneously by ± 0.25 cms, whereas target monthly flows greater than 5.0 cms may vary instantaneously by $\pm 5\%$. Flow changes from May 20 to August 3, 2016 may occur ± 1 day from the dates identified in the table above. Flow changes from September 1 to May 20 may occur ± 3 days from the dates identified in the table above. The target flows for the 29 cms annual water budget must not be exceeded. BC Hydro will contact the Comptroller of Water Rights immediately for flow scenarios that fall outside of 6.0cms and 29.0cms and will notify and/or gain support, when required, from the Department of Oceans and Fisheries and the Ministry of Forest, Lands and Natural Resource Operations (fisheries).

I recognize that the Terzaghi flow range will be used to manage the upper reservoirs per the Downton Interim Risk Management Plan and the Bridge WUP Order Clause 7 for Carpenter Reservoir and is not intended for meeting flood routing requirements per the Bridge Water Use Plan Priority 2 under Clause 18. BC Hydro will still be required to meet the ramping rates as outlined by Clause 10 of the Bridge Water Use Plan Order (March 31, 2011).

I understand that the hydrograph was developed with input from the Department of Fisheries and Oceans (DFO), Ministry of Forests, Lands and Natural Resource Operations (Fisheries), and the St'at'imc technicians through a meeting held on May 13, 2016. I note that the Department of Fisheries and Oceans and the Ministry of Forests, Lands and Natural Resource Operations (Fisheries) both endorse the variance order request. I have received communication from the St'at'imc, on May 4, 2016, and understand that they have agreed to work with BC Hydro to find such solutions by the end of 2016 with regards to the Bridge system before any multi-year variance is requested.

Under Section 93 of the *Water Sustainability Act*, I approve the increase in annual average flow releases at Terzaghi Dam to be between 6.0cms and 29.0cms for the period of May 20, 2016 to February 28, 2017 as per the terms and conditions outlined above. The transition between target flows will occur as outlined above, in addition to meeting the ramping rates as outlined by Clause 10 of the Bridge Water Use Plan Order (March 31, 2011). BC Hydro is to notify the Comptroller of Water Rights of every time flow is ramped up and ramped down at Terzaghi Dam between the period of May 20 and August 31, 2016, in addition to any mitigation measures occurring with the changes. BC Hydro is required to submit to the Comptroller of Water Rights office by September 30, 2016 a record of the actual flows released from the Terzaghi Dam for the period of January 1 to August 31, 2016. In addition, BC Hydro will be financially responsible for any additional or amended monitoring and habitat rehabilitation needed as a result of these flow changes.

If for some reason any of the terms and conditions outlined in this order cannot be met this office needs to be notified immediately.

Yours truly,

A handwritten signature in black ink, appearing to read 'G. Davidson', written in a cursive style.

Glen Davidson, P.Eng.
Comptroller of Water Rights

pc: Rich McCleary, Regional Aquatic Ecologist, Thompson-Okanagan Region, FLNR
Dan Snee, Habitat Assessment Biologist, DFO
Chief Don Harris, Chair, St'at'imc Chiefs Council, Lillooet, BC