COLUMBIA RIVER TREATY

AGREEMENT

on

DETAILED OPERATING PLAN FOR CANADIAN STORAGE

DURING THE OPERATING YEAR 1 JULY 1970 THROUGH 31 JULY 1971

The Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Treaty Storage, agreed by the Entities on 25 July 1967, provide that the Entities develop a Detailed Operating Plan for each year's actual operation. The Canadian Entity and the United States Entity herewith agree that the Canadian storage will be operated in accordance with the attached "Columbia River Treaty Detailed Operating Plan for Canadian Storage -- 1 July 1970 through 31 July 1971," dated 15 September 1970.

Ray G. Williston
Chairman
Canadian Entity

October 21 1970
(Date signed)

H. R. Richmond
Chairman
United States Entity

OCT 16 1970
(Date signed)

COLUMBIA RIVER TREATY

DETAILED OPERATING PLAN FOR CANADIAN STORAGE

1 July 1970 through 31 July 1971

15 September 1970

15 September 1970

COLUMBIA RIVER TREATY
DETAILED OPERATING PLAN FOR CANADIAN STORAGE
1 July 1970 through 31 July 1971

1. INTRODUCTION

The Detailed Operating Plan for Canadian Storage has been developed from the Assured Operating Plan previously agreed for the operating year 1 July 1970 through 31 July 1971 pursuant to Part III of the Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans for Canadian Storage. The Detailed Operating Plan also incorporates provisions of the Interim Flood Control Operating Plan for Duncan and Arrow Reservoirs dated 12 November 1968. This operating plan consists of the data and criteria required for the formulation and use of Operating Rule Curves for each of the Canadian storage reservoirs, Duncan and Arrow, and for the combined storage. The usable storage content available for power purposes for the operating year is 711.4 thousand second-foot-days (1411.0 thousand acre-feet) at Duncan between elevations 1892.0 and 1792.4 feet and 3602.3 thousand second-foot-days (7145.0 thousand acre-feet) at Arrow between elevations 1444.0 and 1377.0 feet. Storage in Arrow reservoir was made available after 1 July 1970 to elevation 1446.0 feet and this storage was filled by 16 July 1970. However, this surcharge storage is not a part of this operating plan. For normal flood control use during this operating year, the maximum usable storage is 640.3 thousand second-foot-days (1270.0 thousand acre-feet) at Duncan and 3579.6 thousand second-foot-days (7100.0 thousand acre-feet) at Arrow except that additional storage to elevation 1446.0 feet in Arrow may be required by extraordinary large floods in accordance with the Flood Control Plan.

2. REFERENCES

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

a. "Columbia River Treaty Hydroelectric Operating Plans for Canadian Storage," dated 15 February 1969, herein referred to as the "Assured Operating Plans";

b. "Principles and Procedures for the Preparation and Use of Hydro-Electric Operating Plans for Canadian Treaty Storage," dated 25 July 1967, herein referred to as the "Principles and Procedures";

c. "Interim Flood Control Operating Plan for Duncan and Arrow Reservoirs," dated 12 November 1968, herein referred to as the "Flood Control Plan."

3. OPERATING RULE CURVE

The Operating Rule Curve for each of Duncan and Arrow reservoirs during the period 1 July 1970 through 31 July 1971, to be determined in accordance with the reference documents of Section 2, is defined as follows:

a. During 1 July 1970 through 31 December 1971, 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 Flood Control Storage Reservation Curve.

b. During 1 January 1971 through 31 July 1971, it is the lower of the Assured Refill Curve and the Variable Refill Curve.

4. OPERATION

The operation of Canadian Storage by the Columbia River Treaty Operating Committee during the period 1 July 1970 through 31 July 1971 will be in accordance with the reference documents of Section 2, and the following operating guides:

a. Critical Rule Curve and Assured Refill Curve for Duncan, Arrow and the whole of Canadian Storage. — Exhibit 1

b. Flood Control Storage Reservation Diagram for Duncan. — Exhibit 2

c. Flood Control Storage Reservation Diagram for Arrow. — Exhibit 3

NOTES

(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 Flood Control Storage Reservation Curve for Arrow.

(2) The volume inflow forecasting and Variable Refill Curve procedures for Duncan and Arrow shall be as set out in document entitled, "Runoff Volume Forecast Program for Canadian Columbia River Treaty Reservoirs," dated 15 August 1969, with subsequent modifications agreed to by the Operating Committee.

(3) The Variable Refill Curve for the whole of Canadian storage is the sum of the month-end storage contents as given by Duncan and Arrow Variable Refill Curves.

5. SCHEDULING STORAGE REGULATION

a. The Operating Committee will exchange all current operating data necessary to the regulation of Canadian Storage projects.

b. Unless otherwise agreed, requests by the U.S. Section of the Operating Committee for the regulation of the Canadian Storage content will be made to the Canadian Section of the Operating Committee on a regular basis in accordance with the following procedures:

(1) Weekly Requests for Storage Regulation During the Storage Drawdown Season.

(a) Timing of Requests. A preliminary request will be made not later than noon each Thursday, followed by a final request by noon Friday if necessary.

(b) Confirmation of Requests. Written confirmation of the request will be dispatched on Friday in accordance with the following format:

"This message will confirm our verbal request of this date for the (storing/drafting) of _____ KSFD (in/from) the whole of Canadian storage for the period (____(date)____) through (____(date)____). This request is based on an estimated average inflow of _____ KCFS to Arrow Lakes and of _____ KCFS to Duncan Lake during the above mentioned period. It is our understanding that during this period the Canadian Entity plans to discharge an average of _____ KCFS from the Arrow Lakes project and _____ KCFS from the Duncan Project."

(c) Period Covered by Request. The period covered by the request shall be from 0800 hours on the Sunday following the date of the weekly request to 0800 hours on the Sunday a week later.

(d) 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 Fauquier, 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.

(e) 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 U.S. Section of the Operating Committee will recognize that at low elevations discharge of storage from Arrow reservoir may be limited because of channel restrictions between the Upper and Lower Lakes.

(f) Modifications. If any modification to a written request is agreed by the Operating Committee, a further written request superseding the original written request will be dispatched immediately by the U.S. Section of the Operating Committee to the Canadian Section of the Operating Committee.

(g) Non-Routine Operation. Any special operation which is agreed by the Operating Committee will be suitably documented.

(2) Daily Request for Storage Regulation During the Flood Control Season.

(a) Forecasts. Seasonal runoff volume forecasts shall be made available by the Section responsible for the forecast no later than the seventh of each month, as required. Forecasts of

seasonal runoff volume at periods other than those representing month-end conditions may be requested by the Operating Committee if hydrologic conditions warrant. Day-to-day streamflow forecasts will be accomplished by use of computer simulation by the Cooperative Columbia River Forecasting Unit. The regulation center required by the Flood Control Plan for the flood regulation will be located in the North Pacific Division office, Corps of Engineers, in Portland, Oregon.

(b) Daily Requests for Project Outflows. Pursuant to the operating rules in the Flood Control Plan, during the flood control refill period, the release from Canadian storage projects are specified on a day-to-day basis as project outflows. Requests will be coordinated by telephone daily or on an as-needed basis, by conference calls between the members of the Operating Committee or their authorized assistants. Daily requests for project outflows will be documented by message dispatched on the Columbia Basin Teletype Circuit from the regulation center in Portland, Oregon. Best efforts will be made to issue such requests by 1200 hours of each day. The requests will normally prescribe the requested outflows as a mean daily discharge in cubic feet per second, for the 24-hour period from noon-to-noon of each day. Acknowledgement of the teletype request will be made by the Canadian authority by teletype message. The project outflows from Canadian projects will be determined from gaged values by methods as agreed upon for the Hydrometeorological Reporting Network. Any modification of the

documented daily request shall be agreed upon by the Operating Committee before being put into effect, and shall be documented by teletype immediately thereafter.

(3) Regulation of Winter Floods. Daily requests for project outflows from Canadian projects are normally confined to the flood control refill period. During periods of high winter flows in the lower Columbia River, where the regulation of Arrow storage would aid in the control of winter floods, the outflows from Arrow will be regulated on a day-to-day basis in accordance with the requests of the U.S. Section of the Operating Committee. The requests for such regulation will be in accordance with procedures described above.

6. OPERATING LIMITS

a. Duncan Project.

(1) Maximum outflow - 20,000 cfs through outlets.

(2) Minimum average weekly outflow - 100 cfs.

(3) Maximum rate of change in outflow - 4,000 cfs per day.

(4) Normal full pool elevation - 1,892 feet.

(5) Minimum pool elevation - 1,792.4 feet.

b. Arrow Project.

(1) Maximum outflow - physical limits only.

(2) Minimum average weekly outflow - 5,000 cfs.

(3) Maximum rate of change in outflow - 25,000 cfs per day.

(4) Normal full pool elevation - 1,444 feet.

(5) Minimum pool elevation - 1,377 feet.

(6) Advance notice for changes in outflow for:

(a) Drop in downstream level of:

1/2 foot	None
1 foot	1 hour
2 feet	2 hours
3 feet or more	24 hours

(b) Rise in downstream level of:

1/2 foot	None
1 foot	1 hour
2 feet	2 hours
3 feet	7 hours - only if notice is received early (before 1000 hours) in the day. Otherwise 24-hour notice is required.
More than 3 feet	24 hours

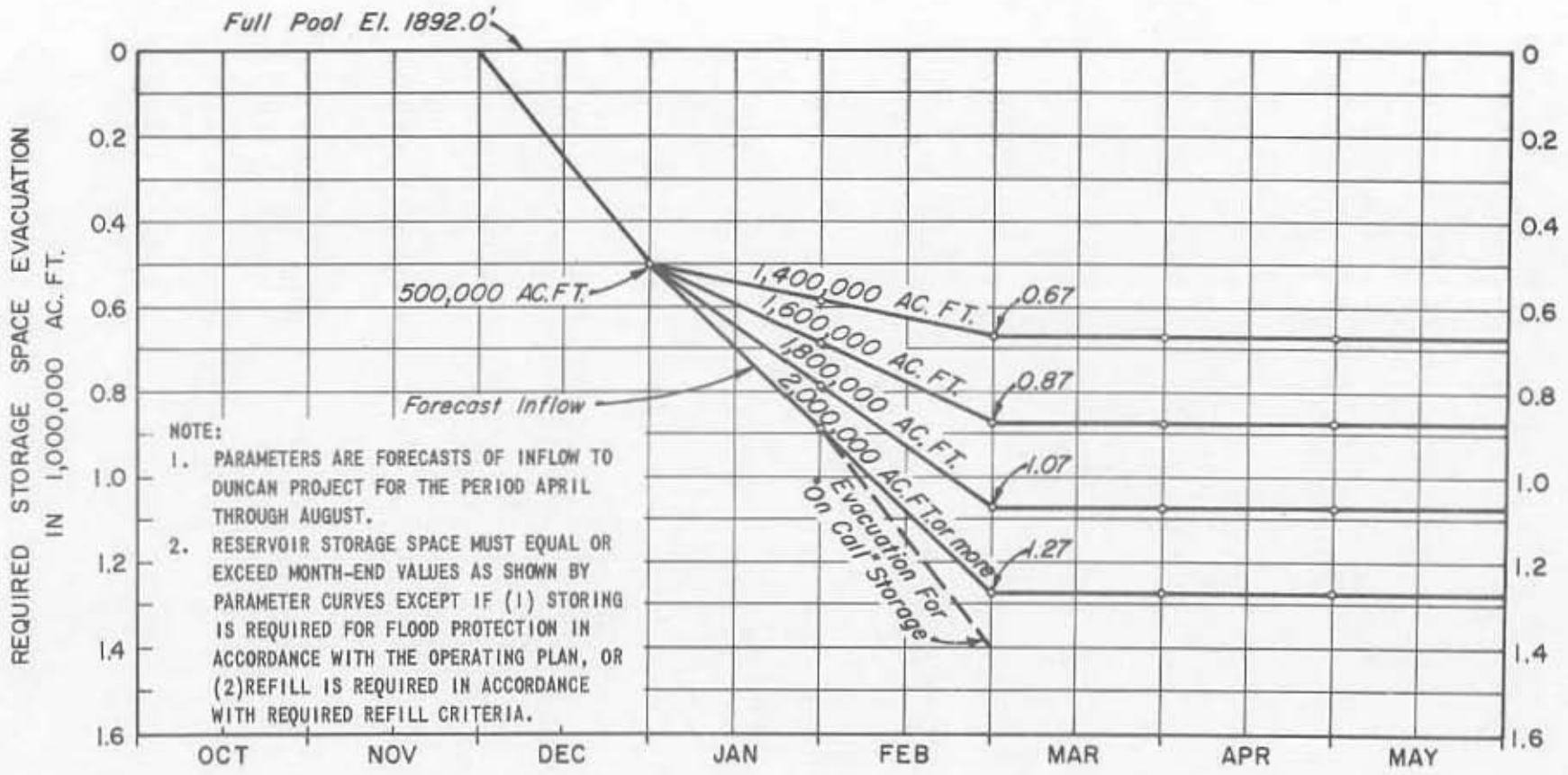
NOTE: Each 5,000 cfs change causes about one foot variation in the downstream level.

EXHIBIT 1

DETAILED OPERATING PLAN FOR CANADIAN STORAGE
CRITICAL RULE CURVE & ASSURED REFILL CURVE
1970-71

End-of-Month Usable Storage Content in 1000 SFD

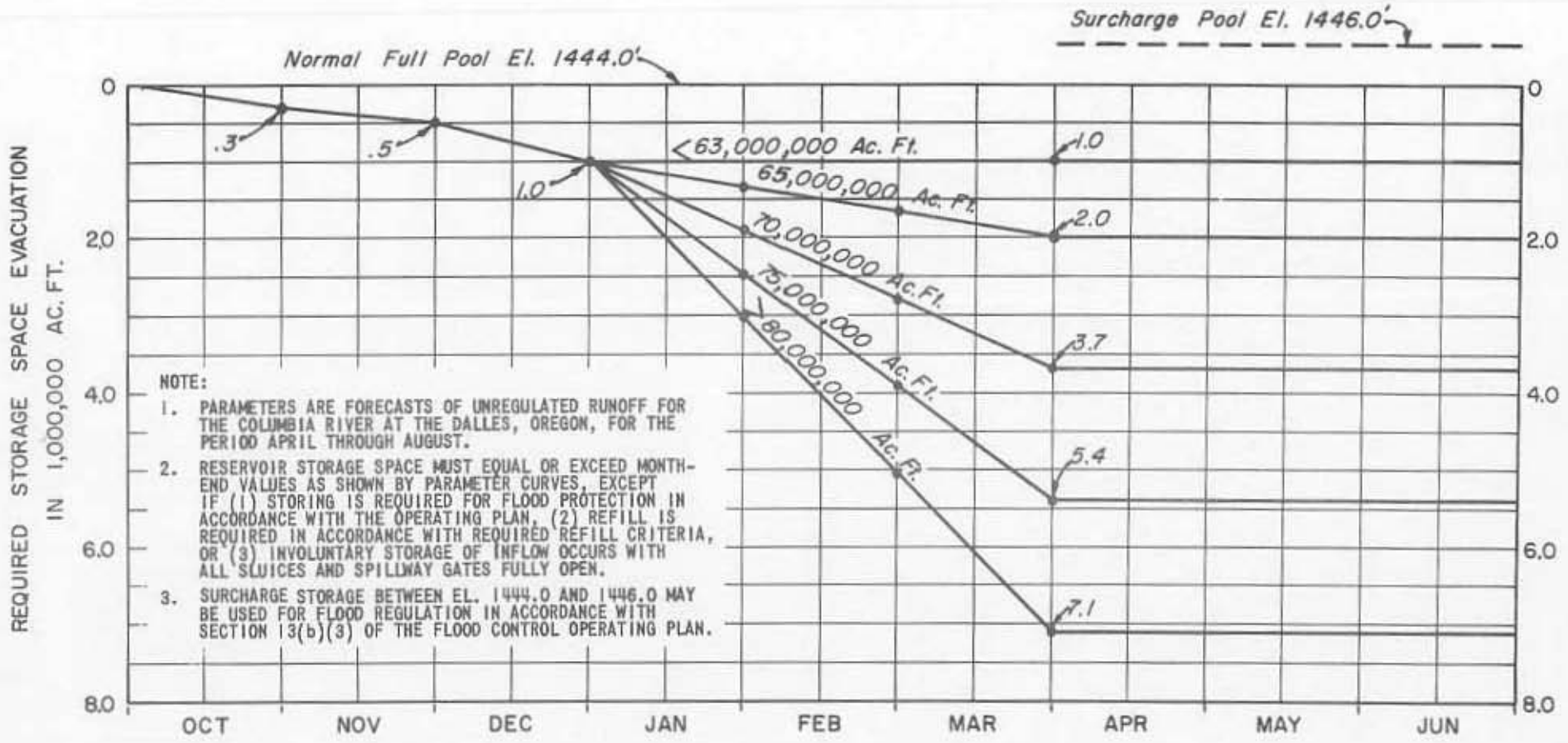
Month	Critical Rule Curve			Assured Refill Curve		
	Duncan	Arrow	Total	Duncan	Arrow	Total
July	711.4	3602.3	4313.7	--	--	--
August	711.4	3597.7	4309.1	--	--	--
September	598.1	3458.1	4056.2	--	--	--
October	471.6	3203.7	3675.3	--	--	--
November	298.4	2473.8	2772.2	--	--	--
December	141.0	1398.0	1539.0	--	--	--
January	0.0	0.0	0.0	102.6	0.0	102.6
February	0.0	0.0	0.0	108.7	0.0	108.7
March	0.0	0.0	0.0	117.8	0.0	117.8
April	2.6	0.0	2.6	134.6	0.0	134.6
May	131.3	318.9	450.2	251.8	659.0	910.8
June	379.7	2388.6	2768.3	525.7	2388.6	2914.3
July	628.8	3602.3	4231.1	711.4	3602.3	4313.7



DUNCAN PROJECT
FLOOD CONTROL
STORAGE RESERVATION DIAGRAM

FLOOD CONTROL OPERATING PLAN
COLUMBIA RIVER TREATY
JULY 1968

EXHIBIT 2



ARROW PROJECT
FLOOD CONTROL
STORAGE RESERVATION DIAGRAM
PRE-MICA CONDITIONS

FLOOD CONTROL OPERATING PLAN
COLUMBIA RIVER TREATY
JULY 1968

EXHIBIT 3