

C O L U M B I A R I V E R T R E A T Y

AGREEMENT

on

SPECIAL OPERATING PLAN FOR CANADIAN STORAGE

DURING PERIOD 1 AUGUST 1968 THROUGH 31 JULY 1969

The Special Operating Program for Canadian Storage during the period 1 April 1968 through 30 June 1969 was agreed to by the Canadian and United States Entities on February 29, 1968. A more detailed plan for implementation of the agreed-upon program is required for operating purposes. The Canadian Entity and the United States Entity agree that the attached "Special Operating Plan for Canadian Storage During the Period 1 August 1968 Through 31 July 1968" dated 27 August 1968 carries out this objective.



H. L. Keenleyside
Chairman
British Columbia Hydro and
Power Authority
Canadian Entity



H. R. Richmond
Chairman
United States Entity

10. 15. 1968

(Date signed)

Sept 19, 1968

(Date signed)

27 August 1968

COLUMBIA RIVER TREATY
SPECIAL OPERATING PLAN FOR CANADIAN STORAGE DURING THE PERIOD
1 AUGUST 1968 THROUGH 31 JULY 1969

1. INTRODUCTION

The Special Operating Program for Canadian Storage for the period
* 1 April 1968 through 30 June 1969, dated 26 February 1968, was agreed
by the Canadian and United States Entities on 29 February 1968. This
Program provides that an Operating Rule Curve be developed for each of
Duncan and Arrow storages for the period 1 August 1968 through 30 June 1969,
and that an Operating Rule Curve for the whole of the Canadian Storage be
prepared by combining the Operating Rule Curves for Duncan and Arrow
Reservoirs. During this period the actual operation of the whole of the
Canadian Storage for power purposes will be guided by this Operating Rule
Curve in accordance with Section 22 of the Principles and Procedures for
the Preparation and Use of Hydroelectric Operating Plans for Canadian
Treaty Storage.

This Special Operating Plan presumes that the Duncan storage will be
fully operative for power and for flood control during the period 1 August
1968 through 31 July 1969; that Arrow storage will be operative for power
to a content not exceeding an elevation of 1404 feet on the Lower Arrow
Lake during the period 1 August 1968 through 31 March 1969 and thereafter
to 31 July 1969 will be fully operative for power; and that Arrow storage
will be fully operative for flood control commencing on or before
15 December 1968 through 31 July 1969.

The Canadian and United States Entities agree that operation of Canadian Storage during the period 1 August 1968 through 31 July 1969 will be as described herein.

2. REFERENCES

The Canadian and United States Entities have agreed on the following related documents:

- (a) "Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Treaty Storage," dated July 25, 1967, hereinafter referred to as the "Principles and Procedures;"
- (b) "Program for Initial Filling of Arrow Reservoir Fully Operative April 1, 1969," dated July 26, 1967, hereinafter referred to as the "Program for Initial Filling of Arrow."

In addition, it is expected the Entities will have agreed to the "Flood Control Operating Plan for Columbia River Treaty Storage" by 1 December 1968, hereinafter referred to as the "Flood Control Operating Plan."

3. OPERATING RULE CURVE

The Operating Rule Curve for each of Duncan and Arrow reservoirs during the period 1 August 1968 through 31 July 1969, to be determined in accordance with the reference documents of Section 2, is defined as follows:

- (a) During 1 August 1968 through 31 December 1968, it is the higher of the Critical Rule Curve and the Assured Refill Curve, except that under no conditions shall it be higher than the Upper Rule Curve.
- (b) During 1 January 1969 through 31 July 1969, it is the lower of the Assured Refill Curve, the Variable Refill Curve and the Upper Rule Curve.

The foregoing curves for Duncan and Arrow reservoirs and for the whole of Canadian Storage, in terms of end-of-month storage content are shown in the attached exhibits or developed therefrom:

Duncan

- (a) Critical Rule Curve and Assured Refill Curve Exhibit 1
- (b) Upper Rule Curve:
 - (i) Volume Inflow Forecasting Procedure Exhibit 2
 - (ii) Flood Control Storage Reservation Diagram Exhibit 3
- (c) Variable Refill Curve Exhibit 4

Arrow

- (a) Critical Rule Curve and Assured Refill Curve Exhibit 1
- (b) Upper Rule Curve:
 - Flood Control Storage Reservation Diagram Exhibit 5

Whole of Canadian Storage

- Critical Rule Curve and Assured Refill Curve Exhibit 1

NOTE:

- (1) The seasonal volume inflow forecast for the Columbia River at The Dalles supplied by the United States Section of the Operating Committee shall be used to obtain the upper rule curve for Arrow.
- (2) The variable refill curve for the whole of Canadian storage is the sum of the month-end storage contents as given by Duncan variable refill curve and the Arrow assured refill curve.

4. OPERATION

The operation of Canadian Storage during the period 1 August 1968 through 31 July 1969 will be in accordance with the reference documents of Section 2, guided by the Operating Rule Curves determined in accordance with Section 3.

5. SCHEDULING STORAGE REGULATION

- (a) The Entities will exchange all current operating data necessary to the regulation of Canadian Storage content.
- (b) Unless otherwise agreed, requests by the United States Entity for the regulation of the whole of the Canadian Storage water will be made to the Canadian Entity on a regular weekly basis in accordance with the following procedures:

(i) Timing of Weekly Requests

- (1) A preliminary request will be made not later than noon each Thursday, followed by a final request by noon Friday.
- (2) Written confirmation of the request will be dispatched on Friday.

(ii) Period covered by Request

From 0000 hours on the Sunday following the weekly request to 2400 hours Saturday one week later.

(iii) Discrepancies

The Canadian Entity will release or store as nearly as possible the amounts specified in the request for that week. Each request is to take into account adjustments if any, which the United States Entity considers necessary for

previous inadvertent over or under releases of water from storage.

(iv) Release Determinations

The amount of water released or stored during the period of the request will be determined by the changes in reservoir elevation at Duncan and Arrow. The change in Arrow storage content will be determined using the gauge near Needles, B. C. for the Lower Arrow Lake and using the gauge near Nakusp, B. C. for the Upper Arrow Lake. The reservoir volume tables which will be used are for Duncan dated 24 April 1968 and for Upper Arrow and Lower Arrow dated April 1968.

(v) Delivery

Requested storage releases will be made effective at the Canadian-United States border. The request will be deemed to have been fulfilled if the total amount of storage water requested is released from Duncan and Arrow reservoirs, provided an amount equal to or greater than the Duncan storage water release is concurrently discharged past Corra Linn dam. Requests of the United States Entity will recognize that at the lower elevation, discharge of storage from Arrow reservoir may be limited because of the restrictions between the Upper and Lower Lakes.

(vi) Modifications

If any modification to a written request is agreed between the Entities, a further written request superseding the original written request will be dispatched immediately by the U. S. Entity to the Canadian Entity.

SPECIAL OPERATING PLAN FOR THE DUNCAN RESERVOIR

VOLUME INFLOW FORECASTING PROCEDURE

1968-69

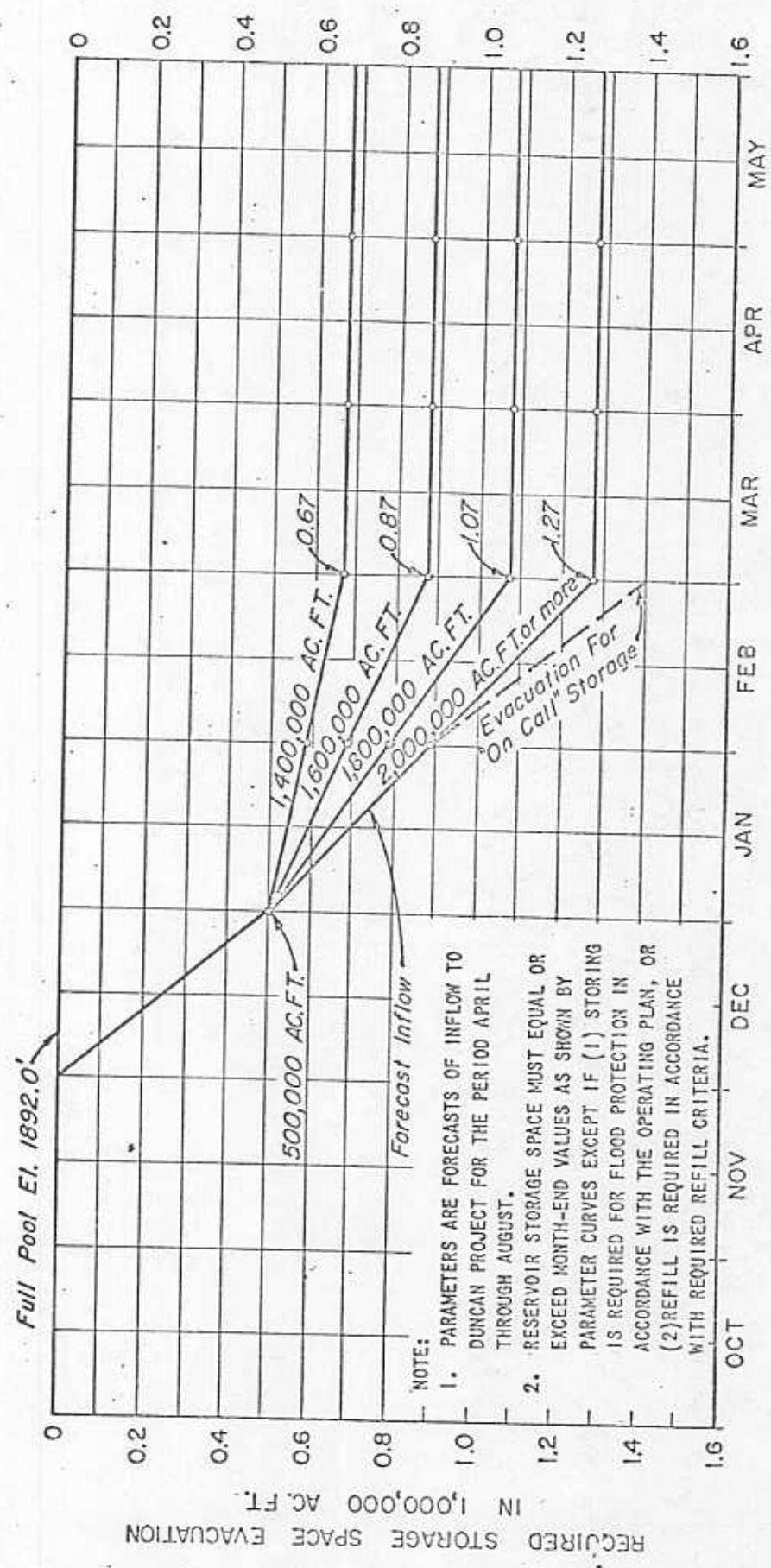
Date	Month											
	Jan 1:	Feb 1:	Mar 1:	Apr 1:	May 1:	Jun 1:	Jul 1:	Aug 1:	Sep 1:	Oct 1:	Nov 1:	Dec 1:
Weights:												
0.6												
0.4												
23.78	35.67	12.07	12.07	12.07	12.07	42.08	32.73	23.38	9.35			

RESERVOIR EQUIVALENT

Monthly Weight	31.26	31.26	31.26	31.26								
3 x line 7												
related line 8												
Source												
16.03												
12.09												
related Sum												
Median Subsequent	1303.9	1148.3	1022.7	779.8	706.6	634.3	563.4	531.0	515.9			
Jan-July Runoff 1000 AF												
% of 19__ - Average												
Apr-Aug Runoff 1000 AF												
(1.193 x line 14 - 104.7)												
% of 19__ - Average												

Station and snow water equivalent in inches.
 line 14 is line 6 plus either line 9 or 12 plus line 13.

DUNCAN PROJECT
FLOOD CONTROL
STORAGE RESERVATION DIAGRAM



NOTE:

1. PARAMETERS ARE FORECASTS OF INFLOW TO DUNCAN PROJECT FOR THE PERIOD APRIL THROUGH AUGUST.
2. RESERVOIR STORAGE SPACE MUST EQUAL OR EXCEED MONTH-END VALUES AS SHOWN BY PARAMETER CURVES EXCEPT IF (1) STORING IS REQUIRED FOR FLOOD PROTECTION IN ACCORDANCE WITH THE OPERATING PLAN, OR (2) REFILL IS REQUIRED IN ACCORDANCE WITH REQUIRED REFILL CRITERIA.

Full Pool El. 1892.0'

SPECIAL OPERATING PLAN FOR THE DUNCAN RESERVOIR
 95 PERCENT CONFIDENCE FORECAST AND VARIABLE REFILL CURVE
 COMPUTATION FORM
 1968-69

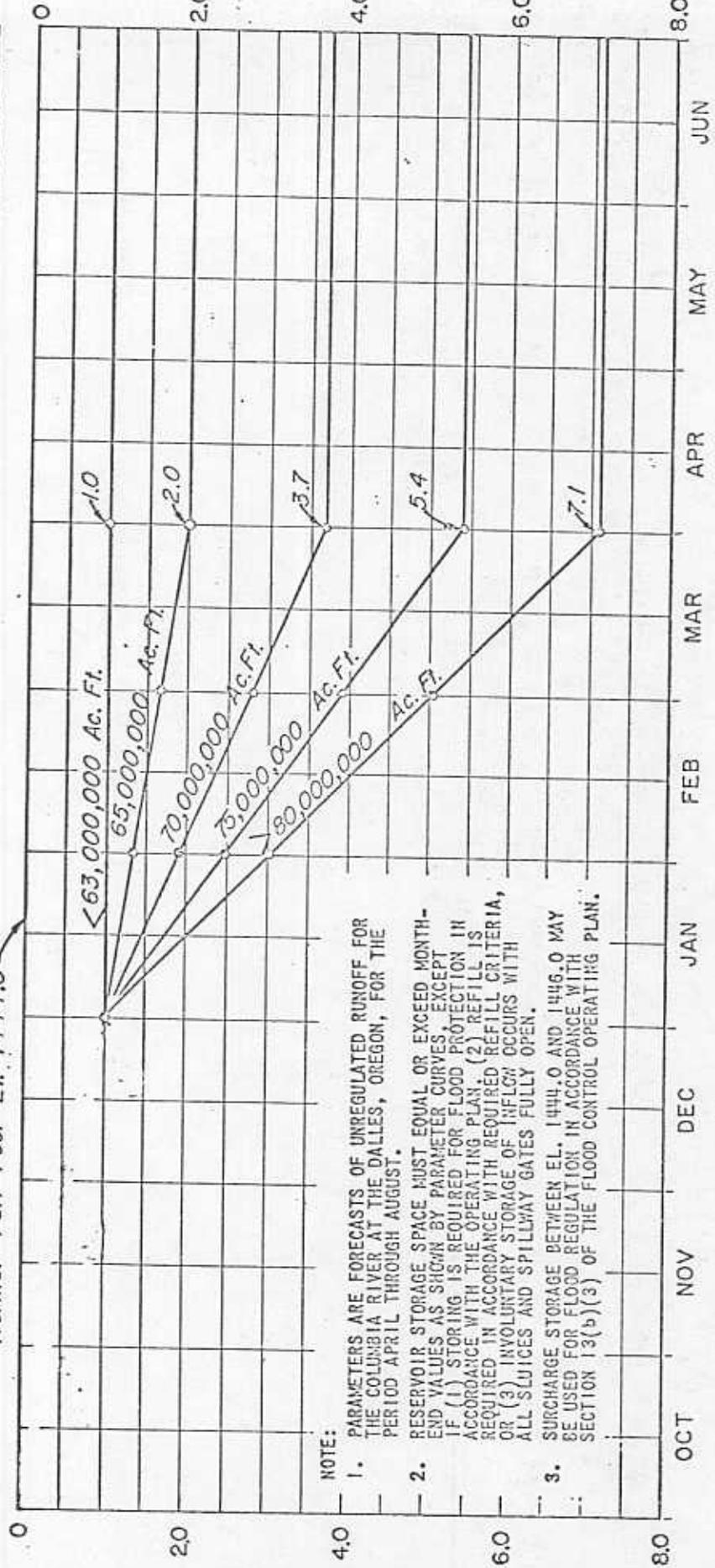
Forecast Date	Jan 1	Feb 1	Mar 1	Apr 1	May 1	Jun 1
1 Probable Jan 1-Jul 31 inflow, ksf <u>1/</u>						
2 95% forecast error, ksf						
3 95% confidence Jan 1-Jul 31 inflow, ksf <u>2/</u>	<u>193.0</u>	<u>177.0</u>	<u>164.0</u>	<u>119.0</u>	<u>111.0</u>	<u>103.0</u>
4 Observed Jan 1-date inflow, ksf	0.0					
5 Residual 95% date-Jul 31 inflow, ksf <u>3/</u>						
Assumed Feb 1-Jul 31 inflow, % of volume	97.94					
Assumed Feb 1-Jul 31 inflow, ksf <u>4/</u>						
Min. Feb 1-Jul 31 outflow, ksf	<u>18.1</u>					
Jan 31 Variable Refill Curve, ksf <u>5/</u>	<u> </u>					
Assumed Mar 1-Jul 31 inflow, % of volume	96.23	98.25				
Assumed Mar 1-Jul 31 inflow, ksf <u>4/</u>						
Min. Mar 1-Jul 31 outflow, ksf	<u>15.3</u>	<u>15.3</u>				
Feb 28 Variable Refill Curve, ksf <u>5/</u>	<u> </u>	<u> </u>				
Assumed Apr 1-Jul 31 inflow, % of volume	94.30	96.28	98.00			
Assumed Apr 1-Jul 31 inflow, ksf <u>4/</u>						
Min. Apr 1-Jul 31 outflow, ksf	<u>12.2</u>	<u>12.2</u>	<u>12.2</u>			
Mar 31 Variable Refill Curve, ksf <u>5/</u>	<u> </u>	<u> </u>	<u> </u>			
Assumed May 1-Jul 31 inflow, % of volume	88.94	90.80	92.42	94.31		
Assumed May 1-Jul 31 inflow, ksf <u>4/</u>						
Min. May 1-Jul 31 outflow, ksf	<u>9.2</u>	<u>9.2</u>	<u>9.2</u>	<u>9.2</u>		
Apr 30 Variable Refill Curve, ksf <u>5/</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		
Assumed Jun 1-Jul 31 inflow, % of volume	66.90	68.30	69.52	70.94	75.22	
Assumed Jun 1-Jul 31 inflow, ksf <u>4/</u>						
Min. Jun 1-Jul 31 outflow, ksf	<u>6.1</u>	<u>6.1</u>	<u>6.1</u>	<u>6.1</u>	<u>6.1</u>	
May 31 Variable Refill Curve, ksf <u>5/</u>	<u> </u>					
Assumed Jul 1-31 inflow, % of volume	32.03	32.71	33.29	33.97	36.02	47.85
Assumed Jul 1-31 inflow, ksf <u>4/</u>						
Min. Jul 1-31 outflow, ksf	<u>3.1</u>	<u>3.1</u>	<u>3.1</u>	<u>3.1</u>	<u>3.1</u>	<u>3.1</u>
Jun 30 Variable Refill Curve, ksf <u>5/</u>	<u> </u>					
Jul 31 Variable Refill Curve, ksf	<u>711.4</u>	<u>711.4</u>	<u>711.4</u>	<u>711.4</u>	<u>711.4</u>	<u>711.4</u>

1/ 0.50417 times line 14 of Exhibit 2.
 2/ Line 1 - line 2.
 3/ Line 3 - line 4.
 4/ Preceding line x line 5.
 5/ All content (711.4 ksf) plus preceding line less line preceding that.

ARROW PROJECT
FLOOD CONTROL
STORAGE RESERVATION DIAGRAM

Surcharge Pool El. 1446.0'

Normal Full Pool El. 1444.0'



REQUIRED STORAGE SPACE EVACUATION
IN 1,000,000 AC. FT.

NOTE:

1. PARAMETERS ARE FORECASTS OF UNREGULATED RUNOFF FOR THE COLUMBIA RIVER AT THE DALLES, OREGON, FOR THE PERIOD APRIL THROUGH AUGUST.
2. RESERVOIR STORAGE SPACE MUST EQUAL OR EXCEED MONTH-END VALUES AS SHOWN BY PARAMETER CURVES, EXCEPT IF (1) STORING IS REQUIRED FOR FLOOD PROTECTION IN ACCORDANCE WITH THE OPERATING PLAN, (2) REFILL IS REQUIRED IN ACCORDANCE WITH REQUIRED REFILL CRITERIA, OR (3) INVOLUNTARY STORAGE OF INELCOW OCCURS WITH ALL SLUICES AND SPILLWAY GATES FULLY OPEN.
3. SURCHARGE STORAGE BETWEEN EL. 1444.0 AND 1446.0 MAY BE USED FOR FLOOD REGULATION IN ACCORDANCE WITH SECTION 13(b)(3) OF THE FLOOD CONTROL OPERATING PLAN.