

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE

1 AUGUST 1992
THROUGH 31 JULY 1993



COLUMBIA RIVER TREATY OPERATING COMMITTEE

NOVEMBER 1992

**DETAILED OPERATING PLAN
FOR COLUMBIA RIVER TREATY STORAGE
1 AUGUST 1992 THROUGH 31 JULY 1993**

1. REFERENCES AND INTERPRETATION

In this document:

- a. "Principles and Procedures" means the document "Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans," dated December 1991.
- b. "Assured Operating Plan" means the document "Columbia River Treaty Hydroelectric Operating Plan-Assured Operating Plan for Operating Year 1992-1993," dated September 1988.
- c. "Flood Control Plan" means the document "Columbia River Treaty Flood Control Operating Plan," October 1972.
- d. "Operating Year" means the period from 1 August 1992 through 31 July 1993.
- e. "Operating Committee" means the Columbia River Treaty Operating Committee.
- f. "Detailed Operating Plan" means a detailed operating plan prepared for the Operating Year by the Operating Committee pursuant to the Principles and Procedures and consisting of the contents of this document.
- g. "Runoff Volume Forecast Program for Canadian Columbia River Treaty Reservoirs" means the document of that title dated 15 August 1969, with subsequent modifications as agreed by the Operating Committee.
- h. "Actual Energy Regulation" means the simulated hydroregulation study performed by the Coordinating Group that reflects actual streamflow conditions.
- i. "Refill Studies" means multi-water-year hydroregulations that determines the Power Discharge Requirements used in the calculation of the Assured Refill Curves and the Variable Refill Curves.

2. PREPARATION AND SCOPE

This Detailed Operating Plan has been developed from the Northwest Power Pool PNCA Final Regulation for the 1992-93 Operating Year. System load and resource estimates, duration of critical period, flood control and other criteria have been reviewed and revised in accordance with the Principles and Procedures as necessary. The Critical Period duration is 42 months extending from 1 September 1992 through 28 February 1996 with hydro capability based on the 1928-29 through 1931-32 water years.

The data, criteria, and procedures presented herein will be used as described for the formation and use of Operating Rule Curves for each of the Canadian storage reservoirs, Duncan, Arrow, and Kinbasket Lake (Mica), and for the whole of Canadian storage as well as Lake Koocanusa (Libby).

The Entity agreement on the Determination of Downstream Power Benefits for Operating Year 1992-93 indicated that the U.S. Entity is not entitled to receive from B.C. Hydro and Power Authority during the period 1 August 1992 through 31 March 1993, any power in accordance with Sections 7 and 10 of the Canadian Entitlement Purchase Agreement dated 10 August 1964. The Entity agreement on the Determination of Downstream Power Benefits for Operating Year 1993-94 indicated that the U.S. Entity is entitled to receive from B.C. Hydro and Power Authority during the period 1 April 1993 through 31 July 1993, 2.3 MW of capacity and no energy in accordance with Sections 7 and 10 of the Canadian Entitlement Purchase Agreement dated 10 August 1964. Suitable arrangements for delivery of this capacity will be made between the Bonneville Power Administration and B.C. Hydro.

The usable Columbia River Treaty storage space available for power purposes during the Operating Year is 15.5 million acre-feet in Canada and 4.9795 million acre-feet at Libby in the United States, distributed as follows:

Duncan Reservoir

1.4 million acre-feet (705.8 thousand second-foot-days) between elevations 1892.0 feet and 1794.2 feet measured at Duncan forebay. (Based on B.C. Hydro table dated 21 February 1973.)

Arrow Reservoir

7.1 million acre-feet (3579.6 thousand second-foot-days) between elevations 1444.0 feet and 1377.9 feet measured at Fauquier, B.C. (Based on B.C. Hydro table dated 28 February 1974.)

Kinbasket Lake (Mica)

7.0 million acre-feet (3529.2 thousand second-foot-days) measured at Mica forebay. (Based on B.C. Hydro table dated 25 March 1974.)

Lake Koocanusa (Libby)

4.9795 million acre-feet (2510.5 thousand second-foot-days) between elevation 2459.0 feet and 2287.0 feet measured at Libby forebay.

The usable Canadian storage available for normal flood-control purposes for the Operating Year is 1.27 million acre-feet in Duncan Reservoir below elevation 1892.0 feet; 5.1 million acre-feet in Arrow Reservoir below elevation 1444.0 feet; and 2.08 million acre-feet in Kinbasket Lake (Mica Reservoir) except that additional storage may also be operated for flood control purposes under special circumstances, as described in the Flood Control Plan. The foregoing assumes a 2.0 million acre-feet transfer of flood-control storage from Arrow Reservoir to Kinbasket Lake as detailed in the Flood Control Plan.

3. OPERATING RULE CURVE

The Operating Rule Curve for the whole of Canadian Storage shall be the sum of the Operating Rule Curves for each of Duncan, Arrow, and Mica. The Operating Rule Curve for each of the Duncan, Arrow, and Mica Reservoirs during the period 1 August 1992 through 31 July 1993 is determined in accordance with the reference documents of Section 1, and is defined as follows:

- a. During the period 1 August 1992 through 31 December 1992, it is the higher of the First Critical Rule Curve or the Assured Refill Curve.
- b. During the period 1 January 1993 through 31 July 1993 it is the higher of the First Critical Rule Curve or the Assured Refill Curve, unless the Variable Refill Curve is below the higher of the above two curves; then it is defined by the Variable Refill Curve.
- c. During the period 1 January 1993 through 31 March 1993 it will not be lower than a Limiting Rule Curve designed to protect firm loads with recurrence of 1936-37 hydro conditions unless a lower reservoir elevation is required for flood control (Exhibit 6).
- d. During any period in the 1992-93 Operating Year, it will not be higher than the Upper Rule Curve, defined as the maximum elevation of each reservoir established by flood control requirements and may be modified on mutual agreement for construction and other contingency requirements.
- e. Operation of Mica will be in accordance with the monthly average outflows tabulated with specified qualifications under Operating Limits. The obligation to operate Mica to produce optimum benefits in Canada and downstream in the United States will be deemed to have been fulfilled by operating to these criteria.
- f. The Variable Refill Curves for Duncan and Mica shall be constructed based on the power discharge requirement specified in Exhibit 7.
- g. The Variable Refill Curve for Arrow shall be constructed as specified below:
 - (1) If the projected live Mica storage content at the end of the current month using most likely Mica inflow and target outflows (expected live Mica storage content) is less than that computed for the Variable Refill Curve for Mica, the Variable Refill Curve for Arrow will be calculated using the Arrow Local Inflow Method as follows.
 - (a) The forecast volume of inflow for Arrow will exclude the volume of inflow above the Mica project (Arrow local inflow). This volume will be reduced by a forecast error such that there is a 95 percent probability that the reduced forecast is equaled or exceeded.
 - (b) The total Mica target outflow as specified in 6c will be added to the forecast volume described in (a) above.

- (c) In computing water available for refill of Arrow Reservoir the power discharge requirements for Arrow as specified in Exhibit 7 will be deducted from the volume calculated in (b).
 - (d) For the purpose of calculating the rule curve for the whole of Canadian storage, the Variable Refill Curve for Mica will be set equal to the expected live Mica storage content.
- (2) If the expected live Mica storage content is greater than that computed for the Variable Refill Curve for Mica, the Variable Refill Curve for Arrow will be computed using the Arrow Total Inflow Method, i.e., the forecast volume of inflow above the Mica project will be included. The space in Mica to be deducted from the Arrow total inflow will be equal to the amount of storage draft determined by the Operating Rule Curve for Mica as defined in paragraphs 3b and 3c.

The Operating Rule Curve for Libby Reservoir is defined in a manner similar to that for Canadian storage.

4. OPERATIONS

- a. The operation of Treaty storage by the Columbia River Treaty Operating Committee during the period 1 August 1992 through 31 July 1993 will be in accordance with the reference documents of Section 1, and the following operating guides:
 - (1) Assured Refill Curve for Duncan, Arrow, and Mica and the whole of Canadian storage. Exhibit 1
 - (2) First Critical Rule Curve for Duncan, Arrow, and Mica and the whole of Canadian storage. Exhibit 2
 - (3) Second Critical Rule Curve for Duncan, Arrow, and Mica and the whole of Canadian storage. Exhibit 3
 - (4) Third Critical Rule Curve for Duncan, Arrow, and Mica and the whole of Canadian storage. Exhibit 4
 - (5) Fourth Critical Rule Curve for Duncan, Arrow, and Mica and the whole of Canadian storage. Exhibit 5
 - (6) Limiting Rule Curve based on 1936-37 Hydro Conditions. Exhibit 6
 - (7) Variable Refill Curve Procedures. Exhibit 7
 - (8) The First, Second, Third, and Fourth Critical Rule Curves and Assured Refill Curve for Libby. Exhibit 8

b. The following tables, including adjustments, have been agreed to by the Entities:

- | | |
|---|------------|
| (1) Second Critical Rule Curves for Duncan, Arrow, and Mica and the whole of Canadian storage for Operating Year 1993-94. | Exhibit 9 |
| (2) Third Critical Rule Curves for Duncan, Arrow, and Mica and the whole of Canadian storage for Operating Year 1994-95. | Exhibit 10 |
| (3) Fourth Critical Rule Curves for Duncan, Arrow, and Mica and the whole of Canadian storage for Operating Year 1995-96. | Exhibit 11 |

c. The following tables shall be considered to be the official storage for the projects:

- | | |
|---|------------|
| (1) Duncan Reservoir Capacity Table (based on B.C. Hydro table dated 21 February 1973). | Exhibit 12 |
| (2) Arrow Reservoir Capacity Table (based on B.C. Hydro Combined Storage Table dated 28 February 1974). | Exhibit 13 |
| (3) Mica Reservoir Capacity Table (based on B.C. Hydro table dated 25 March 1974). | Exhibit 14 |
| (4) Libby Storage Above Elevation 2287 feet. | Exhibit 15 |

5. SCHEDULING STORAGE REGULATION

- a. The Operating Committee will exchange all current operating data necessary for the regulation of Canadian storage projects as soon as available, including the beginning and end of the flood control season.
- b. Seasonal runoff volume forecasts for Canadian Treaty Projects shall be made available by the Canadian Section 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. Preliminary seasonal runoff volume forecasts for the Columbia River at The Dalles, Oregon, shall be made available by the U.S. Section on the second working day of each month as required.
- c. 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 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. Confirmation of the request will be transmitted via the hydromet reporting network or fax on Friday in accordance with the following format unless otherwise agreed:

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 ___ through ___. This request is based on an estimated average regulated inflow of ___ kcfs to Arrow Reservoir, ___ kcfs to Duncan Reservoir, ___kcfs to Mica Reservoir, and ___kcfs to Libby Reservoir during the above mentioned period, and an average discharge of ___kcfs from the Arrow Project, ___ kcfs from the Duncan Project, ___ kcfs from the Mica Project, and ___ kcfs from the Libby Project.

- (c) Period Covered by Request. The period covered by the request shall be from 0800 hours on the Saturday following the date of weekly request to 0800 hours on the Saturday a week later. Changes from the previous week's request shall commence at 0800 hours on Saturday, or as soon thereafter as permitted by the limits of 6b(7).
- (d) Release Determination. The amount of water released or stored during the period of the request will be determined by the changes in reservoir contents based on the recorded lake stage and storage capacity tables for Duncan (Exhibit 12), Arrow (Exhibit 13), and Mica (Exhibit 14). The change in Arrow storage content will be determined using the recorded lake stage at the gauge near Fauquier, B.C.
- (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, Arrow, and Mica reservoirs, provided an amount equal to or greater than the storage water release from Duncan reservoir is concurrently discharged from Kootenay Lake.
- (f) Modification. 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) Nonroutine Operation. Any special operation which is agreed by the Operating Committee will be suitably documented.
- (2) Daily Request for Storage Regulation During Flood Control Season
 - (a) Forecasts. Day-to-day streamflow forecasts will be accomplished by use of computer simulation by the Columbia River Forecasting Service. 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, Portland, Oregon.
 - (b) Daily Requests for Project Outflows. Pursuant to the operating rules in the Flood Control Plan, the outflows from individual Canadian storage projects are specified on a day-to-day basis. Requests will be coordinated by telephone daily or on an as needed basis, by conference calls between members of the Operating Committee or their representatives. 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. Daily requests for project outflows will be determined by methods as agreed upon, and documented by a message transmitted via the hydromet reporting network or fax from the Corps of Engineers, in Portland, Oregon. Acknowledgment of this request will be made by the Canadian Section of the Operating Committee or their representative via the hydromet reporting network or fax. Any modification of the documented daily request shall be agreed by the Operating Committee before being put into effect, and shall be documented immediately using the procedure described above.
- (3) Regulation During 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, if a special regulation of Arrow storage becomes necessary to preserve the natural flood control storage effect, 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.
- d. The weekly storage requests shall be based on operating Treaty projects to an end-of-month point between an upper limit of the Upper Rule Curve and a lower limit of the elevations contained in the Pacific Northwest Coordinating Group's Actual Energy Regulation (AER). The AER shall include the operating and critical rule curves and operating criteria and limits contained in this document. Without further agreement, storage operation above the AER elevations shall be consistent with the 1992-93 Assured Operating Plan.

6. OPERATING LIMITS

a. Duncan Project

- (1) Maximum outflow is 20,000 cfs through outlets.
- (2) Minimum average weekly outflow is 100 cfs.
- (3) Maximum rate of change in outflow is normally 4,000 cfs per day unless a larger change is necessary to accomplish the objectives of the Flood Control Plan.
- (4) Normal full pool elevation is 1,892.0 feet.
- (5) Normal minimum pool elevation is 1,794.2 feet.
- (6) Normal maximum reservoir change in elevation during any month is limited to the equivalent of 1 foot per day.

b. Arrow Project

- (1) Maximum outflow is physical limits only.
- (2) Minimum average weekly outflow is 5,000 cfs.
- (3) Maximum rate of change in outflow is normally 25,000 cfs per day unless a larger change is necessary to accomplish the objectives of the Flood Control Plan.
- (4) Normal full pool elevation is 1,444.0 feet
- (5) Normal minimum pool elevation is 1,377.9 feet
- (6) Normal maximum reservoir monthly change in elevation limited to the equivalent of 1 foot per day
- (7) Advance notice for changes in outflow for:
 - (a) Drop in downstream level of
 - ½ foot - None,
 - 1 foot - 1 hour,
 - 2 feet - 2 hours,
 - 3 feet - 24 hours, and

(b) Rise in downstream level of

½ foot	-	None,
1 foot	-	1 hour,
2 feet	-	2 hours,
3 feet	-	7 hours, only if notice is received before 10:00 hours that day, otherwise 24-hour notice is required.

c. Mica Project

In accordance with the 1992-93 Assured Operating Plan, the Mica Project will be operated to the following monthly average target outflows specified in (2) below except as qualified in paragraphs 6c(3) through 6c(9).

(1) Variable Refill Curves.

Variable Refill Curves (VRC) shall be constructed based on a power discharge requirement as indicated in Exhibit 7 with a target 31 July Treaty storage content of 3,529.2 KSFD.

(2) Mica Project Operating Criteria.

Mica project operation will be determined by the End of Previous Period Arrow Storage Content as shown in the following table, except for the limitations or changes required by subsection 6c(3) through 6c(9). The End of Previous Period Arrow Storage Content will be determined from the current AER. Mica's operation will be defined either by a Target End of Period Storage Content or a Target Period Average Outflow.

Mica Project Operating Criteria

Month	End of Previous Period Arrow Storage Content (KSFD)	Target Operation		Minimum Outflow (CFS)	Minimum Target Treaty Content at Mica (KSFD)
		Period Average Outflow (CFS)	End of Period Storage Content (KSFD)		
August 1-15	3,300 - Full 0 - 3,300	-- 27,000	3,456.2	10,000	0.0
August 16-31	2,400 - Full 0 - 2,400	-- 27,000	3,529.2	10,000	0.0
September	2,500 - Full 0 - 2,500	-- 27,000	3,529.2	10,000	0.0
October	2,850 - Full 0 - 2,850	-- 27,000	3,529.2	10,000	0.0
November	3,300 - Full 3,000 - 3,300 0 - 3,000	-- 23,000 27,000	3,246.2	11,000	0.0
December	3,400 - Full 2,200 - 3,400 0 - 2,200	22,000 27,000 34,000	--	21,000	0.0
January	1,700 - Full 0 - 1,700	27,000 34,000	--	27,000	0.0
February	0 - Full	25,000	--	25,000	0.0
March	500 - Full 0 - 500	23,000 27,000	--	23,000	0.0
April 1-15	0 - Full	27,000	--	22,000	106.2
April 16-31	0 - Full	10,000	--	10,000	0.0
May	0 - Full	10,000	--	10,000	0.0
June	0 - Full	10,000	--	10,000	0.0
July	2,300 - Full 0 - 2,300	-- 27,000	3,256.2	10,000	0.0

- (3) Mica operation to the Target End-of-Period Treaty Storage Contents shall be limited by the Minimum Outflows shown in the table above, and a maximum outflow of 34,000 cfs when the Target End-of-Period Storage Content is below 3529.2 ksfd unless needed to accomplish the objectives of the Flood Control Plan.
- (4) Mica operation to the Target Period Average Outflow shall be limited by the Minimum Target Treaty Content shown in the table above. Mica outflows shall be reduced as required down to a lower limit of the Minimum Outflow shown in the table above, to prevent draft below the Minimum Target Treaty Storage Content. Minimum Outflows may cause the reservoir to draft below the Minimum Target Treaty Content.
- (5) During July, the Mica operation to the Target Period Average Outflow shall not be less than the outflow necessary to meet the Target End-of-Period Storage Content of 3256.2 ksfd.
- (6) Mica outflows will be increased during the months October through June as required to avoid violation of the Upper Rule Curve.
- (7) During the period January through July, if in any month the Arrow Local Inflow Method is used to compute the Variable Refill Curve as defined in Section 3g(1), a Parallel AER using only Variable Refill Curves based on the Arrow Total Inflow Method continuously from January on will be used instead of the official AER to determine if the Arrow contents are within the limits shown above.
- (8) Each month, within two working days of determination of the final AER, normally available within the first ten days of the month, one correction to the adjusted Mica outflow may be made, consistent with (3) above.
- (9) Storage releases from Mica in excess of 7 million acre-feet (MAF) that result from operating Mica under the criteria described in 6c(2) through 6c(8) above will be retained in the Arrow reservoir, subject to flood control criteria at Arrow, and Mica will be reduced to Minimum Outflow as required to minimize releases in excess of 7 MAF. The total combined storage draft from Mica and Arrow will not exceed 14.1 million acre-feet unless flood control criteria will not permit the additional Mica storage releases for minimum flow purposes to be retained at Arrow.

d. Libby Project

- (1) Maximum Outflow - When the spillway capacity is insufficient to pass the required flow, the regulating outlets may be used.

<u>Forebay</u> <u>Elevation</u>	<u>One</u> <u>Sluice</u>	<u>Three</u> <u>Sluices</u>
2459 ft.	20,300 cfs	61,000 cfs
2425 ft.	19,000 cfs	57,000 cfs
2405 ft.	18,200 cfs	54,600 cfs
2350 ft.	15,500 cfs	46,500 cfs
2287 ft.	11,700 cfs	35,000 cfs

- (2) Minimum instantaneous outflow is 2,000 cfs and the normal minimum daily outflow is 4,000 cfs.
- (3) Maximum rate of tailwater change
- (a) May - September - 1 ft. per hour
4 ft. per 24 hours
- (b) October - April - 1 ft. per ½ hour
6 ft. per 24 hours
- (4) Maximum CRC elevation - 2459.0 feet
- (5) Minimum CRC elevation - 2363.0 feet in December only
2287.0 feet in all other months

**DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
ASSURED REFILL CURVE CALCULATIONS
1992-93**

MONTH	DUNCAN					MICA					ARROW				
	1931 Inflow	PDR	Water Available for Refill		ARC	1931 Inflow	PDR	Water Available for Refill		ARC	1931 Inflow	PDR	Water Available for Refill		MICA Fill 1/
	CFS	CFS	CFS	KSFD	KSFD	CFS	CFS	CFS	KSFD	KSFD	CFS	CFS	CFS	KSFD	KSFD
	(1)	(2)	(3)	(4)	(5)										
July	7320	1700	5620	174.2	705.8	56490	14600	41890	1298.6	3529.2	88790	48000	40790	1264.5	1298.6
June	8030	1700	6330	189.9	531.6	60210	11600	48610	1458.3	2230.6	114820	31000	83820	2514.6	1458.3
May	5170	1700	3470	107.6	341.7	28080	11600	16480	510.9	772.3	68060	31000	37060	1148.9	282.4
Apr2	981	1700	-720	-10.8	234.1	7230	11600	-4370	-65.6	261.4	20510	22000	-1490	-22.4	-213.3
Apr1	981	1700	-720	-10.8	244.9	4676	15000	-10320	-154.8	327.0	10700	22000	-11300	-169.5	-236.7
Mar	555	100	460	14.3	255.7	3219	15000	-11780	-365.2	481.8	7694	5000	2690	83.4	-459.7
Feb	428	100	330	9.2	241.5	2592	15000	-12410	-347.5	847.0	5865	5000	870	24.4	-553.5
Jan	428	100	330	10.2	232.2	2833	20000	-17170	-532.3	1194.4	6476	5000	1480	45.9	-592.9
Dec	461	100	360	11.2	222.0	3531	20000	-16470	-510.6	1726.7	6707	5000	1710	53.0	-576.2
Nov	684	100	580	17.4	210.8	5174	10000	-4830	-144.9	2237.3	9509	5000	4510	135.3	-306.2
Oct	1090	100	990	30.7	193.4	8750	10000	-1250	-38.8	2382.2	14720	5000	9720	301.3	-100.8
Sep	2310	100	2210	66.3	162.7	23100	10000	13100	393.0	2420.9	39730	5000	34730	1041.9	0.0
Aug2	4530	100	4430	70.9	96.4	39460	10000	29460	471.4	2027.9	62620	5000	57620	921.9	0.0
Aug1	4530	100	4430	66.5	25.5	52240	10000	42240	633.6	1556.6	82270	5000	77270	1159.1	0.0

1/ Higher of Mica's ARC or CRC1 shown in Exhibit 2.

Note: The Assured Refill Curve indicates the end-of-month storage content required to assure refill of Canadian storage by 31 July based on 1931 historical monthly inflow. The monthly inflow at each reservoir is reduced by deducting the Power Discharge Requirements and water required for refill, if any, at upstream reservoirs. The PDR's are from the 1991-92 Detailed Operating Plan. These data may change as a result of the PNCA Refill Studies.

Calculation of ARC:

(3) = (1) - (2);

(4) = (3) x (days in the period);

(5) = (Full) - [Water available for refill in later months(4)]

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
FIRST CRITICAL RULE CURVE
1992-93

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	705.8	3579.6	3529.2	7814.6
August 31	705.8	3579.6	3529.2	7814.6
September	705.5	3578.4	3526.2	7810.1
October	658.3	3304.7	3372.7	7335.7
November	425.4	3164.7	3334.2	6924.3
December	222.2	2716.5	3064.1	6002.8
January	25.8	2014.6	2300.8	4341.2
February	8.7	1122.9	1487.7	2619.3
March	5.1	1074.6	943.6	2023.3
April 15	0.0	372.9	534.6	907.5
April 30	0.0	84.5	361.6	446.1
May	117.5	802.3	766.2	1686.0
June	392.3	2343.7	2408.1	5144.1
July	565.0	3278.1	2935.2	6778.3

Source: First-year critical rule curves from the 1992-93 Final Regulation. There were no changes from the 1992-93 AOP rule curves, except that Arrow was lowered 100 ksfd in October and 200 ksfd in November during the PNCA 6d process.

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
SECOND CRITICAL RULE CURVE
1992-93

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	484.6	3466.7	3370.8	7322.1
August 30	493.4	3373.2	3388.0	7254.6
September	487.7	3355.6	3302.8	7146.1
October	298.7	3125.1	3099.2	6523.0
November	94.6	2803.7	2856.0	5754.3
December	0.3	2332.2	2609.7	4942.2
January	0.6	1444.9	1765.1	3210.6
February	0.3	698.5	1213.3	1912.1
March	5.1	398.2	771.0	1174.3
April 15	0.0	173.8	507.5	681.3
April 30	0.0	233.2	478.5	711.7
May	94.0	495.8	427.5	1017.3
June	109.7	2036.5	1530.3	3676.5
July	153.7	3076.0	2762.8	5992.5

Source: Second-year critical rule curves from the 1991-92 Final Regulation (FR) unless higher than the first-year critical rule curve, except that the April 15 and April 30 values for Mica and Arrow are from the 93 AOP because the FR drafted Mica below empty.

**DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
THIRD CRITICAL RULE CURVE
1992-93**

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	231.8	3390.4	3370.8	6993.0
August 31	213.7	3342.0	3388.0	6943.7
September	262.4	3278.2	3242.1	6782.7
October	154.9	3067.0	3059.6	6281.5
November	3.5	2791.7	2854.9	5650.1
December	0.2	2048.3	2383.7	4432.2
January	0.1	1214.9	1622.2	2837.2
February	0.3	132.8	1225.0	1358.1
March	0.1	334.2	474.8	809.1
April 15	0.0	85.6	162.2	247.8
April 30	0.0	0.0	4.2	4.2
May	94.0	448.4	140.9	683.3
June	109.7	1762.3	1337.2	3209.2
July	38.9	2398.5	2335.0	4772.4

Source: Third-year critical rule curves from the 1990-91 Final Regulation (FR) unless higher than the first or second-year critical rule curves. The FR values are the same as the 93 AOP, except for August 15 where Duncan, Arrow, and Mica were adjusted upward, and August 31 where Mica and Arrow were adjusted upward.

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
FOURTH CRITICAL RULE CURVE
1992-93

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	0.1	2577.1	2829.0	5406.2
August 31	0.1	2552.6	2779.8	5332.5
September	0.7	2481.0	2476.0	4957.7
October	1.2	2222.6	2080.1	4303.9
November	1.9	1969.9	1280.5	3252.3
December	0.8	793.7	583.4	1377.4
January	2.9	584.5	14.1	601.5
February	0.0	0.0	0.0	0.0

Source: Fourth-year critical rule curves from the 1989-90 Final Regulation (FR) unless higher than the first, second or third year critical rule curves. The FR values are the same as the 93 AOP except Mica was raised August 15 and August 31 because of full gate limit in the load growth critical period study.

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
LIMITING RULE CURVE BASED ON 1936-37 HYDRO CONDITIONS

(End-of-Month Usable Storage Contents in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Libby</u>
January	0.0	962.5	968.4	133.7
February	0.0	59.6	583.2	31.8
March	0.0	43.2	61.8	0.0

Source: Pacific Northwest Coordinating Group's ECC Lower Limits Study dated November 7, 1992.

**DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
1991-92 VARIABLE REFILL CURVE PROCEDURES**

The Variable Refill Curves (VRC) indicate the end-of-month storage content required to refill Canadian storage based on forecasts of natural inflow volume. The probable forecast volume at each reservoir is reduced by deducting the 95 percent confidence forecast error, Power Discharge Requirements (PDR), and water required for refill at upstream reservoirs. The 1992-93 AOP studies made for the U.S. Coordinated System operation indicate that the PDR's for all cyclic reservoirs must be greater than project minimum release to allow filling in accordance with the Principles and Procedures coincident with carrying system firm load when the Columbia River at The Dalles natural January-July runoff volume is lower than 95 million acre-feet. The following schedule for PDR's will apply when computing the VRC's during the period January 1 through June 1, unless the Entities agree to updated study results.

**POWER DISCHARGE REQUIREMENT, IN CFS
FOR JANUARY-JULY VOLUME RUNOFF
OF THE COLUMBIA RIVER AT THE DALLES, OREGON**

<u>Project</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr. 1-15</u>	<u>Apr. 16-30</u>	<u>May</u>	<u>June</u>	<u>July</u>
80 MAF								
Mica	3,000	3,000	22,500	25,000	25,000	25,000	32,000	38,000
Arrow	5,000	5,000	5,000	22,000	30,000	40,000	48,000	60,000
Duncan	100	100	100	1,700	1,700	1,700	1,700	1,700
Libby	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
90 MAF								
Mica	3,000	3,000	3,000	3,000	3,000	20,000	25,000	30,000
Arrow	5,000	5,000	5,000	9,600	9,600	20,000	35,000	45,000
Duncan	100	100	100	900	900	900	900	900
Libby	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
95 MAF and Higher								
Mica	3,000	3,000	3,000	3,000	15,000	15,000	20,000	29,000
Arrow	5,000	5,000	5,000	5,000	5,000	10,000	25,000	47,000
Duncan	100	100	100	100	100	100	100	100
Libby	4,000	4,000	4,000	4,000	4,000	4,000	10,000	10,000

Notes:

- (1) If the forecasted natural January through July volume runoff at The Dalles is less than 80 MAF, the Power Discharge Requirement in the 80 MAF schedule will be used. For intermediate forecasted volumes, the Power Discharge Requirement will be interpolated linearly between the values shown above.
- (2) Data may be revised upon completion of the U.S. Entity Refill Studies. The Canadian Entity reserves the right to request changes to the revised data.

CRITICAL RULE CURVES AND ASSURED REFILL CURVE FOR
LIBBY RESERVOIR
1992-93

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	Critical Rule Curve (1)				Assured Refill Curve (2)
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>	<u> </u>
August 15	2510.5	2148.6	1946.3	999.9	1927.5
August 31	2510.5	2185.2	1995.9	907.2	1977.1
September	2408.1	2101.8	2030.9	635.1	2012.2
October	2470.9	1905.6	1760.8	342.8	2008.8
November	2204.6	1163.9	1163.9	318.9	1980.3
December	1518.4	775.9	775.9	68.8	1929.4
January	902.8	581.3	220.1	7.9	1878.6
February	727.5	545.7	69.8	0.0	1826.5
March	682.2	499.2	17.3	0.0	1671.8
April 15	660.0	539.8	2.3	0.0	1656.8
April 30	658.5	658.5	0.0	0.0	1654.9
May	1120.7	1120.7	456.7	0.0	2111.5
June	2078.9	2067.9	888.1	0.0	2510.5
July	2190.4	2190.4	756.8	0.0	2510.5

Note:

- (1) Source is Pacific Northwest Coordination Agreement Final Regulation (FR) for 92-93 CRC1, FR for 91-92 CRC2, FR for 90-91 CRC3, and FR for 89-90 CRC4, unless CRC2 higher than CRC1, CRC3 higher than CRC2, or CRC4 higher than CRC3.
- (2) The Assured Refill Curve may be changed as a result of the PNCA Refill Studies.

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
SECOND CRITICAL RULE CURVE
1993-94

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	479.1	3332.7	3389.2	7201.1
August 31	492.6	3087.9	3529.2	7109.7
September	430.5	3036.0	3529.2	6995.7
October	202.6	2544.0	3428.4	6175.0
November	23.6	2315.8	2740.8	5080.2
December	0.0	2383.1	2016.1	4399.2
January	0.0	1216.9	1259.9	2476.8
February	0.1	624.8	637.5	1262.4
March	0.0	443.9	18.4	462.3
April 15	0.0	413.9	0.0	413.9
April 30	23.2	520.9	0.0	544.1
May	72.6	249.7	369.0	691.3
June	100.3	1505.3	1502.5	3108.1
July	145.6	2961.0	2624.2	5730.8

Note: Source is the second-year critical rule curves from the 1992-93 Final Regulation. There were no changes from the AOP Rule Curves, except Arrow was lowered during the PNCA 6d process by 100 ksfd in October and 200 ksfd in November.

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
THIRD CRITICAL RULE CURVE
1994-95

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	114.7	3282.9	2955.9	6353.5
August 31	160.8	3232.0	3134.5	6527.3
September	167.2	3256.0	3099.3	6522.5
October	11.0	2982.3	2856.8	5850.1
November	10.6	2436.8	2394.6	4842.0
December	8.9	1648.0	1885.2	3542.1
January	10.5	898.9	864.0	1773.4
February	9.8	96.5	147.1	253.4
March	7.2	158.1	68.6	233.9
April 15	12.5	128.4	93.3	234.2
April 30	4.0	95.0	26.0	125.0
May	62.3	665.1	12.8	740.2
June	208.1	1226.2	847.4	2281.7
July	134.0	1840.7	1579.5	3554.2

Note: Source is the third-year critical rule curves from the 1992-93 Final Regulation. There were no changes from the AOP Rule Curve.

DETAILED OPERATING PLAN FOR COLUMBIA RIVER TREATY STORAGE
FOURTH CRITICAL RULE CURVE
1995-96

(End-of-Month Usable Storage Content in 1000 SFD)

<u>Month</u>	<u>Duncan</u>	<u>Arrow</u>	<u>Mica</u>	<u>Total</u>
August 15	50.3	1876.7	1636.1	3563.1
August 31	6.0	1632.0	1630.8	3268.8
September	2.3	1598.3	1351.4	2952.0
October	1.8	1364.2	951.1	2317.1
November	0.0	1247.1	387.3	1634.4
December	0.0	822.2	4.6	826.8
January	0.0	346.0	10.1	356.1
February	0.0	0.0	0.0	0.0

Note: Source is the fourth-year critical rule curves from the 1992-93 Final Regulation. There were no changes from the AOP Rule Curve.

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RESERVOIR CAPACITY TABLE

PAGE # 1

FIGURES IN 1000'S
OF SECOND FOOT DAYS

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
1892.	705.8										
1891.	696.9	697.8	698.7	699.6	700.5	701.3	702.2	703.1	704.0	704.9	0.89
1890.	688.0	688.9	689.8	690.7	691.6	692.4	693.3	694.2	695.1	696.0	0.89
1889.	679.2	680.1	681.0	681.8	682.7	683.6	684.5	685.4	686.2	687.1	0.88
1888.	670.4	671.3	672.2	673.0	673.9	674.8	675.7	676.6	677.4	678.3	0.88
1887.	661.5	662.4	663.3	664.2	665.1	665.9	666.8	667.7	668.6	669.5	0.89
1886.	652.8	653.7	654.5	655.4	656.3	657.1	658.0	658.9	659.8	660.6	0.87
1885.	644.0	644.9	645.8	646.6	647.5	648.4	649.3	650.2	651.0	651.9	0.88
1884.	635.3	636.2	637.0	637.9	638.8	639.6	640.5	641.4	642.3	643.1	0.87
1883.	626.6	627.5	628.3	629.2	630.1	630.9	631.8	632.7	633.6	634.4	0.87
1882.	617.9	618.8	619.6	620.5	621.4	622.2	623.1	624.0	624.9	625.7	0.87
1881.	609.2	610.1	610.9	611.8	612.7	613.5	614.4	615.3	616.2	617.0	0.87
1880.	600.6	601.5	602.3	603.2	604.0	604.9	605.8	606.6	607.5	608.3	0.86
1879.	592.0	592.9	593.7	594.6	595.4	596.3	597.2	598.0	598.9	599.7	0.86
1878.	583.4	584.3	585.1	586.0	586.8	587.7	588.6	589.4	590.3	591.1	0.86
1877.	574.8	575.7	576.5	577.4	578.2	579.1	580.0	580.8	581.7	582.5	0.86
1876.	566.3	567.1	568.0	568.8	569.7	570.5	571.4	572.2	573.1	573.9	0.85
1875.	557.8	558.6	559.5	560.3	561.2	562.0	562.9	563.7	564.6	565.4	0.85
1874.	549.3	550.1	551.0	551.8	552.7	553.5	554.4	555.2	556.1	556.9	0.85
1873.	540.9	541.7	542.6	543.4	544.3	545.1	545.9	546.8	547.6	548.5	0.84
1872.	532.4	533.2	534.1	534.9	535.8	536.6	537.5	538.3	539.2	540.0	0.85
1871.	524.0	524.8	525.7	526.5	527.4	528.2	529.0	529.9	530.7	531.6	0.84
1870.	515.7	516.5	517.4	518.2	519.0	519.8	520.7	521.5	522.3	523.2	0.83

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RESERVOIR CAPACITY TABLE

PAGE # 2

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
1869.	507.3	508.1	509.0	509.8	510.7	511.5	512.3	513.2	514.0	514.9	0.84
1868.	499.0	499.8	500.7	501.5	502.3	503.1	504.0	504.8	505.6	506.5	0.83
1867.	490.7	491.5	492.4	493.2	494.0	494.8	495.7	496.5	497.3	498.2	0.83
1866.	482.4	483.2	484.1	484.9	485.7	486.5	487.4	488.2	489.0	489.9	0.83
1865.	474.2	475.0	475.8	476.7	477.5	478.3	479.1	479.9	480.8	481.6	0.82
1864.	466.0	466.8	467.6	468.5	469.3	470.1	470.9	471.7	472.6	473.4	0.82
1863.	457.8	458.6	459.4	460.3	461.1	461.9	462.7	463.5	464.4	465.2	0.82
1862.	449.7	450.5	451.3	452.1	452.9	453.7	454.6	455.4	456.2	457.0	0.81
1861.	441.6	442.4	443.2	444.0	444.8	445.6	446.5	447.3	448.1	448.9	0.81
1860.	433.5	434.3	435.1	435.9	436.7	437.5	438.4	439.2	440.0	440.8	0.81
1859.	425.4	426.2	427.0	427.8	428.6	429.4	430.3	431.1	431.9	432.7	0.81
1858.	417.4	418.2	419.0	419.8	420.6	421.4	422.2	423.0	423.8	424.6	0.80
1857.	409.4	410.2	411.0	411.8	412.6	413.4	414.2	415.0	415.8	416.6	0.80
1856.	401.4	402.2	403.0	403.8	404.6	405.4	406.2	407.0	407.8	408.6	0.80
1855.	393.5	394.3	395.1	395.9	396.7	397.4	398.2	399.0	399.8	400.6	0.79
1854.	385.6	386.4	387.2	388.0	388.8	389.5	390.3	391.1	391.9	392.7	0.79
1853.	377.7	378.5	379.3	380.1	380.9	381.6	382.4	383.2	384.0	384.8	0.79
1852.	369.9	370.7	371.5	372.2	373.0	373.8	374.6	375.4	376.1	376.9	0.78
1851.	362.1	362.9	363.7	364.4	365.2	366.0	366.8	367.6	368.3	369.1	0.78
1850.	354.3	355.1	355.9	356.6	357.4	358.2	359.0	359.8	360.5	361.3	0.78
1849.	346.6	347.4	348.1	348.9	349.7	350.4	351.2	352.0	352.8	353.5	0.77
1848.	338.9	339.7	340.4	341.2	342.0	342.7	343.5	344.3	345.1	345.8	0.77
1847.	331.2	332.0	332.7	333.5	334.3	335.0	335.8	336.6	337.4	338.1	0.77
1846.	323.6	324.4	325.1	325.9	326.6	327.4	328.2	328.9	329.7	330.4	0.76
1845.	316.0	316.8	317.5	318.3	319.0	319.8	320.6	321.3	322.1	322.8	0.76

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RESERVOIR CAPACITY TABLE

PAGE # 3

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
1844.	308.5	309.2	310.0	310.7	311.5	312.2	313.0	313.7	314.5	315.2	0.75
1843.	300.9	301.7	302.4	303.2	303.9	304.7	305.5	306.2	307.0	307.7	0.76
1842.	293.5	294.2	295.0	295.7	296.5	297.2	297.9	298.7	299.4	300.2	0.74
1841.	286.0	286.7	287.5	288.2	289.0	289.7	290.5	291.2	292.0	292.7	0.75
1840.	278.6	279.3	280.1	280.8	281.6	282.3	283.0	283.8	284.5	285.3	0.74
1839.	271.2	271.9	272.7	273.4	274.2	274.9	275.6	276.4	277.1	277.9	0.74
1838.	263.9	264.6	265.4	266.1	266.8	267.5	268.3	269.0	269.7	270.5	0.73
1837.	256.6	257.3	258.1	258.8	259.5	260.2	261.0	261.7	262.4	263.2	0.73
1836.	249.4	250.1	250.8	251.6	252.3	253.0	253.7	254.4	255.2	255.9	0.72
1835.	242.2	242.9	243.6	244.4	245.1	245.8	246.5	247.2	248.0	248.7	0.72
1834.	235.0	235.7	236.4	237.2	237.9	238.6	239.3	240.0	240.8	241.5	0.72
1833.	227.9	228.6	229.3	230.0	230.7	231.4	232.2	232.9	233.6	234.3	0.71
1832.	220.8	221.5	222.2	222.9	223.6	224.3	225.1	225.8	226.5	227.2	0.71
1831.	213.8	214.5	215.2	215.9	216.6	217.3	218.0	218.7	219.4	220.1	0.70
1830.	206.8	207.5	208.2	208.9	209.6	210.3	211.0	211.7	212.4	213.1	0.70
1829.	199.9	200.6	201.3	202.0	202.7	203.3	204.0	204.7	205.4	206.1	0.69
1828.	193.0	193.7	194.4	195.1	195.8	196.4	197.1	197.8	198.5	199.2	0.69
1827.	186.1	186.8	187.5	188.2	188.9	189.5	190.2	190.9	191.6	192.3	0.69
1826.	179.3	180.0	180.7	181.3	182.0	182.7	183.4	184.1	184.7	185.4	0.68
1825.	172.6	173.3	173.9	174.6	175.3	175.9	176.6	177.3	178.0	178.6	0.67
1824.	165.9	166.6	167.2	167.9	168.6	169.2	169.9	170.6	171.3	171.9	0.67
1823.	159.2	159.9	160.5	161.2	161.9	162.5	163.2	163.9	164.6	165.2	0.67
1822.	152.6	153.3	153.9	154.6	155.2	155.9	156.6	157.2	157.9	158.5	0.66
1821.	146.1	146.7	147.4	148.0	148.7	149.3	150.0	150.6	151.3	151.9	0.65
1820.	139.6	140.2	140.9	141.5	142.2	142.8	143.5	144.1	144.8	145.4	0.65

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RESERVOIR CAPACITY TABLE

PAGE # 4

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
1819.	133.2	133.8	134.5	135.1	135.8	136.4	137.0	137.7	138.3	139.0	0.64
1818.	126.8	127.4	128.1	128.7	129.4	130.0	130.6	131.3	131.9	132.6	0.64
1817.	120.5	121.1	121.8	122.4	123.0	123.6	124.3	124.9	125.5	126.2	0.63
1816.	114.3	114.9	115.5	116.2	116.8	117.4	118.0	118.6	119.3	119.9	0.62
1815.	108.1	108.7	109.3	110.0	110.6	111.2	111.8	112.4	113.1	113.7	0.62
1814.	102.0	102.6	103.2	103.8	104.4	105.0	105.7	106.3	106.9	107.5	0.61
1813.	96.0	96.6	97.2	97.8	98.4	99.0	99.6	100.2	100.8	101.4	0.60
1812.	90.0	90.6	91.2	91.8	92.4	93.0	93.6	94.2	94.8	95.4	0.60
1811.	84.1	84.7	85.3	85.9	86.5	87.0	87.6	88.2	88.8	89.4	0.59
1810.	78.3	78.9	79.5	80.0	80.6	81.2	81.8	82.4	82.9	83.5	0.58
1809.	72.5	73.1	73.7	74.2	74.8	75.4	76.0	76.6	77.1	77.7	0.58
1808.	66.9	67.5	68.0	68.6	69.1	69.7	70.3	70.8	71.4	71.9	0.56
1807.	61.3	61.9	62.4	63.0	63.5	64.1	64.7	65.2	65.8	66.3	0.56
1806.	55.8	56.3	56.9	57.4	58.0	58.5	59.1	59.6	60.2	60.7	0.55
1805.	50.4	50.9	51.5	52.0	52.6	53.1	53.6	54.2	54.7	55.3	0.54
1804.	45.1	45.6	46.2	46.7	47.2	47.7	48.3	48.8	49.3	49.9	0.53
1803.	39.9	40.4	40.9	41.5	42.0	42.5	43.0	43.5	44.1	44.6	0.52
1802.	34.8	35.3	35.8	36.3	36.8	37.3	37.9	38.4	38.9	39.4	0.51
1801.	29.8	30.3	30.8	31.3	31.8	32.3	32.8	33.3	33.8	34.3	0.50
1800.	25.0	25.5	26.0	26.4	26.9	27.4	27.9	28.4	28.8	29.3	0.48
1799.	20.3	20.8	21.2	21.7	22.2	22.6	23.1	23.6	24.1	24.5	0.47
1798.	15.7	16.2	16.6	17.1	17.5	18.0	18.5	18.9	19.4	19.8	0.46
1797.	11.3	11.7	12.2	12.6	13.1	13.5	13.9	14.4	14.8	15.3	0.44
1796.	7.1	7.5	7.9	8.4	8.8	9.2	9.6	10.0	10.5	10.9	0.42
1795.	3.0	3.4	3.8	4.2	4.6	5.0	5.5	5.9	6.3	6.7	0.41
1794.			0.0	0.4	0.8	1.1	1.5	1.9	2.3	2.6	0.37

ARROW LAKES RESERVOIR CAPACITY TABLE

PAGE # 1

FIGURES IN 1000'S
OF SECOND FOOT DAYS

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
1444.	3579.6										
1443.	3514.1	3520.6	3527.2	3533.7	3540.3	3546.8	3553.4	3559.9	3566.5	3573.0	6.55
1442.	3448.9	3455.4	3461.9	3468.5	3475.0	3481.5	3488.0	3494.5	3501.1	3507.6	6.52
1441.	3384.0	3390.5	3397.0	3403.5	3410.0	3416.4	3422.9	3429.4	3435.9	3442.4	6.49
1440.	3319.5	3325.9	3332.4	3338.8	3345.3	3351.7	3358.2	3364.6	3371.1	3377.5	6.45
1439.	3255.2	3261.6	3268.1	3274.5	3280.9	3287.3	3293.8	3300.2	3306.6	3313.1	6.43
1438.	3191.4	3197.8	3204.2	3210.5	3216.9	3223.3	3229.7	3236.1	3242.4	3248.8	6.38
1437.	3127.8	3134.2	3140.5	3146.9	3153.2	3159.6	3166.0	3172.3	3178.7	3185.0	6.36
1436.	3064.6	3070.9	3077.2	3083.6	3089.9	3096.2	3102.5	3108.8	3115.2	3121.5	6.32
1435.	3001.7	3008.0	3014.3	3020.6	3026.9	3033.1	3039.4	3045.7	3052.0	3058.3	6.29
1434.	2939.2	2945.4	2951.7	2957.9	2964.2	2970.4	2976.7	2982.9	2989.2	2995.4	6.25
1433.	2877.0	2883.2	2889.4	2895.7	2901.9	2908.1	2914.3	2920.5	2926.8	2933.0	6.22
1432.	2815.1	2821.3	2827.5	2833.7	2839.9	2846.0	2852.2	2858.4	2864.6	2870.8	6.19
1431.	2753.5	2759.7	2765.8	2772.0	2778.1	2784.3	2790.5	2796.6	2802.8	2808.9	6.16
1430.	2692.3	2698.4	2704.5	2710.7	2716.8	2722.9	2729.0	2735.1	2741.3	2747.4	6.12
1429.	2631.5	2637.6	2643.7	2649.7	2655.8	2661.9	2668.0	2674.1	2680.1	2686.2	6.08
1428.	2570.9	2577.0	2583.0	2589.1	2595.1	2601.2	2607.3	2613.3	2619.4	2625.4	6.06
1427.	2510.7	2516.7	2522.7	2528.8	2534.8	2540.8	2546.8	2552.8	2558.9	2564.9	6.02
1426.	2450.8	2456.8	2462.8	2468.8	2474.8	2480.7	2486.7	2492.7	2498.7	2504.7	5.99
1425.	2391.2	2397.2	2403.1	2409.1	2415.0	2421.0	2427.0	2432.9	2438.9	2444.8	5.96
1424.	2331.9	2337.8	2343.8	2349.7	2355.6	2361.5	2367.5	2373.4	2379.3	2385.3	5.93
1423.	2272.8	2278.7	2284.6	2290.5	2296.4	2302.3	2308.3	2314.2	2320.1	2326.0	5.91
1422.	2214.1	2220.0	2225.8	2231.7	2237.6	2243.4	2249.3	2255.2	2261.1	2266.9	5.87
1421.	2155.7	2161.5	2167.4	2173.2	2179.1	2184.9	2190.7	2196.6	2202.4	2208.3	5.84
1420.	2097.7	2103.5	2109.3	2115.1	2120.9	2126.7	2132.5	2138.3	2144.1	2149.9	5.80

ARROW LAKES RESERVOIR CAPACITY TABLE

PAGE # 2

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
1419.	2040.1	2045.9	2051.6	2057.4	2063.1	2068.9	2074.7	2080.4	2086.2	2091.9	5.76
1418.	1982.9	1988.6	1994.3	2000.1	2005.8	2011.5	2017.2	2022.9	2028.7	2034.4	5.72
1417.	1926.1	1931.8	1937.5	1943.1	1948.8	1954.5	1960.2	1965.9	1971.5	1977.2	5.68
1416.	1869.6	1875.2	1880.9	1886.5	1892.2	1897.8	1903.5	1909.1	1914.8	1920.4	5.65
1415.	1813.5	1819.1	1824.7	1830.3	1835.9	1841.5	1847.2	1852.8	1858.4	1864.0	5.61
1414.	1757.8	1763.4	1768.9	1774.5	1780.1	1785.6	1791.2	1796.8	1802.4	1807.9	5.57
1413.	1702.4	1707.9	1713.5	1719.0	1724.6	1730.1	1735.6	1741.2	1746.7	1752.3	5.54
1412.	1647.4	1652.9	1658.4	1663.9	1669.4	1674.9	1680.4	1685.9	1691.4	1696.9	5.50
1411.	1592.7	1598.2	1603.6	1609.1	1614.6	1620.0	1625.5	1631.0	1636.5	1641.9	5.47
1410.	1538.4	1543.8	1549.3	1554.7	1560.1	1565.5	1571.0	1576.4	1581.8	1587.3	5.43
1409.	1484.5	1489.9	1495.3	1500.7	1506.1	1511.4	1516.8	1522.2	1527.6	1533.0	5.39
1408.	1430.9	1436.3	1441.6	1447.0	1452.3	1457.7	1463.1	1468.4	1473.8	1479.1	5.36
1407.	1377.7	1383.0	1388.3	1393.7	1399.0	1404.3	1409.6	1414.9	1420.3	1425.6	5.32
1406.	1324.7	1330.0	1335.3	1340.6	1345.9	1351.2	1356.5	1361.8	1367.1	1372.4	5.30
1405.	1272.1	1277.4	1282.6	1287.9	1293.1	1298.4	1303.7	1308.9	1314.2	1319.4	5.26
1404.	1219.5	1224.8	1230.0	1235.3	1240.5	1245.8	1251.1	1256.3	1261.6	1266.8	5.26
1403.	1167.3	1172.5	1177.7	1183.0	1188.2	1193.4	1198.6	1203.8	1209.1	1214.3	5.22
1402.	1115.4	1120.6	1125.8	1131.0	1136.2	1141.3	1146.5	1151.7	1156.9	1162.1	5.19
1401.	1063.9	1069.0	1074.2	1079.3	1084.5	1089.6	1094.8	1099.9	1105.1	1110.2	5.15
1400.	1012.8	1017.9	1023.0	1028.1	1033.2	1038.3	1043.5	1048.6	1053.7	1058.8	5.11
1399.	962.5	967.5	972.6	977.6	982.6	987.6	992.7	997.7	1002.7	1007.8	5.03
1398.	912.7	917.7	922.7	927.6	932.6	937.6	942.6	947.6	952.5	957.5	4.98
1397.	863.2	868.1	873.1	878.0	883.0	887.9	892.9	897.8	902.8	907.7	4.95
1396.	814.1	819.0	823.9	828.8	833.7	838.6	843.6	848.5	853.4	858.3	4.91
1395.	765.2	770.1	775.0	779.9	784.8	789.6	794.5	799.4	804.3	809.2	4.89

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[illegible]

FIGURES IN 1000'S
OF SECOND FOOT DAYS

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2475.	10121.1										5.38
2474.	10067.5	10072.9	10078.2	10083.6	10088.9	10094.3	10099.7	10105.0	10110.4	10115.7	5.36
2473.	10014.1	10019.4	10024.8	10030.1	10035.5	10040.8	10046.1	10051.5	10056.8	10062.2	5.34
2472.	9960.8	9966.1	9971.5	9976.8	9982.1	9987.4	9992.8	9998.1	10003.4	10008.8	5.33
2471.	9907.8	9913.1	9918.4	9923.7	9929.0	9934.3	9939.6	9944.9	9950.2	9955.5	5.30
2470.	9854.8	9860.1	9865.4	9870.7	9876.0	9881.3	9886.6	9891.9	9897.2	9902.5	5.30
2469.	9802.1	9807.4	9812.6	9817.9	9823.2	9828.4	9833.7	9839.0	9844.3	9849.5	5.27
2468.	9749.5	9754.8	9760.0	9765.3	9770.5	9775.8	9781.1	9786.3	9791.6	9796.8	5.26
2467.	9697.1	9702.3	9707.6	9712.8	9718.1	9723.3	9728.5	9733.8	9739.0	9744.3	5.24
2466.	9644.8	9650.0	9655.3	9660.5	9665.7	9670.9	9676.2	9681.4	9686.6	9691.9	5.23
2465.	9592.7	9597.9	9603.1	9608.3	9613.5	9618.7	9624.0	9629.2	9634.4	9639.6	5.21
2464.	9540.8	9546.0	9551.2	9556.4	9561.6	9566.7	9571.9	9577.1	9582.3	9587.5	5.19
2463.	9489.0	9494.2	9499.4	9504.5	9509.7	9514.9	9520.1	9525.3	9530.4	9535.6	5.18
2462.	9437.4	9442.6	9447.7	9452.9	9458.0	9463.2	9468.4	9473.5	9478.7	9483.8	5.16
2461.	9386.0	9391.1	9396.3	9401.4	9406.6	9411.7	9416.8	9422.0	9427.1	9432.3	5.14
2460.	9334.8	9339.9	9345.0	9350.2	9355.3	9360.4	9365.5	9370.6	9375.8	9380.9	5.12
2459.	9283.7	9288.8	9293.9	9299.0	9304.1	9309.2	9314.4	9319.5	9324.6	9329.7	5.11
2458.	9232.8	9237.9	9243.0	9248.1	9253.2	9258.2	9263.3	9268.4	9273.5	9278.6	5.09
2457.	9182.0	9187.1	9192.2	9197.2	9202.3	9207.4	9212.5	9217.6	9222.6	9227.7	5.08
2456.	9131.4	9136.5	9141.5	9146.6	9151.6	9156.7	9161.8	9166.8	9171.9	9176.9	5.06
2455.	9081.0	9086.0	9091.1	9096.1	9101.2	9106.2	9111.2	9116.3	9121.3	9126.4	5.04

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2454.	9030.8	9035.8	9040.8	9045.9	9050.9	9055.9	9060.9	9065.9	9071.0	9076.0	5.02
2453.	8980.7	8985.7	8990.7	8995.7	9000.7	9005.7	9010.8	9015.8	9020.8	9025.8	5.01
2452.	8930.8	8935.8	8940.8	8945.8	8950.8	8955.7	8960.7	8965.7	8970.7	8975.7	4.99
2451.	8881.0	8886.0	8891.0	8895.9	8900.9	8905.9	8910.9	8915.9	8920.8	8925.8	4.98
2450.	8831.4	8836.4	8841.3	8846.3	8851.2	8856.2	8861.2	8866.1	8871.1	8876.0	4.96
2449.	8782.0	8786.9	8791.9	8796.8	8801.8	8806.7	8811.6	8816.6	8821.5	8826.5	4.94
2448.	8732.8	8737.7	8742.6	8747.6	8752.5	8757.4	8762.3	8767.2	8772.2	8777.1	4.92
2447.	8683.7	8688.6	8693.5	8698.4	8703.3	8708.2	8713.2	8718.1	8723.0	8727.9	4.91
2446.	8634.8	8639.7	8644.6	8649.5	8654.4	8659.2	8664.1	8669.0	8673.9	8678.8	4.89
2445.	8586.0	8590.9	8595.8	8600.6	8605.5	8610.4	8615.3	8620.2	8625.0	8629.9	4.88
2444.	8537.5	8542.3	8547.2	8552.0	8556.9	8561.7	8566.6	8571.4	8576.3	8581.1	4.85
2443.	8489.1	8493.9	8498.8	8503.6	8508.5	8513.3	8518.1	8523.0	8527.8	8532.7	4.84
2442.	8440.8	8445.6	8450.5	8455.3	8460.1	8464.9	8469.8	8474.6	8479.4	8484.3	4.83
2441.	8392.7	8397.5	8402.3	8407.1	8411.9	8416.7	8421.6	8426.4	8431.2	8436.0	4.81
2440.	8344.8	8349.6	8354.4	8359.2	8364.0	8368.7	8373.5	8378.3	8383.1	8387.9	4.79
2439.	8297.1	8301.9	8306.6	8311.4	8316.2	8320.9	8325.7	8330.5	8335.3	8340.0	4.77
2438.	8249.5	8254.3	8259.0	8263.8	8268.5	8273.3	8278.1	8282.8	8287.6	8292.3	4.76
2437.	8202.1	8206.8	8211.6	8216.3	8221.1	8225.8	8230.5	8235.3	8240.0	8244.8	4.74
2436.	8154.8	8159.5	8164.3	8169.0	8173.7	8178.4	8183.2	8187.9	8192.6	8197.4	4.73
2435.	8107.8	8112.5	8117.2	8121.9	8126.6	8131.3	8136.0	8140.7	8145.4	8150.1	4.70
2434.	8060.9	8065.6	8070.3	8075.0	8079.7	8084.3	8089.0	8093.7	8098.4	8103.1	4.69
2433.	8014.1	8018.8	8023.5	8028.1	8032.8	8037.5	8042.2	8046.9	8051.5	8056.2	4.68
2432.	7967.5	7972.2	7976.8	7981.5	7986.1	7990.8	7995.5	8000.1	8004.8	8009.4	4.66
2431.	7921.1	7925.7	7930.4	7935.0	7939.7	7944.3	7948.9	7953.6	7958.2	7962.9	4.64
2430.	7874.9	7879.5	7884.1	7888.8	7893.4	7898.0	7902.6	7907.2	7911.9	7916.5	4.62

ELLEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2429.	7828.8	7833.4	7838.0	7842.6	7847.2	7851.8	7856.5	7861.1	7865.7	7870.3	4.61
2428.	7782.9	7787.5	7792.1	7796.7	7801.3	7805.8	7810.4	7815.0	7819.6	7824.2	4.59
2427.	7737.2	7741.8	7746.3	7750.9	7755.5	7760.0	7764.6	7769.2	7773.8	7778.3	4.57
2426.	7691.6	7696.2	7700.7	7705.3	7709.8	7714.4	7719.0	7723.5	7728.1	7732.6	4.56
2425.	7646.2	7650.7	7655.3	7659.8	7664.4	7668.9	7673.4	7678.0	7682.5	7687.1	4.54
2424.	7600.9	7605.4	7610.0	7614.5	7619.0	7623.5	7628.1	7632.6	7637.1	7641.7	4.53
2423.	7555.9	7560.4	7564.9	7569.4	7573.9	7578.4	7582.9	7587.4	7591.9	7596.4	4.50
2422.	7511.0	7515.5	7520.0	7524.5	7529.0	7533.4	7537.9	7542.4	7546.9	7551.4	4.49
2421.	7466.2	7470.7	7475.2	7479.6	7484.1	7488.6	7493.1	7497.6	7502.0	7506.5	4.48
2420.	7421.6	7426.1	7430.5	7435.0	7439.4	7443.9	7448.4	7452.8	7457.3	7461.7	4.46
2419.	7377.2	7381.6	7386.1	7390.5	7395.0	7399.4	7403.8	7408.3	7412.7	7417.2	4.44
2418.	7333.0	7337.4	7341.8	7346.3	7350.7	7355.1	7359.5	7363.9	7368.4	7372.8	4.42
2417.	7288.9	7293.3	7297.7	7302.1	7306.5	7310.9	7315.4	7319.8	7324.2	7328.6	4.41
2416.	7245.0	7249.4	7253.8	7258.2	7262.6	7266.9	7271.3	7275.7	7280.1	7284.5	4.39
2415.	7201.3	7205.7	7210.0	7214.4	7218.8	7223.1	7227.5	7231.9	7236.3	7240.6	4.37
2414.	7157.7	7162.1	7166.4	7170.8	7175.1	7179.5	7183.9	7188.2	7192.6	7196.9	4.36
2413.	7114.3	7118.6	7123.0	7127.3	7131.7	7136.0	7140.3	7144.7	7149.0	7153.4	4.34
2412.	7071.0	7075.3	7079.7	7084.0	7088.3	7092.6	7097.0	7101.3	7105.6	7110.0	4.33
2411.	7028.0	7032.3	7036.6	7040.9	7045.2	7049.5	7053.8	7058.1	7062.4	7066.7	4.30
2410.	6985.1	6989.4	6993.7	6998.0	7002.3	7006.5	7010.8	7015.1	7019.4	7023.7	4.29
2409.	6942.3	6946.6	6950.9	6955.1	6959.4	6963.7	6968.0	6972.3	6976.5	6980.8	4.28
2408.	6899.7	6904.0	6908.2	6912.5	6916.7	6921.0	6925.3	6929.5	6933.8	6938.0	4.26
2407.	6857.3	6861.5	6865.8	6870.0	6874.3	6878.5	6882.7	6887.0	6891.2	6895.5	4.24
2406.	6815.1	6819.3	6823.5	6827.8	6832.0	6836.2	6840.4	6844.6	6848.9	6853.1	4.22
2405.	6773.0	6777.2	6781.4	6785.6	6789.8	6794.0	6798.3	6802.5	6806.7	6810.9	4.21

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2404.	6731.1	6735.3	6739.5	6743.7	6747.9	6752.0	6756.2	6760.4	6764.6	6768.8	4.19
2403.	6689.4	6693.6	6697.7	6701.9	6706.1	6710.2	6714.4	6718.6	6722.8	6726.9	4.17
2402.	6647.8	6652.0	6656.1	6660.3	6664.4	6668.6	6672.8	6676.9	6681.1	6685.2	4.16
2401.	6606.4	6610.5	6614.7	6618.8	6623.0	6627.1	6631.2	6635.4	6639.5	6643.7	4.14
2400.	6565.1	6569.2	6573.4	6577.5	6581.6	6585.7	6589.9	6594.0	6598.1	6602.3	4.13
2399.	6524.1	6528.2	6532.3	6536.4	6540.5	6544.6	6548.7	6552.8	6556.9	6561.0	4.10
2398.	6483.4	6487.5	6491.5	6495.6	6499.7	6503.7	6507.8	6511.9	6516.0	6520.0	4.07
2397.	6443.0	6447.0	6451.1	6455.1	6459.2	6463.2	6467.2	6471.3	6475.3	6479.4	4.04
2396.	6403.0	6407.0	6411.0	6415.0	6419.0	6423.0	6427.0	6431.0	6435.0	6439.0	4.00
2395.	6363.4	6367.4	6371.3	6375.3	6379.2	6383.2	6387.2	6391.1	6395.1	6399.0	3.95
2394.	6324.1	6328.0	6332.0	6335.9	6339.8	6345.7	6347.7	6351.6	6355.5	6359.5	3.93
2393.	6285.1	6289.0	6292.9	6295.8	6300.7	6304.6	6308.5	6312.4	6316.3	6320.2	3.90
2392.	6240.4	6250.3	6254.1	6258.0	6261.9	6265.7	6269.6	6273.5	6277.4	6281.2	3.87
2391.	6208.1	6211.9	6215.8	6219.6	6223.4	6227.2	6231.1	6234.9	6238.7	6242.6	3.83
2390.	6170.1	6173.9	6177.7	6181.5	6185.3	6189.1	6192.9	6196.7	6200.5	6204.3	3.80

LIBBY

RESERVOIR CAPACITY TABLE

PAGE # 1

FIGURES IN 1000'S
OF SECOND FOOT DAYS

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2459.	2510.5										
2458.	2487.1	2489.4	2491.8	2494.1	2496.5	2498.8	2501.1	2503.5	2505.8	2508.2	2.34
2457.	2463.8	2466.1	2468.5	2470.8	2473.1	2475.4	2477.8	2480.1	2482.4	2484.8	2.33
2456.	2440.6	2442.9	2445.2	2447.6	2449.9	2452.2	2454.5	2456.8	2459.2	2461.5	2.32
2455.	2417.5	2419.8	2422.1	2424.4	2426.7	2429.0	2431.4	2433.7	2436.0	2438.3	2.31
2454.	2394.5	2396.8	2399.1	2401.4	2403.7	2406.0	2408.3	2410.6	2412.9	2415.2	2.30
2453.	2371.6	2373.9	2376.2	2378.5	2380.8	2383.0	2385.3	2387.6	2389.9	2392.2	2.29
2452.	2348.8	2351.1	2353.4	2355.6	2357.9	2360.2	2362.5	2364.8	2367.0	2369.3	2.28
2451.	2326.1	2328.4	2330.6	2332.9	2335.2	2337.4	2339.7	2342.0	2344.3	2346.5	2.27
2450.	2303.4	2305.7	2307.9	2310.2	2312.5	2314.7	2317.0	2319.3	2321.6	2323.8	2.27
2449.	2280.9	2283.1	2285.4	2287.6	2289.9	2292.1	2294.4	2296.6	2298.9	2301.1	2.25
2448.	2258.4	2260.6	2262.9	2265.1	2267.4	2269.6	2271.9	2274.1	2276.4	2278.6	2.25
2447.	2236.1	2238.3	2240.6	2242.8	2245.0	2247.2	2249.5	2251.7	2253.9	2256.2	2.23
2446.	2213.8	2216.0	2218.3	2220.5	2222.7	2224.9	2227.2	2229.4	2231.6	2233.9	2.23
2445.	2191.7	2193.9	2196.1	2198.3	2200.5	2202.7	2205.0	2207.2	2209.4	2211.6	2.21
2444.	2170.0	2172.2	2174.3	2176.5	2178.7	2180.8	2183.0	2185.2	2187.4	2189.5	2.17
2443.	2147.7	2149.9	2152.2	2154.4	2156.6	2158.8	2161.1	2163.3	2165.5	2167.8	2.23
2442.	2125.9	2128.1	2130.3	2132.4	2134.6	2136.8	2139.0	2141.2	2143.3	2145.5	2.18
2441.	2104.1	2106.3	2108.5	2110.6	2112.8	2115.0	2117.2	2119.4	2121.5	2123.7	2.18
2440.	2082.5	2084.7	2086.8	2089.0	2091.1	2093.3	2095.5	2097.6	2099.8	2101.9	2.16
2439.	2061.0	2063.1	2065.3	2067.4	2069.6	2071.7	2073.9	2076.0	2078.2	2080.3	2.15
2438.	2039.5	2041.6	2043.8	2045.9	2048.1	2050.2	2052.4	2054.5	2056.7	2058.8	2.15
2437.	2018.2	2020.3	2022.5	2024.6	2026.7	2028.8	2031.0	2033.1	2035.2	2037.4	2.13
2436.	1997.0	1999.1	2001.2	2003.4	2005.5	2007.6	2009.7	2011.8	2014.0	2016.1	2.12
2435.	1975.9	1978.0	1980.1	1982.2	1984.3	1986.4	1988.6	1990.7	1992.8	1994.9	2.11

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2434.	1954.9	1957.0	1959.1	1961.2	1963.3	1965.4	1967.5	1969.6	1971.7	1973.8	2.10
2433.	1934.0	1936.1	1938.2	1940.3	1942.4	1944.4	1946.5	1948.6	1950.7	1952.8	2.09
2432.	1913.2	1915.3	1917.4	1919.4	1921.5	1923.6	1925.7	1927.8	1929.8	1931.9	2.08
2431.	1892.5	1894.6	1896.6	1898.7	1900.8	1902.8	1904.9	1907.0	1909.1	1911.1	2.07
2430.	1871.9	1874.0	1876.0	1878.1	1880.1	1882.2	1884.3	1886.3	1888.4	1890.4	2.06
2429.	1851.4	1853.4	1855.5	1857.5	1859.6	1861.6	1863.7	1865.7	1867.8	1869.8	2.05
2428.	1831.0	1833.0	1835.1	1837.1	1839.2	1841.2	1843.2	1845.3	1847.3	1849.4	2.04
2427.	1810.7	1812.7	1814.8	1816.8	1818.8	1820.8	1822.9	1824.9	1826.9	1829.0	2.03
2426.	1790.6	1792.6	1794.6	1796.6	1798.6	1800.6	1802.7	1804.7	1806.7	1808.7	2.01
2425.	1770.5	1772.5	1774.5	1776.5	1778.5	1780.5	1782.6	1784.6	1786.6	1788.6	2.01
2424.	1750.6	1752.6	1754.6	1756.6	1758.6	1760.5	1762.5	1764.5	1766.5	1768.5	1.99
2423.	1730.8	1732.8	1734.8	1736.7	1738.7	1740.7	1742.7	1744.7	1746.6	1748.6	1.98
2422.	1711.1	1713.1	1715.0	1717.0	1719.0	1720.9	1722.9	1724.9	1726.9	1728.8	1.97
2421.	1691.5	1693.5	1695.4	1697.4	1699.3	1701.3	1703.3	1705.2	1707.2	1709.1	1.96
2420.	1672.0	1673.9	1675.9	1677.8	1679.8	1681.7	1683.7	1685.6	1687.6	1689.5	1.95
2419.	1652.6	1654.5	1656.5	1658.4	1660.4	1662.3	1664.2	1666.2	1668.1	1670.1	1.94
2418.	1633.3	1635.2	1637.2	1639.1	1641.0	1642.9	1644.9	1646.8	1648.7	1650.7	1.93
2417.	1614.2	1616.1	1618.0	1619.9	1621.8	1623.7	1625.7	1627.6	1629.5	1631.4	1.91
2416.	1595.2	1597.1	1599.0	1600.9	1602.8	1604.7	1606.6	1608.5	1610.4	1612.3	1.90
2415.	1576.3	1578.2	1580.1	1582.0	1583.9	1585.7	1587.6	1589.5	1591.4	1593.3	1.89
2414.	1557.5	1559.4	1561.3	1563.1	1565.0	1566.9	1568.8	1570.7	1572.5	1574.4	1.88
2413.	1538.9	1540.8	1542.6	1544.5	1546.3	1548.2	1550.1	1551.9	1553.8	1555.6	1.86
2412.	1520.3	1522.2	1524.0	1525.9	1527.7	1529.6	1531.5	1533.3	1535.2	1537.0	1.86
2411.	1501.9	1503.7	1505.6	1507.4	1509.3	1511.1	1512.9	1514.8	1516.6	1518.5	1.84
2410.	1483.6	1485.4	1487.3	1489.1	1490.9	1492.7	1494.6	1496.4	1498.2	1500.1	1.83

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2409.	1465.5	1467.3	1469.1	1470.9	1472.7	1474.5	1476.4	1478.2	1480.0	1481.8	1.81
2408.	1447.6	1449.4	1451.2	1453.0	1454.8	1456.5	1458.3	1460.1	1461.9	1463.7	1.79
2407.	1429.7	1431.5	1433.3	1435.1	1436.9	1438.6	1440.4	1442.2	1444.0	1445.8	1.79
2406.	1412.1	1413.9	1415.6	1417.4	1419.1	1420.9	1422.7	1424.4	1426.2	1427.9	1.76
2405.	1394.6	1396.3	1398.1	1399.8	1401.6	1403.3	1405.1	1406.8	1408.6	1410.3	1.75
2404.	1377.4	1379.1	1380.8	1382.6	1384.3	1386.0	1387.7	1389.4	1391.2	1392.9	1.72
2403.	1360.3	1362.0	1363.7	1365.4	1367.1	1368.8	1370.6	1372.3	1374.0	1375.7	1.71
2402.	1343.3	1345.0	1346.7	1348.4	1350.1	1351.8	1353.5	1355.2	1356.9	1358.6	1.70
2401.	1326.6	1328.3	1329.9	1331.6	1333.3	1334.9	1336.6	1338.3	1340.0	1341.6	1.67
2400.	1310.0	1311.7	1313.3	1315.0	1316.6	1318.3	1320.0	1321.6	1323.3	1324.9	1.66
2399.	1293.6	1295.2	1296.9	1298.5	1300.2	1301.8	1303.4	1305.1	1306.7	1308.4	1.64
2398.	1277.3	1278.9	1280.6	1282.2	1283.8	1285.4	1287.1	1288.7	1290.3	1292.0	1.63
2397.	1261.2	1262.8	1264.4	1266.0	1267.6	1269.2	1270.9	1272.5	1274.1	1275.7	1.61
2396.	1245.2	1246.8	1248.4	1250.0	1251.6	1253.2	1254.8	1256.4	1258.0	1259.6	1.60
2395.	1229.4	1231.0	1232.6	1234.1	1235.7	1237.3	1238.9	1240.5	1242.0	1243.6	1.58
2394.	1213.7	1215.3	1216.8	1218.4	1220.0	1221.5	1223.1	1224.7	1226.3	1227.8	1.57
2393.	1198.1	1199.7	1201.2	1202.8	1204.3	1205.9	1207.5	1209.0	1210.6	1212.1	1.56
2392.	1182.8	1184.3	1185.9	1187.4	1188.9	1190.4	1192.0	1193.5	1195.0	1196.6	1.53
2391.	1167.5	1169.0	1170.6	1172.1	1173.6	1175.1	1176.7	1178.2	1179.7	1181.3	1.53
2390.	1152.4	1153.9	1155.4	1156.9	1158.4	1159.9	1161.5	1163.0	1164.5	1166.0	1.51
2389.	1137.4	1138.9	1140.4	1141.9	1143.4	1144.9	1146.4	1147.9	1149.4	1150.9	1.50
2388.	1122.5	1124.0	1125.5	1127.0	1128.5	1129.9	1131.4	1132.9	1134.4	1135.9	1.49
2387.	1107.7	1109.2	1110.7	1112.1	1113.6	1115.1	1116.6	1118.1	1119.5	1121.0	1.48
2386.	1093.0	1094.5	1095.9	1097.4	1098.9	1100.3	1101.8	1103.3	1104.8	1106.2	1.47
2385.	1078.4	1079.9	1081.3	1082.8	1084.2	1085.7	1087.2	1088.6	1090.1	1091.5	1.46

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2384.	1063.8	1065.3	1066.7	1068.2	1069.6	1071.1	1072.6	1074.0	1075.5	1076.9	1.46
2383.	1049.3	1050.7	1052.2	1053.6	1055.1	1056.5	1058.0	1059.4	1060.9	1062.3	1.45
2382.	1034.9	1036.3	1037.8	1039.2	1040.7	1042.1	1043.5	1045.0	1046.4	1047.9	1.44
2381.	1020.6	1022.0	1023.5	1024.9	1026.3	1027.7	1029.2	1030.6	1032.0	1033.5	1.43
2380.	1006.3	1007.7	1009.2	1010.6	1012.0	1013.4	1014.9	1016.3	1017.7	1019.2	1.43
2379.	992.2	993.6	995.0	996.4	997.8	999.2	1000.7	1002.1	1003.5	1004.9	1.41
2378.	978.1	979.5	980.9	982.3	983.7	985.1	986.6	988.0	989.4	990.8	1.41
2377.	964.1	965.5	966.9	968.3	969.7	971.1	972.5	973.9	975.3	976.7	1.40
2376.	950.2	951.6	953.0	954.4	955.8	957.1	958.5	959.9	961.3	962.7	1.39
2375.	936.3	937.7	939.1	940.5	941.9	943.2	944.6	946.0	947.4	948.8	1.39
2374.	922.5	923.9	925.3	926.6	928.0	929.4	930.8	932.2	933.5	934.9	1.38
2373.	908.8	910.2	911.5	912.9	914.3	915.6	917.0	918.4	919.8	921.1	1.37
2372.	895.2	896.6	897.9	899.3	900.6	902.0	903.4	904.7	906.1	907.4	1.36
2371.	881.6	883.0	884.3	885.7	887.0	888.4	889.8	891.1	892.5	893.8	1.36
2370.	868.1	869.4	870.8	872.1	873.5	874.8	876.2	877.5	878.9	880.2	1.35
2369.	854.7	856.0	857.4	858.7	860.1	861.4	862.7	864.1	865.4	866.8	1.34
2368.	841.3	842.6	844.0	845.3	846.7	848.0	849.3	850.7	852.0	853.4	1.34
2367.	828.1	829.4	830.7	832.1	833.4	834.7	836.0	837.3	838.7	840.0	1.32
2366.	815.0	816.3	817.6	818.9	820.2	821.5	822.9	824.2	825.5	826.8	1.31
2365.	801.9	803.2	804.5	805.8	807.1	808.4	809.8	811.1	812.4	813.7	1.31
2364.	788.9	790.2	791.5	792.8	794.1	795.4	796.7	798.0	799.3	800.6	1.30
2363.	776.0	777.3	778.6	779.9	781.2	782.4	783.7	785.0	786.3	787.6	1.29
2362.	763.2	764.5	765.8	767.0	768.3	769.6	770.9	772.2	773.4	774.7	1.28
2361.	750.5	751.8	753.0	754.3	755.6	756.8	758.1	759.4	760.7	761.9	1.27
2360.	737.9	739.2	740.4	741.7	742.9	744.2	745.5	746.7	748.0	749.2	1.26

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2359.	725.3	726.6	727.8	729.1	730.3	731.6	732.9	734.1	735.4	736.6	1.26
2358.	712.8	714.0	715.3	716.5	717.8	719.0	720.3	721.5	722.8	724.0	1.25
2357.	700.4	701.6	702.9	704.1	705.4	706.6	707.8	709.1	710.3	711.6	1.24
2356.	688.0	689.2	690.5	691.7	693.0	694.2	695.4	696.7	697.9	699.2	1.24
2355.	675.7	676.9	678.2	679.4	680.6	681.8	683.1	684.3	685.5	686.8	1.23
2354.	663.5	664.7	665.9	667.2	668.4	669.6	670.8	672.0	673.3	674.5	1.22
2353.	651.4	652.6	653.8	655.0	656.2	657.4	658.7	659.9	661.1	662.3	1.21
2352.	639.3	640.5	641.7	642.9	644.1	645.3	646.6	647.8	649.0	650.2	1.21
2351.	627.3	628.5	629.7	630.9	632.1	633.3	634.5	635.7	636.9	638.1	1.20
2350.	615.3	616.5	617.7	618.9	620.1	621.3	622.5	623.7	624.9	626.1	1.20
2349.	603.4	604.6	605.8	607.0	608.2	609.3	610.5	611.7	612.9	614.1	1.19
2348.	591.6	592.8	594.0	595.1	596.3	597.5	598.7	599.9	601.0	602.2	1.18
2347.	579.8	581.0	582.2	583.3	584.5	585.7	586.9	588.1	589.2	590.4	1.18
2346.	568.1	569.3	570.4	571.6	572.8	573.9	575.1	576.3	577.5	578.6	1.17
2345.	556.5	557.7	558.8	560.0	561.1	562.3	563.5	564.6	565.8	566.9	1.16
2344.	544.9	546.1	547.2	548.4	549.5	550.7	551.9	553.0	554.2	555.3	1.16
2343.	533.4	534.5	535.7	536.8	538.0	539.1	540.3	541.4	542.6	543.7	1.15
2342.	521.9	523.0	524.2	525.3	526.5	527.6	528.8	529.9	531.1	532.2	1.15
2341.	510.5	511.6	512.8	513.9	515.1	516.2	517.3	518.5	519.6	520.8	1.14
2340.	499.2	500.3	501.5	502.6	503.7	504.8	506.0	507.1	508.2	509.4	1.13
2339.	488.0	489.1	490.2	491.4	492.5	493.6	494.7	495.8	497.0	498.1	1.12
2338.	476.7	477.8	479.0	480.1	481.2	482.3	483.5	484.6	485.7	486.9	1.13
2337.	465.6	466.7	467.8	468.9	470.0	471.1	472.3	473.4	474.5	475.6	1.11
2336.	454.5	455.6	456.7	457.8	458.9	460.0	461.2	462.3	463.4	464.5	1.11
2335.	443.5	444.6	445.7	446.8	447.9	449.0	450.1	451.2	452.3	453.4	1.10

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2334.	432.6	433.7	434.8	435.9	437.0	438.0	439.1	440.2	441.3	442.4	1.09
2333.	421.7	422.8	423.9	425.0	426.1	427.1	428.2	429.3	430.4	431.5	1.09
2332.	410.8	411.9	413.0	414.1	415.2	416.2	417.3	418.4	419.5	420.6	1.09
2331.	400.1	401.2	402.2	403.3	404.4	405.4	406.5	407.6	408.7	409.7	1.07
2330.	389.3	390.4	391.5	392.5	393.6	394.7	395.8	396.9	397.9	399.0	1.08
2329.	378.7	379.8	380.8	381.9	382.9	384.0	385.1	386.1	387.2	388.2	1.06
2328.	368.2	369.2	370.3	371.3	372.4	373.4	374.5	375.5	376.6	377.6	1.05
2327.	357.8	358.8	359.9	360.9	362.0	363.0	364.0	365.1	366.1	367.2	1.04
2326.	347.4	348.4	349.5	350.5	351.6	352.6	353.6	354.7	355.7	356.8	1.04
2325.	337.1	338.1	339.2	340.2	341.2	342.2	343.3	344.3	345.3	346.4	1.03
2324.	327.0	328.0	329.0	330.0	331.0	332.0	333.1	334.1	335.1	336.1	1.01
2323.	316.9	317.9	318.9	319.9	320.9	321.9	323.0	324.0	325.0	326.0	1.01
2322.	306.9	307.9	308.9	309.9	310.9	311.9	312.9	313.9	314.9	315.9	1.00
2321.	297.0	298.0	299.0	300.0	301.0	301.9	302.9	303.9	304.9	305.9	0.99
2320.	287.2	288.2	289.2	290.1	291.1	292.1	293.1	294.1	295.0	296.0	0.98
2319.	277.5	278.5	279.4	280.4	281.4	282.3	283.3	284.3	285.3	286.2	0.97
2318.	267.8	268.8	269.7	270.7	271.7	272.6	273.6	274.6	275.6	276.5	0.97
2317.	258.2	259.2	260.1	261.1	262.0	263.0	264.0	264.9	265.9	266.8	0.96
2316.	248.7	249.6	250.6	251.5	252.5	253.4	254.4	255.3	256.3	257.2	0.95
2315.	239.1	240.1	241.0	242.0	242.9	243.9	244.9	245.8	246.8	247.7	0.96
2314.	229.7	230.6	231.6	232.5	233.5	234.4	235.3	236.3	237.2	238.2	0.94
2313.	220.3	221.2	222.2	223.1	224.1	225.0	225.9	226.9	227.8	228.8	0.94
2312.	210.9	211.8	212.8	213.7	214.7	215.6	216.5	217.5	218.4	219.4	0.94
2311.	201.6	202.5	203.5	204.4	205.3	206.2	207.2	208.1	209.0	210.0	0.93
2310.	192.3	193.2	194.2	195.1	196.0	196.9	197.9	198.8	199.7	200.7	0.93

ELEVATION IN FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	AVERAGE DIFFERENCE PER TENTH FT
2309.	183.1	184.0	184.9	185.9	186.8	187.7	188.6	189.5	190.5	191.4	0.92
2308.	174.0	174.9	175.8	176.7	177.6	178.5	179.5	180.4	181.3	182.2	0.91
2307.	164.9	165.8	166.7	167.6	168.5	169.4	170.4	171.3	172.2	173.1	0.91
2306.	155.9	156.8	157.7	158.6	159.5	160.4	161.3	162.2	163.1	164.0	0.90
2305.	146.9	147.8	148.7	149.6	150.5	151.4	152.3	153.2	154.1	155.0	0.90
2304.	138.1	139.0	139.9	140.7	141.6	142.5	143.4	144.3	145.1	146.0	0.88
2303.	129.3	130.2	131.1	131.9	132.8	133.7	134.6	135.5	136.3	137.2	0.88
2302.	120.5	121.4	122.3	123.1	124.0	124.9	125.8	126.7	127.5	128.4	0.88
2301.	111.8	112.7	113.5	114.4	115.3	116.1	117.0	117.9	118.8	119.6	0.87
2300.	103.2	104.1	104.9	105.8	106.6	107.5	108.4	109.2	110.1	110.9	0.86
2299.	99.2	99.6	100.0	100.4	100.8	101.2	101.6	102.0	102.4	102.8	0.40
2298.	86.2	87.5	88.8	90.1	91.4	92.7	94.0	95.3	96.6	97.9	1.30
2297.	81.6	82.1	82.5	83.0	83.4	83.9	84.4	84.8	85.3	85.7	0.46
2296.	69.7	70.9	72.1	73.3	74.5	75.6	76.8	78.0	79.2	80.4	1.19
2295.	61.5	62.3	63.1	64.0	64.8	65.6	66.4	67.2	68.1	68.9	0.82
2294.	53.5	54.3	55.1	55.9	56.7	57.5	58.3	59.1	59.9	60.7	0.80
2293.	45.6	46.4	47.2	48.0	48.8	49.5	50.3	51.1	51.9	52.7	0.79
2292.	39.2	39.8	40.5	41.1	41.8	42.4	43.0	43.7	44.3	45.0	0.64
2291.	30.0	30.9	31.8	32.8	33.7	34.6	35.5	36.4	37.4	38.3	0.92
2290.	22.4	23.2	23.9	24.7	25.4	26.2	27.0	27.7	28.5	29.2	0.76
2289.	14.8	15.6	16.3	17.1	17.8	18.6	19.4	20.1	20.9	21.6	0.76
2288.	7.4	8.1	8.9	9.6	10.4	11.1	11.8	12.6	13.3	14.1	0.74
2287.	0.0	0.7	1.5	2.2	3.0	3.7	4.4	5.2	5.9	6.7	0.74