THE CITY OF SEATTLE
DEPARTMENT OF LIGHTING
ELIOT 7600

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SUPERINTENDENT
MEMBER, BOARD OF PUBLIC WORKS
SEATTLE, 4, WASHINGTON

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July 17, 1950

NPS 800.924(Skagit River)9

Colonel E. C. Itschner
District Engineer
U. S. Corps of Engineers
4735 East Marginal Way
Seattle 4, Washington

Dear Colonel Itschner:

1. Reference is made to your letter of February 10, 1950, in which it is suggested that the Lighting Department of the City of Seattle prepare certain estimates of the resources that would be obtained by operating the reservoir created by Ross Dam on the Skagit River in the interests of flood control.

2. Following your suggestion the Department has made a study of the operations of the reservoir to effect flood control in the amount of 200,000 acre-feet to be made available continuously from December 1 through February 15 of each seasonal year. In this study it was assumed that the Skagit River plants would be operated as a part of the Northwest Power Pool. It was also assumed that the flood control storage space of 200,000 acre-feet would be used as follows:

(1) The full amount of storage space would be available by December 1 of each year.
(2) Drawdown to make available the flood storage space would start not later than November 1.
(3) Except during flood periods, the full 200,000 acre-feet of storage space would be maintained until February 15.
(4) The flood storage space could be filled starting February 15 with at least a 30-day uniform refill period.
(5) When flood storage space becomes filled or partially filled from flood waters, the excess water stored would be released following the flood crest at a rate of 25,000 cfs.

Following the above listed assumptions, estimates were prepared showing the power revenue loss (or increase in power operating expense) over a 35-year period which represents the period for which streamflow data were available.

P 000548

3 In this study 15 years out of 35 years of record were analyzed. These years were selected because of the relatively large amounts of power required from sources other than the Skagit River in order to carry the system loads which have been assumed. During these fifteen years a study of the purchase of surplus hydro electric power in August, September and October of each year under normal operation without flood control and under flood control operation requiring 200,000 acre-feet of flood control space, indicates that the purchases of power required during the period from January 1 to April 30, when power is at a premium, could be reduced by normal operation as compared with flood control operation by 426,823,000 kwh. The various annual amounts of these reductions in the purchase of premium power are shown on the attached tabulation.

4 It has been assumed from study of reports of the Bonneville Power Administration that relatively large blocks of surplus hydro energy will be available from the Government's Columbia River Projects each year during the period from May 1 to October 31. By purchasing such surplus energy from the Columbia River System in the months of August through October, Ross reservoir could be held full up to the first of November. Such purchases could be made under present rates at 2.5 mills per kwh. This energy could be used to displace necessary purchases of energy during the period from January 1 to May 1 when there would be no surplus hydro energy available. Energy requirements during this period would have to come from relatively high cost steam generating sources. The City's existing steam resources are inefficient compared with present-day standards, energy costs running from 1.3¢ to 2¢ per kwh depending on the load factor of the operation. From presently available information it appears that a modern steam generating plant would produce energy at a cost of about 8.5 mills per kwh on a 57% annual load factor basis. The energy requirements in this study are at a much lower load factor than this so that it has been assumed that the average cost for such energy when produced by a modern oil fired steam plant would amount to 1¢ per kwh. As mentioned above, in fifteen years out of 35 years of record, 426,823,000 kwh of energy could, under normal operation, be purchased at a rate of 2.5 mills per kwh or $1,269,142.50 which, with 200,000 acre-feet of flood control reserve in Ross reservoir would have to be supplied from steam resources at a rate of 1¢ per kwh or $4,268,230.

5 The difference in the two costs would be $3,201,172.50 which, spread over a 35-year period would amount to an annual cost (increased operating expense) of $91,462 chargeable to the supply of flood control space in Ross reservoir.

6 In connection with the reserve of 100,000 acre-feet of flood control space, our analysis indicates that there would be very little difference between operating with this amount of flood control reserve and operating with no flood control space. Apparently supplying a 100,000 acre-feet of flood control reserve would result in no increase in operating expense.

7 At this point it is suggested that further consideration be given to the rate at which accumulated flood waters should be released after a flood crest. The City has just completed a new diversion dam at the Gorge plant intake. There are two sluice gates at this dam capable of discharging a total of 16,000 cfs with a forebay elevation of 490 feet. In addition to the sluice gates there is an overflow spillway 180 feet long containing 36 flashboards 5 feet in width by 10 feet in height. The discharge over the flashboards with a forebay elevation at 490 feet would amount to 3,000 cfs. The total capacity that can be discharged through the tunnel and powerplant will amount to 6,000 cfs. This would give a total discharge capacity at this installation of 25,000 cfs. Due to the fact that we may not be able to maintain full load on the power plant at all times, it appears that our discharge at this point would be limited to 20,000 cfs. Any amount greater than this might take out the flashboards at the diversion dam, replacement of which would represent a fair item of additional operating expense. It is suggested, therefore, that in connection with the discharge of accumulated flood waters, the maximum rate of flow be limited to 20,000 cfs at the Newhalem gaging station. Allowing for sidestream discharge between this point and Ross dam, a discharge of about 17,000 cfs could be maintained at Ross dam. About 4,000 cfs of this amount would represent Ross reservoir inflow, giving a net discharge from storage of about 13,000 cfs. At this rate it would take about 8 days to dissipate the full 200,000 acre-feet of accumulated flood waters. It might be added that in extreme emergencies when it appears that a second flood is probable, the flashboards at the Gorge dam could be washed down and discharges could then be made up to 40,000 cfs without seriously damaging City Light installations. The rate of discharge which could be handled downstream from our Gorge plant without damage is unknown to us. We have no surveys of the River below that point.

8 There are being mailed to you under separate cover, prints of our Drawing No. ST-84 which outlines graphically the results of the foregoing study. We shall be glad to discuss this matter with you and your staff after you have had time to go over our estimates.

Yours very truly,

Superintendent of Lighting

ECB:gdr

Encl. Tabulation

ROSS RESERVOIR FLOOD CONTROL STUDY
SUMMARY OF ENERGY IN MEGAWATT-HOURS

Periods	PURCHASES OF ENERGY			PRODUCTION OF SURPLUS ENERGY			ENERGY WASTED		
	With Flood Control	Without Flood Control	Difference	With Flood Control	Without Flood Control	Difference	With Flood Control	Without Flood Control	Difference
1914-1915									
Aug-Dec	210 326	210 326	0	99 000	3 237	95 763	83 405	0	83 405
Jan-Apr	247 587	62 641	184 946	0	0	0	0	0	0
May-Jul	269 120	269 120	0	0	0	0	0	0	0
Total	727 033	542 087	184 946	99 000	3 237	95 763	83 405	0	83 405
1915-1916									
Aug-Dec	223 326	223 326	0	71 737	71 737	0	0	0	0
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	0	0	0	257 143	257 143	0	290 231	290 231	0
Total	223 326	223 326	0	328 880	328 880	0	290 231	290 231	0
1916-1917									
Aug-Dec	186 711	186 711	0	108 733	57 228	51 505	0	0	0
Jan-Apr	54 392	378	54 014	0	0	0	0	0	0
May-Jul	0	0	0	106 829	106 829	0	89 492	89 492	0
Total	241 103	187 089	54 014	215 562	164 057	51 505	89 492	89 492	0
1925-1926									
Aug-Dec	292 016	292 016	0	17 658	0	17 658	0	0	0
Jan-Apr	80 162	61 963	18 199	0	0	0	0	0	0
May-Jul	280 879	280 879	0	0	0	0	0	0	0
Total	653 057	634 858	18 199	17 658	0	17 658	0	0	0
1926-1927									
Aug-Dec	232 808	232 808	0	59 543	60 420	- 877	468	0	468
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	0	0	0	108 533	108 533	0	42 165	42 165	0
Total	232 808	232 808	0	168 076	168 953	- 877	42 633	42 165	468

P 000551

Periods	PURCHASES OF ENERGY			PRODUCTION OF SURPLUS ENERGY			ENERGY WASTED		
	With Flood Control	Without Flood Control	Difference	With Flood Control	Without Flood Control	Difference	With Flood Control	Without Flood Control	Difference
1928-1929									
Aug-Dec	211 439	211 439	0	52 803	0	52 803	0	0	0
Jan-Apr	79 104	24 548	54 556	0	0	0	0	0	0
May-Jul	228 738	228 738	0	0	0	0	0	0	0
Total	519 281	464 725	54 556	52 803	0	52 803	0	0	0
1929-1930									
Aug-Dec	307 573	307 573	0	9 665	9 665	0	0	0	0
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	23 175	23 175	0	0	0	0	0	0	0
Total	330 748	330 748	0	9 665	9 665	0	0	0	0
1930-1931									
Aug-Dec	264 396	264 396	0	42 343	42 343	0	0	0	0
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	121 123	121 123	0	0	0	0	0	0	0
Total	385 519	385 519	0	42 343	42 343	0	0	0	0
1935-1936									
Aug-Dec	198 576	198 576	0	25 795	25 795	0	0	0	0
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	0	0	0	112 818	112 818	0	0	0	0
Total	198 576	198 576	0	138 613	138 613	0	0	0	0
1936-1937									
Aug-Dec	304 525	304 525	0	10 095	0	10 095	0	0	0
Jan-Apr	10 424	0	10 424	0	1 187	- 1 187	0	0	0
May-Jul	0	0	0	96 429	96 429	0	32 191	32 191	0
Total	314 949	304 525	10 424	106 524	97 616	8 908	32 191	32 191	0
1938-1939									
Aug-Dec	287 889	287 889	0	91 376	133 999	-42 623	41 624	0	41 624
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	0	0	0	176 198	176 198	0	39 580	39 580	0
Total	287 889	287 889	0	267 574	310 197	-42 623	81 204	39 580	41 624

P 000552

Periods	PURCHASES OF ENERGY			PRODUCTION OF SURPLUS ENERGY			ENERGY WASTED		
	With Flood Control	Without Flood Control	Difference	With Flood Control	Without Flood Control	Difference	With Flood Control	Without Flood Control	Difference
1939-1940									
Aug-Dec	257 926	257 926	0	71 203	0	71 203	13 431	0	13 431
Jan-Apr	13 536	0	13 536	0	0	0	0	0	0
May-Jul	202 614	121 780	80 834	0	0	0	0	0	0
Total	474 076	379 706	94 370	71 203	0	71 203	13 431	0	13 431
1940-1941									
Aug-Dec	208 672	208 672	0	56 589	0	56 589	0	0	0
Jan-Apr	191 492	131 733	59 759	0	0	0	0	0	0
May-Jul	269 418	269 418	0	0	0	0	0	0	0
Total	669 582	609 823	59 759	56 589	0	56 589	0	0	0
1942-1943									
Aug-Dec	336 376	336 376	0	46 991	46 991	0	0	0	0
Jan-Apr	0	0	0	0	0	0	0	0	0
May-Jul	0	0	0	256 104	256 104	0	88 466	88 466	0
Total	336 376	336 376	0	303 095	303 095	0	88 466	88 466	0
1943-1944									
Aug-Dec	222 888	222 888	0	30 348	368	29 980	0	0	0
Jan-Apr	191 532	160 143	31 389	0	0	0	0	0	0
May-Jul	300 288	300 288	0	0	0	0	0	0	0
Total	714 708	683 319	31 389	30 348	368	29 980	0	0	0
TOTAL PERIOD									
Aug-Dec	3745 447	3745 447	0	793 879	451 783	342 096	138 928	0	138 928
Jan-Apr	868 229	441 406	426 823	0	1 187	- 1 187	0	0	0
May-Jul	1695 355	1614 521	80 834	1114 054	1114 054	0	582 125	582 125	0
TOTAL	6309 031	5801 374	507 657	1907 933	1567 024	340 909	721 053	582 125	138 928

P 000553

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