



CANADA

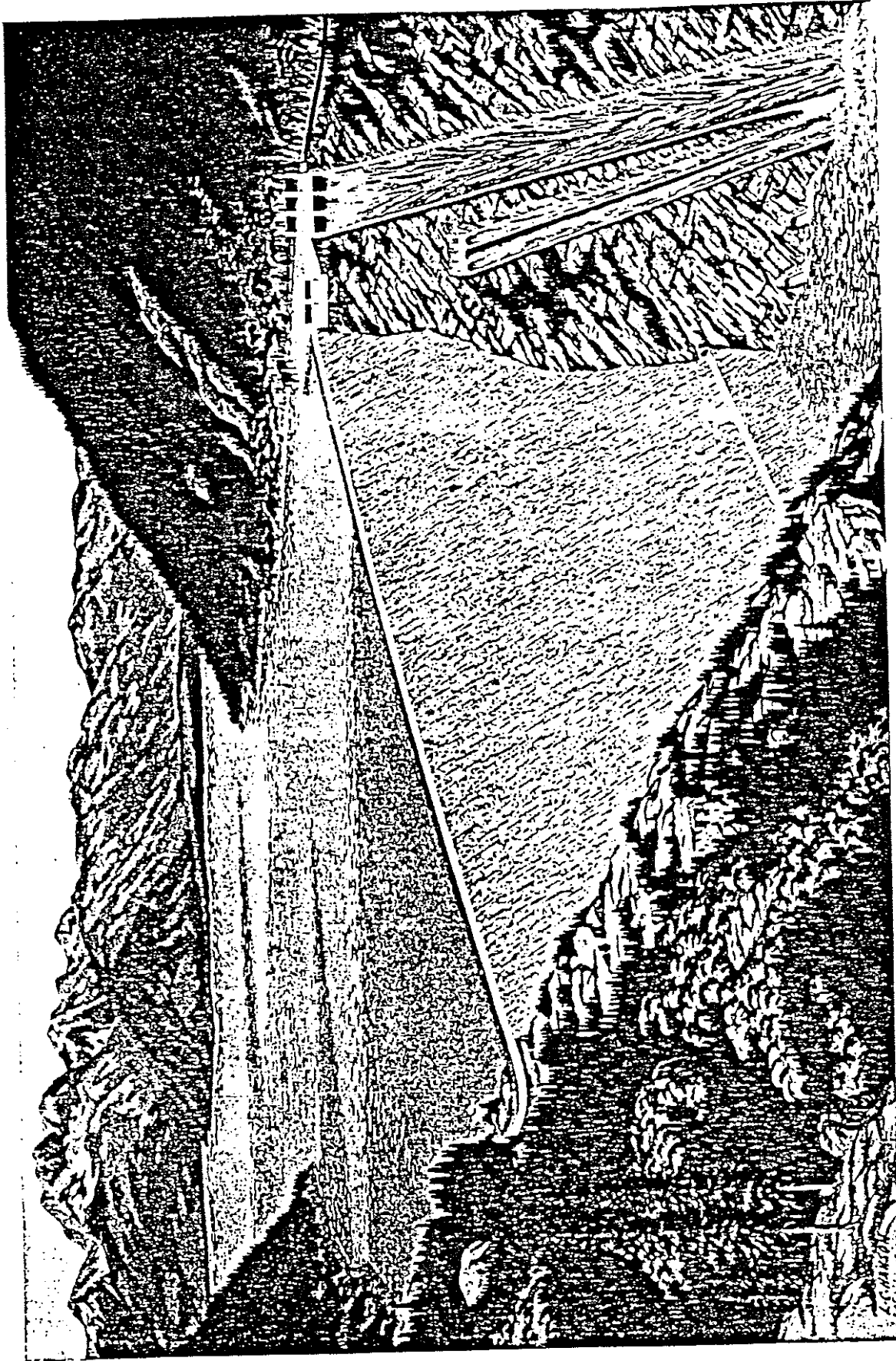
THE COLUMBIA RIVER TREATY AND PROTOCOL

A PRESENTATION

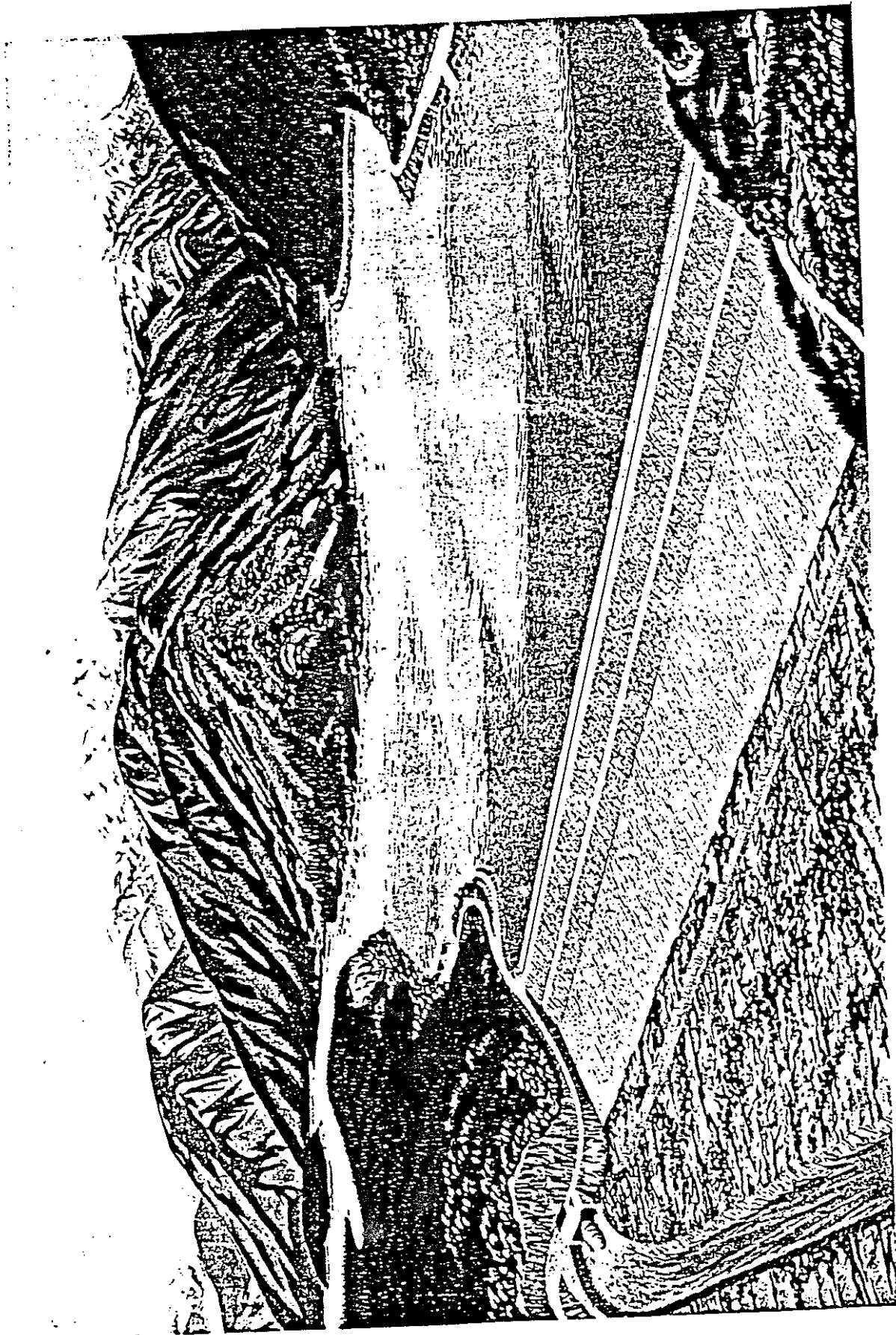
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APRIL 1964

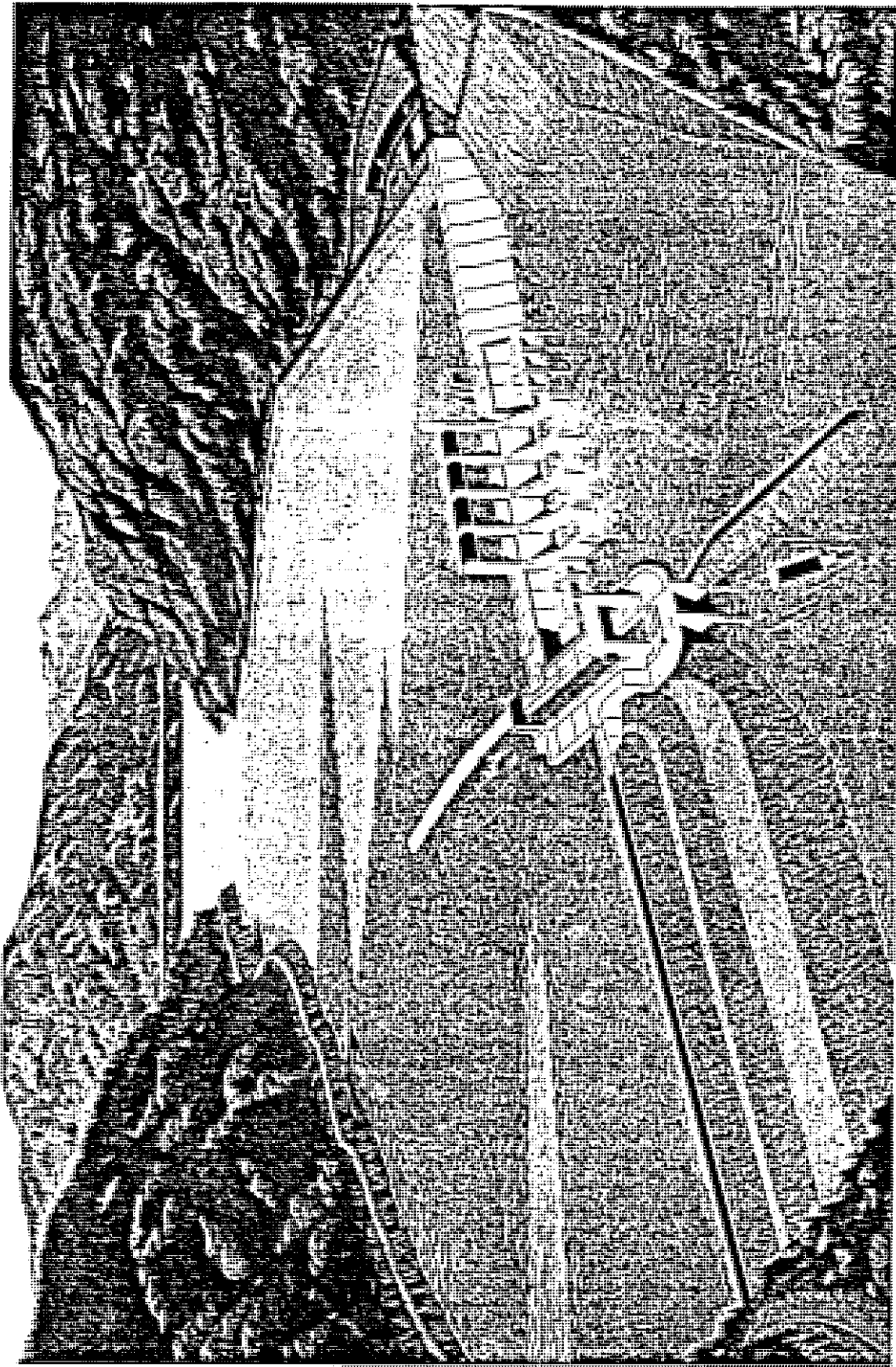
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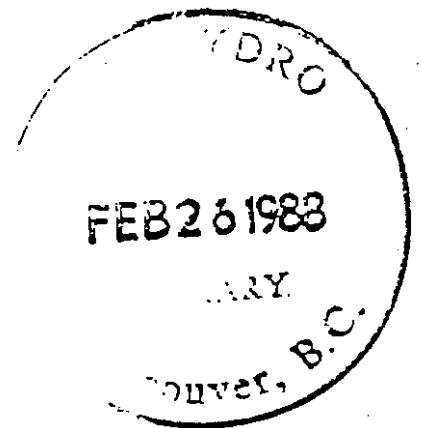
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APRIL 1964

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*Is treaty fair?
Title of future sales*

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GLOSSARY OF TERMS

Acre-Foot - A unit of storage equal to a volume one acre in area and one foot in depth (271,379 Imperial gallons).

Average Annual Energy - The average annual energy which a project or system of projects is capable of generating over the period of record under study,

Average Annual Storage Use - The average amount of storage released and refilled on an annual basis over a specified period of years.

Average Annual Usable Energy - Firm energy plus the portion of the secondary energy which can be sold.

Critical Streamflow Period - The most adverse season or sequence of seasons of streamflow during a period of record under study. During the critical streamflow period only firm power is produced and reservoirs are fully utilized.

Cyclical or Carry-Over Storage - Storage at a project which cannot be released and then refilled in a year of average streamflow. Such storage is normally used only when the firm energy output of a system is threatened by low streamflow conditions or if above normal inflow is expected.

Dead Storage - The volume of water retained behind a dam which is not available for release.

Firm or Dependable Capacity - The maximum generating capacity which can be relied on to meet peak system loads.

Firm or Dependable Energy - Energy which can be supplied to consumers at any time. This energy is usually calculated as the average energy output of a plant or system of plants during critical streamflow conditions with the full use of available storage.

Kilowatt - A unit of power equal to 1.341 horsepower.

Kilowatt Hour - A unit of energy equal to the work done by one kilowatt over a period of one hour. One kilowatt year is equal to 8,760 kilowatt hours.

Live Storage - The volume of water retained behind a dam which is available for release.

Load Factor - The ratio between the average energy demand and the peak energy demand over a specified period of time.

Megawatt - 1,000 kilowatts.

Run of the River Plants - Generating stations with no storage facilities of any magnitude and which therefore must use river flows as they come.

Secondary or Interruptible Energy - Energy which cannot be guaranteed at all times. This energy can be graded into various classes of availability.

CHAPTER I

GENERAL INTRODUCTION

GENERAL INTRODUCTION

1. Scope of The Presentation

A treaty, demonstrating the confidence and the imagination of two countries jointly attempting to develop and manage an immense river which reaches into the territories of both, deserves the widest public understanding. The Columbia River Treaty is such a demonstration of common confidence, but it is more than that. It is the result of a linking of national needs on both sides of the border where Canadian interests, primary for Canadians, were fitted into a wider pattern of continental cooperation. It is also a complex exercise in the engineering and economics of power development and flood control in an area affecting over 250,000 square miles of river drainage and major economic activities on two sides of the international boundary. It is, again, an advanced model of bi-national cooperation where the essential independence of both states is maintained within a framework of administrative coordination. The grand aim of the treaty programme is to harness the waters of the mighty Columbia River so as to tame its powers for energy and prevent its energies from spilling to waste or wreaking destruction.

The object of this presentation is to describe and analyse the Treaty, its purposes and expected achievements and to inform Canadians that the Treaty was a successful conclusion to long and complex negotiations. It will seek to indicate that the Treaty meets all the foreseeable technical and legal problems of protecting the national interest in a vital bi-national river; that there were no acceptable alternative or better uses of the Columbia River for Canada; that the various Treaty projects were wisely selected; that the price paid to Canada for its power and flood control benefits was a fair one, making possible the construction of the Treaty projects and their immense benefits to Canada; and finally that the Treaty not only maintains Canadian independence but that the essential integrity of the Boundary Waters Treaty, 1909 has not been affected.

2. The River and its Basin

The Columbia River is one of the great rivers of the continent, with length and average volume of runoff exceeded only by the Mississippi, Mackenzie, and St. Lawrence Rivers. The portion of the basin considered in detail in this paper consists of the main stem of the river and its major international tributaries, the Kootenay and Clark Fork-Pend d'Oreille Rivers.

(1) Topographic Characteristics: The Columbia River and its tributaries drain an area of 259,000 square miles, mostly between the Rocky Mountains and Cascade Range. The basin extends 270 miles north into Canada and 550 miles south into the United States. The maximum width is about 730 miles. A map showing these and other features of the basin is attached inside the back cover of this presentation.

The Canadian portion of the basin, comprising 39,500 square miles, is in the southeastern part of British Columbia; the United States portion, 219,500 square miles, includes most of Idaho, Oregon and Washington, all of Montana west of the Continental Divide, and small areas of Nevada, Utah and Wyoming. While only about 15 per cent of the river basin is located in Canada approximately 30 per cent of the total river flow originates in that area.

The Columbia River rises in Columbia Lake in the Rocky Mountain Trench and flows a distance of 480 miles in British Columbia before crossing the international boundary into the northeast corner of the State of Washington. In the United States the river flows southerly through the central part of Washington to its junction with the Snake River, then turns and flows westerly and northwesterly to the Pacific Ocean, a total distance of 1,225 miles from its source in Columbia Lake. The total fall of the river from its source to the ocean is 2,655 feet.

The Kootenay River rises to the southeast of Golden, British Columbia, and flows southerly, passing within a mile of Columbia Lake at Canal Flats, British Columbia. About 45 miles south of the international boundary the river turns in a wide semicircle, re-enters Canada, and flows northerly into Kootenay Lake. From the outlet of the lake, the river flows westerly to join the Columbia about 29 miles north of the boundary. The total length of the Kootenay River is 464 miles.

The Clark Fork has its source near Butte, Montana, and flows northwesterly 490 miles to its junction with the Columbia just upstream from the international boundary. It is joined by the Flathead River, its principal tributary, at mile 245, and enters Pend Oreille Lake at mile 139. From Pend Oreille Lake to the Columbia, the stream is named the Pend Oreille River and it crosses the international boundary into Canada only 16 miles before its confluence with the Columbia.

(2) Flow Characteristics: The largest known flood of general occurrence in the Columbia River basin was that of June 1894. The flood resulted from rapid melting of an above-normal snow pack that had accumulated during the preceding winter. Maximum discharge of the Columbia River was estimated at 680,000 cubic feet per second at the international boundary and 1,240,000 cubic feet per second at The Dalles, Oregon. The peak stage at The Dalles was 34 feet above extreme low water and 26.6 feet above the stage at mean annual flow.

The nature of the river basin results in wide fluctuations in streamflow. Extremes of 680,000 cubic feet per second and 12,900 cubic feet per second have been estimated for one point on the international

boundary. At Revelstoke, farther upstream in the basin, the highest recorded flow was 99 times as great as the lowest. By contrast the flows of the St. Lawrence River have a range of only two to one. It is not surprising that in the 1948 flood the Columbia killed fifty people, made 38,000 homeless and destroyed a community in the United States numbering 18,000.

These characteristics demonstrate the great need of multi-purpose storage developments to alleviate flood damage and to regulate the flow to increase the hydroelectric power resources of the river basin. These power resources represent the largest energy potential of any river in North America.

3. Power Patterns in the Pacific Northwest and British Columbia

British Columbia and the Pacific Northwest are the natural heirs to the fruits of the Columbia River. Their joint and several power patterns emphasize this inevitable geographical fact and the economic-technical relationships, in power and flood control, that arise out of that fact.

(1) Power Development in the United States Pacific Northwest: In the United States the hydro plants of the Columbia River basin serve an area known as the Pacific Northwest which includes principally the states of Washington, Oregon, Idaho and Montana west of the Continental Divide. At the present time hydro plants provide about 96 per cent of this area's electrical energy. Power installations, complete or under construction on the main stem of the Columbia River alone now total approximately 10 million kilowatts and the full potential of both the main stem and its tributaries in the United States is estimated to be in the order of 35 million kilowatts of installed capacity, of which over 15 million kilowatts has already been developed. The Second World War created large demands in the Pacific Northwest for power, so that in 1945 the total power requirements in the Pacific Northwest were of the order of 15 billion kilowatt hours per annum, and the growth rate up to 1957 in the energy requirements was approximately 11 per cent per annum. There was a falling-off in 1957 to 1962, when the growth rate was only about 4 1/2 per cent, but it is now expected that this rate will increase to approximately 6 1/2 per cent per annum for the period up to 1980.

Quite apart from the boom conditions created by the Second World War the availability of power in the Pacific Northwest has demonstrated how industry and population could be attracted to this part of the North American Continent.

(2) Power Development in British Columbia: At the present time there are undeveloped hydroelectric power sites in British Columbia having a potential of about 22 million kilowatts of prime power, or about 33 million kilowatts of capacity at 65 per cent load factor. In comparison with this, the present total of hydroelectric power installations which



UNDEVELOPED HYDROELECTRIC RESOURCES IN BRITISH COLUMBIA

TOTAL 33,845,000 Kw.

Capacities to Meet 65% Load Factor

TAKU	5,620,000 Kw.	NECHAKO	925,000 Kw.
LIARD	3,650,000 Kw.	UPPER FRASER	6,540,000 Kw.
STIKINE	1,370,000 Kw.	LOWER FRASER	3,080,000 Kw.
SKEENA-NASS	2,680,000 Kw.	SOUTH COAST	2,390,000 Kw.
PEACE	3,710,000 Kw.	COLUMBIA	3,880,000 Kw.

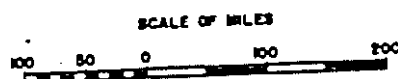


Plate 1 - Undeveloped Hydroelectric Resources in British Columbia.

have been developed in the Province is 2.6 million kilowatts of capacity. There are, in addition, existing thermal power installations totalling about 0.8 million kilowatts.

Between the years 1945 and 1954, the annual energy requirements of the Province increased from approximately 3 billion kilowatt hours to about 7 billion kilowatt hours, with a growth rate of 9 per cent annually. At that time the ALCAN smelter at Kitimat came into operation and between 1954 and 1962 the energy requirements again doubled, from 7 billion kilowatt hours to 15 billion kilowatt hours, for an average load growth of almost 10 per cent annually. Without considering the ALCAN load, the growth in this period would be 6.2 per cent per annum. At this rate the energy requirements of British Columbia are likely to double every ten to twelve years.

With the possible exception of the Bridge River development situated about 100 miles north of Vancouver, where installed capacity is over 400,000 kilowatts, all of the hydro plants serving the major load areas of the lower mainland and Vancouver are relatively small. Nearly all of these smaller sites in the vicinity of the load centres have now been developed, and load increases of the area are presently being met through additions to a 300 megawatt (300,000 kilowatt) thermal-electric plant situated at Vancouver.

In the Central Interior of the Province, where there has been little industrialization, the communities have been supplied from isolated diesel plants. Wherever feasible, these communities are being integrated into the main hydroelectric system of the British Columbia Hydro and Power Authority through extended transmission interconnections.

The ever expanding load in British Columbia can only be met successfully and economically from large power developments. As these large hydro installations take up to 10 years for completion of their engineering and construction, the Province has to plan its power development programme well in advance. Power from the Peace River development which is now underway in the northeastern part of the Province will be capable of meeting forecast loads from 1968 until the mid 1970's. At that time the development of the Columbia River Treaty dams will be completed and paid for through the sale of downstream power benefits to the United States and the generation of power in Canada from these projects will be available at very low cost. This development could start with the "machining" of the Mica project to its ultimate capacity of 1.8 million kilowatts, and then proceed with construction of plants at Downie Creek, Revelstoke Canyon and other sites until a total of about 4 million kilowatts of new capacity has been installed in the Columbia River basin in Canada.

Such a programme has not only provincial and regional significance, but importance for the whole of Canadian economic development and for the evolution of an effective regional and national energy policy.

4. National and Regional Energy Policy

Energy policy is dictated in part by regional considerations of future requirements. In the Maritimes over the long future new electric energy probably will be supplied by hydroelectric, thermal (using coal and oil), tidal and nuclear power. In Québec, for the foreseeable future, electric energy will continue to be supplied by hydroelectric development. In Ontario, large thermal-electric stations using imported coal will be needed together with nuclear power plants using natural uranium from Ontario mines. Manitoba's requirements will be met mainly by hydroelectric development on the Nelson River. Saskatchewan and Alberta with their coal, oil, and gas deposits probably will develop thermal plants together with some hydroelectric development. British Columbia has many sufficiently attractive hydroelectric reserves and sites for the years ahead.

In addition to power developments which have taken place in Canada and the interconnection of some of those developments, there has been an increasing amount of coordination with utilities in the United States. In British Columbia both the British Columbia Hydro and Power Authority and the West Kootenay Power and Light Company are members of the Northwest Power Pool, an organization which comprises more than 100 utilities and power agencies which are interconnected by the transmission lines of the Bonneville Power Administration. The cooperative operations of this power pool increase the dependability of the power supply of its members and provide power at the lowest possible cost. Such cooperative ventures should increase in the future as the power systems of the area grow.

The federal government, in cooperation with the provinces, has been active in the development of the country's energy resources. The National Energy Board, the Water Resources Branch of the Department of Northern Affairs and National Resources, the Dominion Coal Board and Atomic Energy of Canada Limited are responsible in large part, at the federal level, for keeping in close touch with energy reserves and power development in all its forms. Joint federal-provincial activities such as the Saint John River Board, Nelson River Programming Board, Federal-Provincial Working Committee on Long Distance Transmission, Resource Ministers' Council and Douglas Point Nuclear Station, are all contributing to secure orderly development of Canada's energy resources.

On 8 October 1963 the Minister of Trade and Commerce announced a National Power Policy in the House of Commons which embraced two essential concepts:

- (a) To encourage development of large low-cost power sources and to distribute the benefits thereof as widely as possible through interconnection between power systems in Canada, and
- (b) To encourage power exports and interconnection between Canadian and United States power systems where such might induce early development of Canadian power resources.

The Columbia River Treaty should be viewed, therefore, as a greatly significant effort toward the advancement of regional and national energy programmes that include not only the idea of regional and national electrical energy interchanges and grids, but perhaps even more urgently, the exploitation of hydro power resources wherever the Canadian potential and United States markets can accommodate each country's needs and interests.

5. The Making of the Treaty - Historical Summary

In 1944, the Governments of Canada and the United States requested the International Joint Commission (I.J.C.) to undertake investigations to determine whether further development of the water resources of the Columbia River basin would be practical and advantageous to both countries. The Commission, which is a body established under the Boundary Waters Treaty, 1909 to deal with various matters including questions relating to waters that cross the international boundary, established the International Columbia River Engineering Board (I.C.R.E.B.) to undertake the Columbia River investigations. The Board submitted its report in 1959 and indicated that there were a number of sites in Canada suitable for the construction of large storage reservoirs that could be used to regulate the Columbia River for the benefit of both the United States and Canada. The Board presented three development plans of almost equal merit, but did not attempt to indicate how those plans could be developed in a step by step approach or how the benefits of those plans should be divided between the two countries.

In January 1959, the two governments requested the I.J.C. to make a special report on principles for the calculation and apportionment of the benefits which would result from a cooperative development of the Columbia River basin. The Commission submitted its recommendations to the governments in December 1959. The next phase began on February 11, 1960, with the commencement of direct negotiations between representatives of Canada and the United States concerning the selection, construction, and cooperative use of specific projects. These negotiations led to the signing of the Columbia River Treaty on January 17, 1961, at Washington, D. C. 1561

On March 16, 1961, the United States Senate adopted a resolution approving the Treaty. However, ratification did not take place in Canada and following the Hyannis Port meetings between President Kennedy and Prime Minister Pearson in the spring of 1963 formal negotiations resumed between the two countries. At the same time the first of a new series of meetings between representatives of the governments of British Columbia and Canada was held in Ottawa on June 3 and 4 and produced a draft agreement outlining the respective responsibilities of the two governments in the development of the Columbia River. The Main Agreement was signed on July 8, 1963 (a Supplementary Agreement was signed on January 13, 1964).

The Canadian-United States negotiators held their initial 1963 meeting in Ottawa on August 1 and 2, when consideration was given to a

Canadian draft of an Exchange of Notes and Protocol. These negotiations continued through until January 1964 when agreement was reached on the final substance of the documents. On January 22, 1964 the Protocol and other documents relating to the Treaty were signed at Washington, D. C.

6. Columbia River Negotiations - Selected Chronology: 1943-1964

- (1) September 24, 1943 - U.S. Senate Committee on Commerce adopted a resolution asking Corps of Engineers to undertake a comprehensive survey of Columbia River basin in the United States.
- (2) March 9, 1944 - The Columbia River Reference, proposed by U.S. and agreed to by Canada, submitted to I.J.C. This reference called for studies of the entire Columbia River basin to:

"determine whether a greater use than is now being made of the waters of the Columbia River system would be feasible and advantageous".

The Reference goes on to say:

"It is desired that the Commission shall determine whether in its judgment further development of the water resources of the river basin would be practicable and in the public interest from the points of view of the two governments, having in mind (a) domestic water supply and sanitation, (b) navigation, (c) efficient development of water power, (d) the control of floods, (e) the needs of irrigation, (f) reclamation of wet lands, (g) conservation of fish and wildlife, and (h) other beneficial purposes".

This reference led to the establishment of the International Columbia River Engineering Board.

- (3) May , 1948 - Floods in Kootenay Flats area, particularly in vicinity of Bonners Ferry, Idaho. I.J.C. requested by U.S. to make an interim report on Kootenay River.
- (4) 1949 - - U.S. Corps of Engineers' Report on Columbia basin within the U.S.

- (5) November 1, 1950 - Interim Report by International Columbia River Engineering Board submitted.
- (6) January 12, 1951 - First U.S. application to I.J.C. for approval of Libby dam in Montana.
- (7) April 8, 1953 - U.S. application to I.J.C. for approval of Libby withdrawn.
- (8) May 22, 1954 - Second U.S. application to I.J.C. for approval of Libby.
- (9) July 11, 1955 - Enactment of International River Improvements Act (S.C. 1955, Ch. 42).
- (10) March 25-28, 1956 - Prime Minister St. Laurent and President Eisenhower met at White Sulphur Springs and agreed that the Columbia River problem should be discussed at the intergovernmental level.
- (11) May 23, 1956 - Press release issued by the two governments announcing that diplomatic talks would take place with respect to waters of the Columbia River.
- (12) July 4, 1956 - Talks between Premier Bennett and Mr. Lesage, Minister of Northern Affairs.
- (13) March 8, 1957 - Minister of Northern Affairs announced in House forthcoming meeting with the U.S.
- (14) May 20-21, 1957 - Meeting at Washington. Canadian side led by Minister of Northern Affairs accompanied by B.C. representatives.
- (15) October 14, 1957 - Speech from the Throne contained the following reference to the Columbia:

"My Ministers are pressing for a favourable settlement of international problems in connection with the Columbia River to clear the way for a joint programme with the province of British Columbia to develop the immense power in the waters of this river".

- (16) December 5, 1958 - Press Release by Acting Prime Minister (Mr. Green) that the I.J.C. would be asked to report on methods of determining and apportioning benefits.
- (17) January 14, 1959 - First meeting in Vancouver of Canada-B.C. Technical Liaison Committee.
- (18) January 29, 1959 - Identical letters sent to I.J.C. by Canada and U.S. asking I.J.C. to report:
 - "at an early date its recommendations concerning the principles to be applied in determining:
 - (a) benefits which will result from co-operative use of storage of waters and electrical interconnection within the Columbia River system, and
 - (b) apportionment between the two countries of such benefits, more particularly in regard to electrical generation and flood control".
- (19) March 1, 1959 - I.J.C. received report of International Columbia River Engineering Board entitled "Water Resources of the Columbia River Basin".
- (20) April 28, 1959 - First meeting of Canada-B.C. Policy Liaison Committee held in Ottawa.
- (21) December 29, 1959 - I.J.C. Report on "Principles for Determining and Apportioning Benefits from Cooperative Use of Storage Waters and Electrical Interconnection within the Columbia River System" submitted to Canada and the U.S.
- (22) January 14, 1960 - The Government declared in the Speech from the Throne that it "remains ready to participate with British Columbia in the joint development of the potentials of this great river".
- (23) February 11-12, 1960 - First meeting of Canada-U.S. negotiators.
- (24) September 28, 1960 - Joint Progress Report submitted.
- (25) October 19, 1960 - Press announcement by Prime Minister that agreement had been reached on the acceptance of the Progress Report as a basis for a treaty.

- (26) January 8, 1961 - Report to Governments by negotiating teams submitted, recommending the text of the Treaty.
- (27) January 17, 1961 - The Treaty signed in Washington, D.C.
- (28) - Hearings of Comptroller of Water Rights for British Columbia in the matter of application of the British Columbia Power Commission to store water at Arrow Lakes, Duncan Lake and Mica:
- | | | | |
|--------------------|---|------------------|------------------------------------|
| September 18, 1961 | - | Revelstoke, B.C. | <u>Mica</u> |
| September 21, 1961 | - | Kaslo, B.C. | <u>Duncan</u> |
| September 26, 1961 | - | Revelstoke, B.C. | <u>Arrow</u> |
| September 27, 1961 | - | Revelstoke, B.C. | <u>Arrow</u> |
| September 29, 1961 | - | Nakusp, B.C. | <u>Arrow</u> |
| September 30, 1961 | - | Nakusp, B.C. | <u>Arrow</u> |
| October 3, 1961 | - | Castlegar, B.C. | <u>Arrow</u> |
| October 4, 1961 | - | Castlegar, B.C. | <u>Arrow</u> |
| November 21, 1961 | - | Victoria, B.C. | <u>Arrow, Duncan & General</u> |
| November 22, 1961 | - | Victoria, B.C. | <u>Arrow, Duncan & General</u> |
- (29) April 5-6, 1962 - Preliminary meeting of federal and B.C. officials at Ottawa.
- (30) September 11-12, 1962 - Meetings of officials of the governments of Canada, British Columbia and the United States on possible sale in the United States of Canadian downstream benefits.
 October 2-3, 1962 -
 December 19-20, 1962 -
- (31) May 10-11, 1963 - Prime Minister Pearson and President Kennedy agreed at Hyannis Port to initiate negotiations on a Protocol embodying clarifications and adjustments in the Treaty arrangements.
- (32) June 3-4, 1963 - Canada-B.C. meeting at Ottawa to draft an agreement between Canada and B.C.

- (33) July 8, 1963 - Main B.C.-Canada agreement signed.
- (34) July 24-25, 1963 - Canada-B.C. meetings at Ottawa to review draft Protocol and proposed Canadian draft of Canada-U.S. exchange of notes.
- (35) August 1-2, 1963 - First of resumed series of meetings of Canada-U.S. negotiators, at Ottawa. Consideration of Canadian draft of Canada-U.S. exchange of notes and Protocol.
- (36) January 8-9, 1964 - Canada-B.C. meeting at Ottawa, considered supplementary agreement to Agreement of July 8, 1963.
- (37) January 13, 1964 - Supplementary B.C.-Canada Agreement signed.
- (38) January 13, 1964 - Canada-U.S. meeting, Ottawa. Negotiations completed on Protocol and Terms of Sale.
- (39) January 22, 1964 - Signing of exchanges of notes at Washington, D.C.
- (40) March 3, 1964 - Secretary of State for External Affairs submitted a resolution to the House of Commons asking that the Treaty and Protocol be referred for study to the Standing Committee on External Affairs.

CHAPTER II

THE COLUMBIA RIVER TREATY, PROTOCOL, AND RELATED DOCUMENTS

THE COLUMBIA RIVER TREATY, PROTOCOL AND RELATED DOCUMENTS

The basic documents which outline the proposals for a co-operative development of the resources of the Columbia River basin are the Treaty signed in January 1961, the Protocol and proposed Terms of Sale which were signed in January 1964 and the British Columbia-Canada Agreements signed in July 1963 and January 1964. A very brief look at these documents is desirable at this point in the presentation and a more detailed analysis of the documents is given in the Appendix to this paper.

1. The Columbia River Treaty

The basic Treaty for the development of the Columbia River was described in detail by the Prime Minister of Canada in a Press Release on the date of signing, January 17, 1961. That Press Release is contained in Hansard for January 18, 1961 and is reproduced on pages 82 to 97 of a White Paper on the Columbia River which was tabled in Parliament on March 2, 1964.

The main features of the twenty-one Articles and two Annexes of the Treaty are as follows:

- (a) Canada is to build within a nine-year period storage projects in the Columbia River basin in Canada at the Arrow Lakes, Duncan Lake and Mica Creek sites. Plate 2, a map of the northern portion of the Columbia River basin, shows the locations of these projects. These projects will control a very large amount of storage of which a part (though by no means all) will be committed for operation on agreed terms to produce power benefits downstream in the United States which will be shared equally between the two countries as well as substantial benefits in and for Canada itself. Some of this storage will also be operated to provide flood control, and payments totalling at least \$64,400,000 (U. S.) and possibly \$71,900,000 (U. S.) will be made to Canada for flood damage prevented in the United States.
- (b) The United States is to operate all its existing hydroelectric plants in the basin and any new projects on the main stem of the river so as to make the best use of the Canadian storage and therefore produce the maximum amount of power benefits possible for sharing by the two countries.

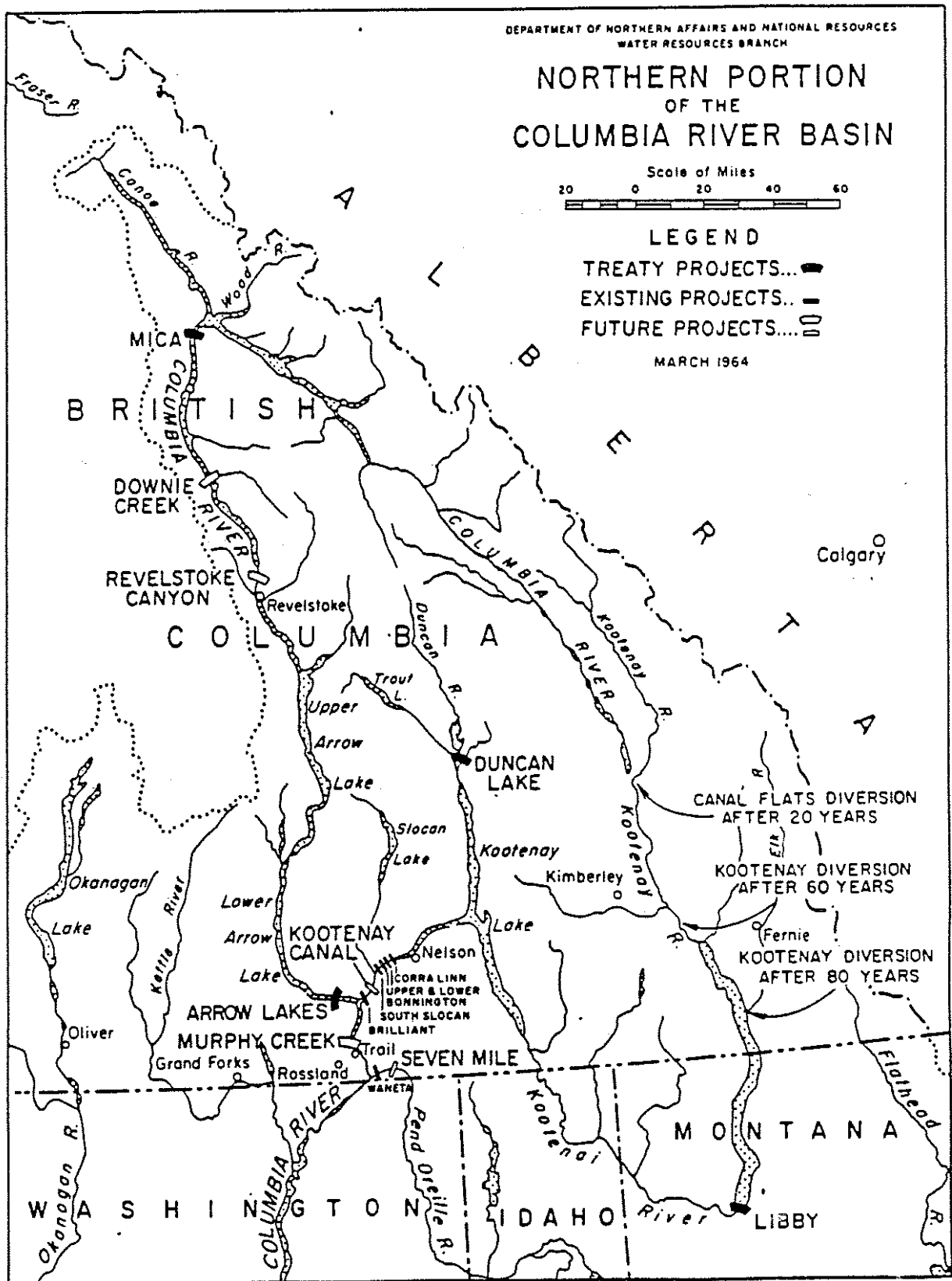


Plate 2 - Northern Portion of Columbia River Basin.

- (c) Canada's entitlement to one-half the downstream power benefits produced in the United States by Canadian storage is either to be returned to the Canadian border for distribution in Canada or sold in the United States under general conditions agreeable to both countries.
- (d) The United States is given the option of constructing a dam on the Kootenai River at Libby, Montana. Canada must be notified within five years of ratification of the Treaty whether the project is to be constructed and the project must be in full operation within seven years of that notification. The United States will pay the entire cost of the dam and reservoir in the United States and Canada will provide the 13,700 acres of land that will be flooded on its side of the boundary. For that very small contribution, Canada gets major benefits in flood control and increased power production at Canadian generating plants downstream on the river from Libby after the river re-enters Canada. Those benefits are not subject to any sharing with the United States.
- (e) The Treaty contains provisions regarding permissible diversions both for power purposes and for consumptive uses such as irrigation, domestic and municipal uses. Either country may make whatever diversions are required for consumptive uses. However, during the period of the Treaty, only Canada can make diversions for power purposes which will alter the flow of the Columbia River or its tributaries where these cross the international boundary. The diversion rights for power purposes permit diversions into the Columbia River at Canal Flats of about 20 per cent, 75 per cent and 90 per cent of the flow of the Kootenay River before it enters the United States. These diversion rights can be exercised at 20, 60 and 80 years respectively from the date of ratification of the Treaty. If the United States does not build the Libby Dam under the terms of its option, the 90 per cent diversion may be made at any time.
- (f) The Treaty also contains provisions regarding the designation of operating entities, the establishment of a joint Permanent Engineering Board, procedures for settling differences, provisions for restoring the pre-Treaty legal position after the Treaty has been terminated and limitations on liabilities for damages.

2. The Protocol

Following the signing of the Treaty on January 17, 1961, there was the widest opportunity for public discussion concerning the merits of the Treaty. Out of that valuable national concern came proposals for improvements in the Treaty. These improvements were incorporated into a Protocol to the Treaty agreed to on January 22, 1964. Among the

improvements to the Treaty are:

- (a) New procedures for Canadian participation in determining the need for any flood control requested by the United States that is additional to the flood control covered by the initial payments.
- (b) Reaffirmation in positive terms of Canada's right to make any diversions of Columbia basin water required for consumptive needs such as irrigation and municipal uses.
- (c) Clarification of Canada's right to continue in perpetuity any diversions of Kootenay River water undertaken in accordance with the Treaty.
- (d) Confirmation of Canadian control over the detailed operation of the Canadian Treaty storage for power purposes.
- (e) An increase in Canada's downstream energy benefits by 14 to 18 per cent by using a longer period of streamflow in benefit calculations.
- (f) A clear statement that the Treaty does not establish any principle or precedent that applies to any waters other than those of the Columbia River basin, and does not modify the application of the Boundary Waters Treaty to such other waters.
- (g) Elimination of the Treaty Standby transmission charges for the 30-year period of the sale of Canadian downstream power benefits to the United States and thereafter if the service is not required.

The Protocol also modifies the Treaty on a point which is vital to the sales agreement with the United States. Article VIII (1) of the Treaty, which refers to a possible disposal of downstream power benefits in the United States, requires that such disposals be covered by an exchange of notes between the two countries "as soon as possible after the ratification date". The sale of Canada's entire entitlement to downstream benefits for 30 years as is now planned and the absence of immediate markets for those power benefits in Canada make it essential that assurance of purchase by the United States is made either before, or contemporaneously with, ratification by Canada. The Protocol requires a simultaneous exchange of the ratifications and completion of the initial sales agreement and therefore insures a market for Canada's downstream benefits.

The total effect of the improvements through the Protocol is to establish a better balance between essentially Canadian interests and the interests of the Columbia River basin as a whole.

3. The Proposed Terms of Sale of Downstream Benefits

Under the terms of the Columbia River Treaty a sale of Canada's entitlement to downstream power benefits could not take place until after the Treaty was in force. However, this restriction has now been removed by the Protocol and the Governments of Canada and the United States through an Exchange of Notes have agreed in advance on general conditions and limits for an initial sale and they have undertaken to authorize a sale that meets these terms and conditions contemporaneously with the exchange of ratifications. British Columbia and Canada in the Supplemental Canada-British Columbia Agreement have each acknowledged that the proposal is satisfactory.

The proposal requires the sale of Canada's share of the first thirty years' production of downstream power benefits of each Treaty project to a single private Purchaser in the United States rather than to a government agency. In return Canada will receive complete pre- payment therefore in a lump sum totalling \$254,400,000 (U.S.) [equivalent to \$274,800,000 Canadian] upon ratification of the Treaty. There is to be no right of renewal of the sale contract so the possibility of full recapture is assured. The formal and detailed contract of sale between the Purchaser and the British Columbia Hydro and Power Authority, the Canadian entity for Treaty purposes, will cover a wide range of technical matters acceptable to them. However, it must conform to and is subject to the general conditions and limits agreed to by the Governments and set out in the attachment to the Exchange of Notes. The actual contract will be negotiated and signed by British Columbia Hydro and Power Authority and the Purchaser before the Treaty is ratified. Thus Canada and the United States retain control of the details of the transaction between British Columbia and the Purchaser.

More detailed comment on the Terms of Sale is given in the Appendix of this presentation.

4. British Columbia - Canada Agreements

The Government of Canada and the Government of British Columbia entered into a Main Agreement dated July 8, 1963, and a supplemental one dated January 13, 1964, under which the rights and obligations of British Columbia are defined and provision is made for effective implementation of all the arrangements that are contemplated for the cooperative development of the Columbia River.

The need for the agreements lies in the fact that while in the Treaty, the Protocol and the exchange of notes concerning sale of the downstream power benefits, Canada is the contracting party in relation to the United States, it is British Columbia that is the owner in Canada of the water resource involved and which must do the things required for the development and utilization of that resource in Canada. Therefore, it was essential to have very clear agreement as to how British Columbia is going to discharge the obligations that Canada has undertaken in relation to the United States, both immediately and during the

entire life of the Treaty. Equally, there had to be a clear understanding as to how Canada is going to pass on to British Columbia the payments and other benefits the United States is to provide and how, during the life of the Treaty, Canada will handle the claims, benefits and other questions that will arise. All of these aspects were agreed upon in the two agreements between the governments.

CHAPTER III

ALTERNATIVE OR BEST USES OF THE COLUMBIA RIVER BASIN IN CANADA

ALTERNATIVE OR BEST USES OF THE COLUMBIA RIVER BASIN IN CANADA

When Canada considered entering into a cooperative undertaking for the development of the Columbia River basin, great care had to be taken to ensure that the alternatives or "best uses" of the river in the national interest of Canada were never lost sight of when considering the international advantages. Accordingly, much study was carried out in Canada over the twenty years subsequent to the original reference to the International Joint Commission in 1944, with the aim of the research being the achievement of the best plan of development for Canada.

Such studies of the Columbia River basin in Canada concentrated on the development of the river for power, not only because of the complexity of this aspect of the problem, but because the development of power appeared as the largest and most valuable benefit from the resource. The studies of the whole of the Columbia River basin which were being carried on simultaneously by the International Columbia River Engineering Board also concentrated on power development. Conclusion "(e)" of the Board's 1959 report to the International Joint Commission stated in part:

"The largest and most valuable benefit to be obtained from water resources developments in the Columbia River basin is the production of hydro-electric power."

In the process of studying the power potential of the basin in Canada the investigations carried out in the reservoir areas of the proposed projects indicated to some extent the beneficial or detrimental effect the various plans of development would have on the use of the river valleys for irrigation, agriculture, forestry, mining, manufacturing, fish and wildlife, recreation and transportation. This chapter briefly reviews the results of those studies as they relate to strictly independent development in the Canadian portion of the basin.

1. The Best Use of the River for Purely Canadian Development - The Concept

In the late 1940's Canadian engineers began a long series of extensive investigations of possible damsites in the Columbia River basin in Canada. These investigations continued throughout the 1950's as the results of the earlier site investigations and associated regulation studies of the river pointed out new and more economical possibilities of development. Altogether more than 20 locations for projects were examined on the main stem of the Columbia River in Canada and over 10 locations on the Kootenay River. Studies were also carried out to

assess the water resource potential of the Pend d'Oreille River and many of the smaller tributary rivers such as the Okanagan-Similkameen, Kettle, Incomappleaux, Beaton, Lardeau, Duncan and Goldstream Rivers. Possibilities of sub-basin and trans-basin diversions were also investigated and very extensive programmes of sub-surface investigations, geological and topographical mapping, and water supply studies were undertaken. Approximately one hundred different combinations of projects were studied by the Water Resources Branch of the Federal Government alone during the course of investigation.

2. "Best Plan" for Power in Canada

As the investigations continued the process of elimination resulted in the adoption of sites on the Columbia River at Luxor, Calamity Curve, Mica Creek, Downie Creek, Revelstoke Canyon and Murphy Creek. Together, projects at these sites could develop over 90 per cent of the total head of 1,350 feet available between the headwaters at Columbia Lake and the international boundary. A further 44 feet of head could be developed by a dam at the outlet of Arrow Lakes, but it was apparent even in these early studies by both government and consulting engineering firms that the great value of the Arrow Lakes site was the important role it would play in a plan of cooperative river development with the United States and particularly in promoting the effective use of Canadian storage farther upstream for production of power in Canada within such a cooperative arrangement.

In the Kootenay River basin in Canada where five main stem plants already produce power which is used to a very considerable extent by the industrial complex in the Trail area, project sites were selected for final study at Canal Flats, Copper Creek, Bull River and Dorr on the main stem and Duncan Lake on a tributary stream entering Kootenay Lake from the north. Consideration was also given to the streamflow regulation that could be provided by development of the proposed Libby project in the United States. The Libby reservoir would provide regulation of the Kootenay River flows which would justify the construction of a new plant on the West Kootenay reach of the river in Canada. This new "Kootenay Canal Plant" (not to be confused with the Canal Flats diversion) would utilize, by means of a by-pass canal, the head between the forebays of the existing Corra Linn and Brilliant plants.

It became apparent during the studies that the economics of the high cost dams in the East Kootenay Valley in Canada could be improved considerably if the projects were used for diversion of Kootenay water into the Columbia River across the low divide at Columbia Lake (see Plate 3). In this way, it would be possible to use the Kootenay water through a much greater total head on the Canadian Columbia than is available on the Canadian Kootenay itself.

Such diversions of the Kootenay River however, would not only flood large land areas and require the relocation of settlements and transportation routes, but it would reduce the flow of water to the Consolidated Mining & Smelting Company (Cominco) plants in the lower



Plate 3 - Canal Flats Diversion.

Kootenay where a total of 375 feet of head has already been developed. Thus, large scale diversions of water from the Kootenay to the Columbia would only be attractive, if at all, when hydroelectric developments on the Canadian Columbia have been advanced to the stage where they offered a very considerable advantage in developed head over that already available on the Kootenay.

The problem of the plan of best use in Canada for power finally resolved itself to the consideration of one plan without any diversion of the Kootenay River and others calling for various degrees of river diversion. Plate 4 shows the projects involved in a limited Canal Flats diversion and those involved in the maximum Dorr-Bull River-Luxor proposal. The power potential of these and other alternative proposals were studied month by month for a 20-year period of streamflow record, and it became obvious that while increasing amounts of Kootenay River diversion provided greater power benefits to Canada, the cost of providing the last increments of power through diversion approached the point where it indicated only marginal economic advantage. This was particularly so when the non-diversion or limited diversion plans studied assumed the construction of the Libby dam in the United States at the expense of that country. Having the flows of the Kootenay River regulated at little or no expense to Canada produced very low-cost power benefits downstream in Canada on the Kootenay (at the Cominco plants) which made it increasingly difficult to support a full diversion of the Kootenay River in Canada. On the other hand, the more limited diversion plans would produce a very low cost increment of power on the main stem of the Columbia River and at the same time would permit the construction of Libby and therefore significant power and flood control benefits on the Kootenay River in Canada.

The final conclusion indicated by the Federal Government power studies was that a plan of development providing for a limited diversion of the Kootenay River, preferably at Canal Flats where only a low and relatively inexpensive structure would be required, was the best use of the river basin in Canada for power purposes. This plan would ultimately call for the development of the sites shown on Plate 5.

While this plan of best use would, at its ultimate stage of development, produce somewhat less power for Canada than a maximum diversion plan, the last-added increment of energy provided by maximum diversion from the Kootenay to the Columbia did not appear competitive with alternative sources of energy. This conclusion, favouring only a limited diversion of the Kootenay River, has been supported by studies carried out independently by Canadian consulting engineering firms. In November 1957 the Montreal Engineering Company included the Canal Flats diversion in the plan it recommended for independent development by Canada, and in 1959 the firm of Crippen Wright Engineering Ltd. concluded that limited diversions of up to 5,000 cubic feet per second at Canal Flats could be handled with "moderate expenditures" and with "outstandingly economical results in terms of increased power

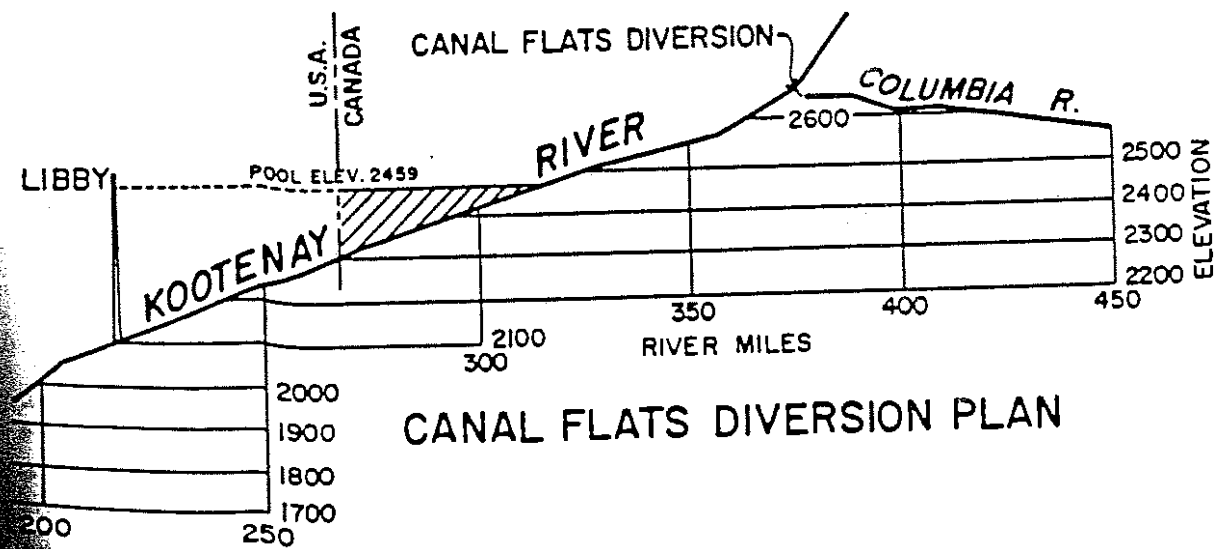
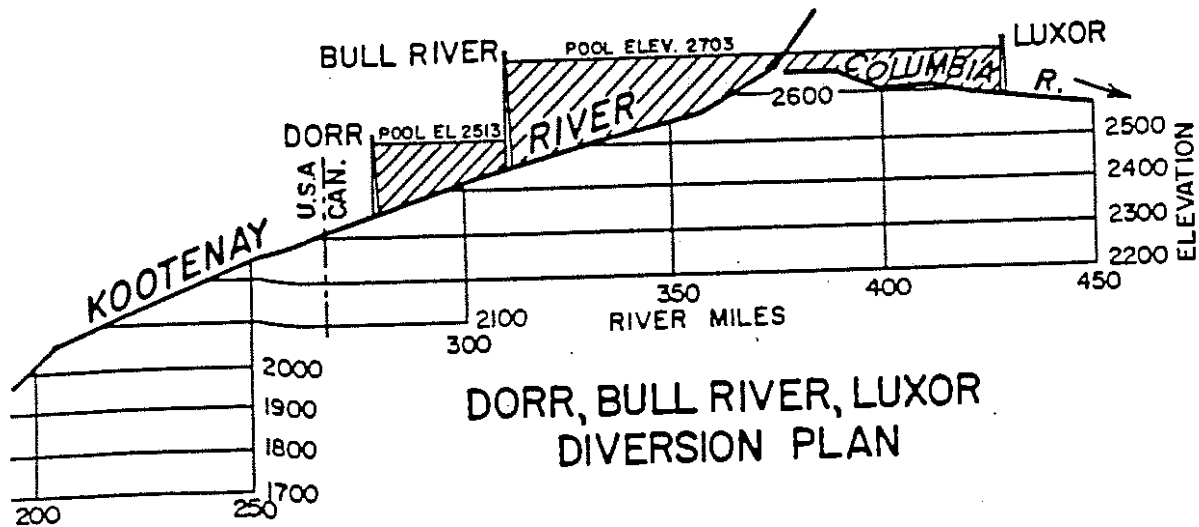
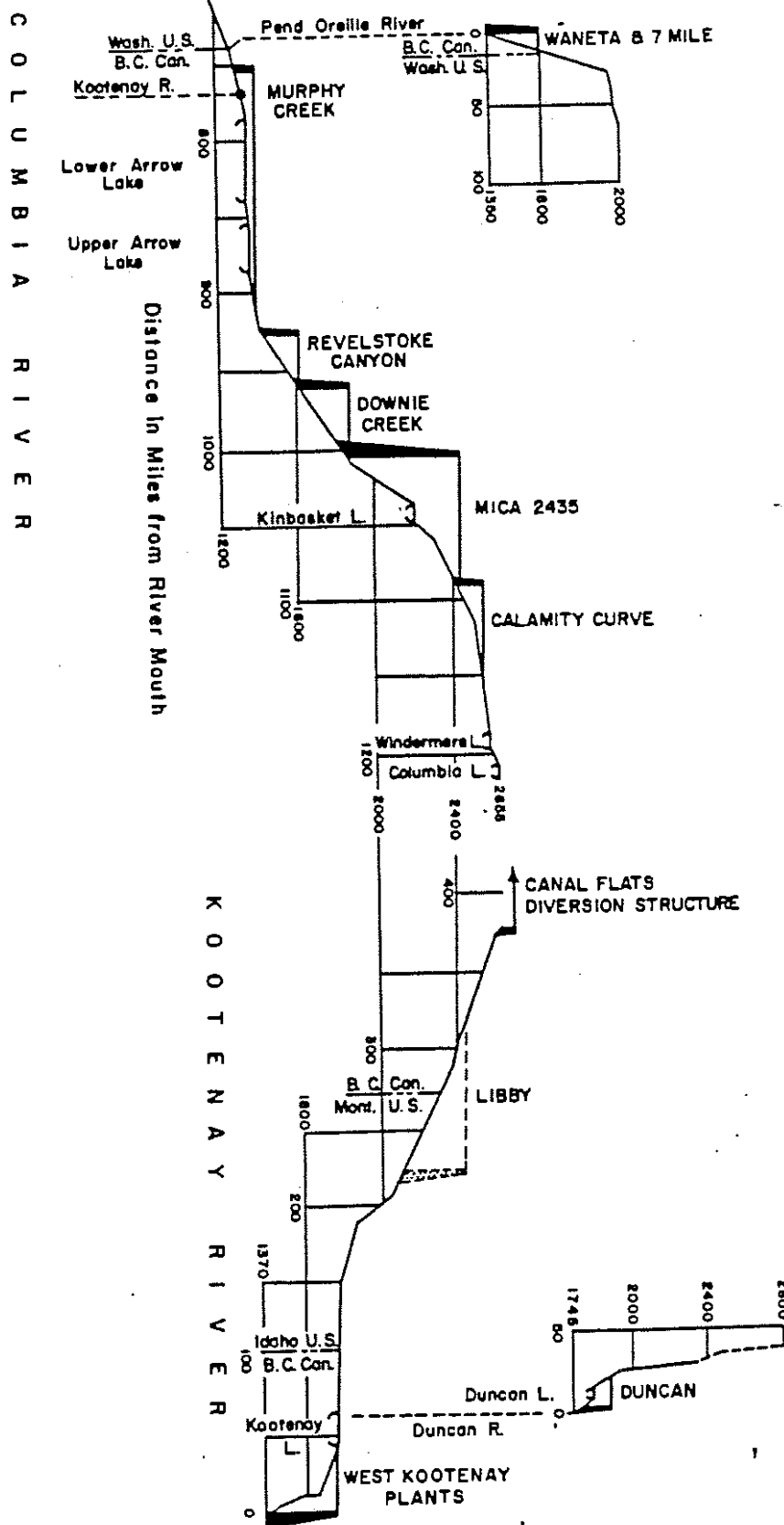


Plate 4 - Profile of Upper Kootenay River in Canada.

Plate 5 - Profile of the Canal Flats Diversion.



generation at downstream plants". They also concluded that:

"Two other possible sites for a diversion dam on Kootenay River are situated near the confluence with the Bull River, one just above the confluence, the other just below. Schemes incorporating diversion dams at these alternative sites are found to be uneconomic in comparison with schemes dependent on a diversion dam at Canal Flats or Copper Creek, and they are not recommended."

In addition, the 1959 report of the International Columbia River Engineering Board to the International Joint Commission, while complicated by the fact that it studied power developments fully integrated with the United States and at one point in time, still indicated that the plan calling for a limited diversion of the Kootenay River produced the lowest cost power for Canada and only slightly less power than the maximum diversion plan.

While these studies of best use were unanimous as to the desirability of a limited Kootenay River diversion, they also showed unanimity in their views as to the marginal economics of even this best use of the water for power purposes in Canada if it were developed independently of development in the United States.

Therefore, even the best use plan for power in Canada on the Columbia River indicated the need for the benefits of cooperative development with the United States to make it a truly profitable venture for Canada.

3. Other Considerations of Best Use for Canada within the Columbia River Basin

While the best use plan of Canadian development was initially determined primarily on the economics of its power potential, it also appeared as the best plan of development having regard to all other aspects of development in the basin. The following sections compare the impact on the economy of the Columbia River basin in Canada of the best use plan or limited diversion plan as opposed to a plan of maximum diversion of the Kootenay River.

(1) Industry and Mining: These two developments go hand in hand in the Columbia River basin as the basin is the centre of the vast industrial complex of the Consolidated Mining and Smelting Company of Canada Ltd. This complex embraces both the East and West Kootenay Valleys with its major effects felt in the Trail and Kimberley areas upon which the May 1963 "Regional Index of British Columbia - East and

West Kootenays" (1) reported as follows:

"The prosperity of the whole area is dependent upon this huge industrial establishment ... Evidence of the importance of the Company's operations to the economy is given by the fact that they employ 4,200 persons in the Trail area. Thus, well over half of the area's estimated labour force is directly dependent upon the Company's operations. In addition, of course, a very large number of persons who provide goods and services are indirectly dependent upon this payroll.

"Because of the preponderant position of The Consolidated Mining and Smelting Company in the economy, the area's future prosperity and economic growth will be closely linked to the fortunes and policy of The Consolidated Mining and Smelting Company Limited."

This vast industrial and mining complex is founded largely upon the supply of low cost power which is presently generated on the Kootenay and Pend d'Oreille Rivers in Canada, and the continued development of the area is dependent upon increased supplies of such low cost power. The Canadian plan of best use of the Columbia River and tributaries, involving only the limited diversion of the Kootenay River, and holding out the prospects of regulation of that river by the Libby dam at United States' expense, promised to be the best of the possibilities of securing the essential supplies of low cost power. Major diversions of the Kootenay River in Canada would take water away from generators on the Kootenay River in Canada to produce power instead on the upper Columbia River -- remote from the industrial load centres of the area. It is for this reason that Cominco has opposed the diversions of the Kootenay River.

(2) Agriculture: With the exception of the Creston area in the West Kootenays agriculture is not of major economic importance in the Columbia River basin. The 1963 "Regional Index" of the East and West Kootenays emphasizes the value of that area by stating that:

"The beautiful and lush valley in which Creston is located is the only area in the Kootenays (both the Columbia and Kootenay Valleys) where the economy is based on agriculture. Farming here is a one million dollar a year business with fruit crops accounting for about 90 per cent of this total and seed potatoes and other vegetables making up the remaining 10 per cent ... It is estimated that all agricultural pursuits in the Area employ about 1,200 people."

(1) Regional Index of British Columbia - East and West Kootenays
Bureau of Economics and Statistics
Department of Industrial Development, Trade, and Commerce,
Victoria, B.C.

This major farming centre of the whole area would not be affected by any of the development plans studied by Canada. However, while none of the plans would flood the best agricultural land, the total area of land affected by the plans did differ substantially. The projects of Dorr, Bull River and Luxor for example, would flood over 86,600 acres of land in their reservoir area while the alternative at Libby would flood only 13,700 acres of land in Canada. Therefore, while agriculture did not play too important a role in determining the best plan of independent development by Canada, the loss of land area was a consideration which was reflected in the studies of problems associated with recreation, wildlife, transportation and the dislocation of homes and families. Part of the area which would be affected by the Bull River-Luxor project is shown on Plate 6. The reservoir would be about 100 feet deep at the historic Fort Steele settlement shown on that Plate. The site of the Dorr project is shown on Plate 7.

(3) Forestry: Extensive logging and sawmill activities are located throughout the Columbia and Kootenay River valleys and any development of the river for power is bound to take some forest land out of production. However, the development of the storage reservoirs such as Mica would provide incidental gains to the forest industry through the provision of slack water navigation to logging areas previously difficult or impossible to reach and by increasing the low flows of the river which presently hinder navigation and log-towing in the narrows between the Upper and Lower Arrow Lakes.

(4) Fish and Wildlife: Sport fishing will be affected to some extent by any development of the Columbia or Kootenay Rivers for power. Any flooding of the Kootenay River will affect the present potential of that area and the maximum diversion proposal would affect fishing in the upper Columbia River Valley as well through the flooding of the Windermere and Columbia Lakes.

One of the more serious objections to the flooding of the East Kootenay Valley by the maximum diversion plan is the effect it would have on the wildlife of the area. The 1963 "Regional Index" of the Kootenays reports the region as being the best big-game hunting area in North America on the basis of numbers of game animals and accessibility. Table 1 sets forth the results of a 1959-60 inventory by the British Columbia Department of Recreation and Conservation of the existing and potential game harvest of the area. The potential of the Dorr, Bull River, Luxor area for big game alone, has been approximated by an official of that Provincial Government Department to represent an annual recreation expenditure of about \$8,000,000. This resource would be seriously affected by the loss of the critical winter range lying in the low areas flooded by the Kootenay River reservoirs of the maximum diversion proposal. Also affected by the maximum diversion plan would be a portion of the area between Canal Flats and Golden in the upper Columbia River Valley which contains some of the best habitat for waterfowl in southeastern British Columbia and which, by itself, has been estimated by the same Conservation official as being capable of supporting an annual recreation expenditure of \$1,000,000.



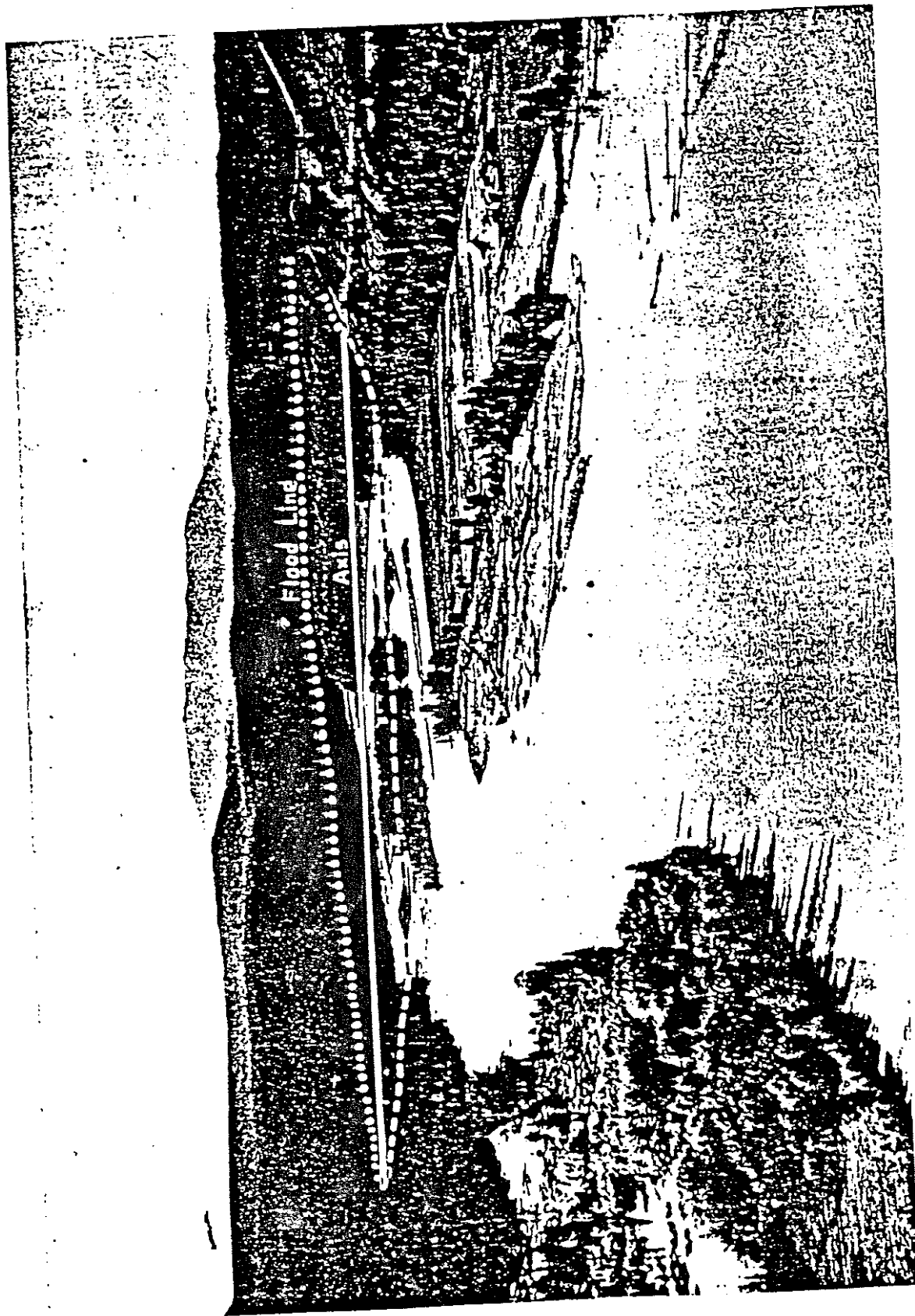


Plate 7 - Dorr Site.

Table 1

Wildlife Harvest in the Columbia River Basin (1959-60 Data)

Wildlife Harvest in the Columbia River Basin (1959-60 Data)							
Species	Treaty Projects		Dorr-Bull River-Luxor Area		Other Areas for Comparison Purposes		
	Upper and Lower Arrow Lakes	Mica and Duncan Lake	Kootenay River from Canal Flats to the International Boundary ¹	Columbia River from Columbia Lake to Spillimacheen	Columbia River Spillimacheen to Golden	Kootenay River Upstream of Canal Flats	Kettle River System in Canada
<u>Deer</u>							
Estimated Kill	435	No data are available for these two areas. However, the distribution of kill in neighbouring areas indicates light kills particularly in the Mica Reservoir area	7,560	1,640	300	960	3,158
Minimum Desirable Kill	548		9,752	2,279	-	1,123	4,645
Probable Maximum Kill	3,000 - 4,000		16,000 - 18,000	5,000	-	2,300	8,000
<u>Elk</u>							
Estimated Kill	-		1,620	260	56	360	-
Minimum Desirable Kill	-		2,430	286	95	400	-
Probable Maximum Kill	-		3,000	500	200	700	-
<u>Moose</u>							
Estimated Kill	-		168	62	52	47	-
Minimum Desirable Kill	-		336	124	104	94	-
Probable Maximum Kill	-		Inadequate Data	350	200	300	-
<u>Sheep</u>							
Estimated Kill	-		100	Inadequate Data	-	Inadequate Data	-
<u>Goat</u>							
Estimated Kill	Limited Numbers		500 - 600 for the whole East Kootenay	-	-	Inadequate Data	-
<u>Waterfowl</u>							
Estimated Kill	1,000		3,000	8,000	5,000	Limited Numbers	1,000
<u>Grouse</u>							
Estimated Kill	Unknown		14,700 ²	5,000	5,000	3,000	13,365
Minimum Desirable Kill	-		-	-	-	-	-
Probable Maximum Kill	-		-	30,000	-	-	50,000 - 60,000

1. The proposed Libby Reservoir would affect approximately 1/4 of this kill.

2. Overall total only some 700 Native Sharp-tail Grouse would be seriously affected.

In summary, fish and wildlife considerations detracted even further from the already economically marginal power benefits made possible by full diversion of the Kootenay River and therefore lent support to a plan of either limited or no diversion as a best-use plan for Canada.

(5) Recreation: While the dry, open nature of the East Kootenay Valley lends itself generally to recreational pursuits such as camping, fishing and hunting, the area of concentrated summer recreation is in the upper Columbia River Valley at Lake Windermere. The increasing recreational value of this lake would be severely damaged when flooded to a depth in excess of 80 feet under a plan of maximum diversion, particularly since the Bull River-Luxor reservoir which would cause the flooding would not necessarily be full or at all stable during the summer recreation period. The peculiar nature of the reservoir as a headwater storage between two river systems would result in considerable water level fluctuation during the summer months if operated for maximum power benefits to Canada.

The recreation value of this area is commented on in the 1963 "Regional Index" of British Columbia which states:

"While forestry and mining are of basic importance and promise continued growth, it is the tourists and summer residents which have given the Area its greatest boost in recent years. The shallow, warm Lake Windermere is near Calgary yet outside the preserved National Park areas. These features have combined to draw a large number of visitors from the Calgary area. Many Alberta residents are, in fact, building summer homes on Lake Windermere and an increasing trend in this direction can be expected as a result of the reconstruction of the highway west of Banff to Radium where it joins Highway 95 which traverses the Area from north to south."

Therefore the consideration of the recreational potential of the Columbia River basin in Canada indicates a strong preference for a plan of development with no flooding of the upper Kootenay and Columbia Rivers and therefore a plan calling for either no diversion or limited diversion of Kootenay River waters.

(6) Irrigation: The studies of the Columbia River basin undertaken by the Columbia River Engineering Board prior to 1959 considered the history and future of irrigation within the basin in Canada. Table 2 summarizes the findings for the Kootenay and Columbia River Valleys in Canada. It can be noted that despite the lack of any visible increase in irrigation between 1928 and 1960 the Board assumed a very substantial increase in irrigation prior to the year 2010. All regulation studies carried out since those estimates were made by the Board have had the streamflow adjusted to allow for the irrigation diversions necessary to meet the needs of the estimated irrigation acreage.

Table 2

Historic and Estimated Irrigated Areas in Thousands of Acres

	Level of Development		
	<u>1928</u>	<u>1960</u>	<u>2000</u>
<u>Kootenay Basin in Canada:</u>			
Above Newgate, B.C.	10.4	10.4	212.
Below Porthill, Idaho	<u>10.8</u>	<u>10.8</u>	<u>45.</u>
Total	21.2	21.2	258.
<u>Columbia River in Canada:</u>			
Above Donald, B.C.	9.8	9.8	70.
Donald to Revelstoke	0	0	
Revelstoke to Birchbank	0	0	22.
Birchbank to International Boundary	<u>4.6</u>	<u>4.6</u>	<u>27.</u>
Total	14.6	14.6	119.

The estimate of 212,300 acres of irrigated land in the East Kootenay Valley above Newgate by the year 2010 included 10,400 acres of presently irrigated land, 511 acres of potential Group 1 soil (the most desirable irrigation soil), 66,598 acres of Group 2 soil and 134,772 acres of Group 3 soil. A soils report of the area (1) noted that while the valley contained relatively large areas of land suitable for agricultural development, most of the land required high cost reclamation.

Although it has been suggested that the East Kootenay dams would make it easier to irrigate arable bench lands in the area, a 1960 memorandum by the Federal Department of Agriculture noted that while some 300,000 acres of such bench lands existed, they were only as potentially arable as some 26,000 acres in the reservoir area which had "some agricultural potential if irrigation could be provided" and could raise some "low priced" crops. No study was made as to whether such low priced crops would make irrigation a feasible consideration. While it has been suggested that the Dorr-Bull River-Luxor dams would provide the area with low cost power to drive irrigation pumps, this is not the case. The area would actually be a power deficient area as more than the full power output of dams would be required to lift water from the Dorr dam up into the Bull River reservoir for diversion to the Columbia. Any power for irrigation pumping would have to be transmitted into the area.

(1) C.C. Kelley and P.N. Sprout, Report No. 5 of British Columbia Soil Survey.

The prospect therefore for significant irrigation advantages in the East Kootenay Valley would not appear to offer any conclusive argument either for or against any particular plan of development.

(7) Transportation: One of the major problems which would result from the construction of large reservoirs in the East Kootenay Valley would be a significant increase in the transportation and access problems which already plague a province which must develop east-west access over mountains and valleys with a general north-south configuration. The reservoirs which would be formed by the dams of Dorr, Bull River and Luxor for the maximum diversion plan would form man-made lakes stretching almost 150 miles in length and ranging up to 3 to 4 miles in width.

A plan of limited diversion of the Kootenay River would involve considerably less disruption of existing transportation routes and would place less limitation of future access to the basin than would the maximum diversion proposal.

(8) Dislocation Problems: While every effort was made to include sufficient costs in all project estimates to fully compensate the residents of the areas who would be required to relocate or lose their homes, it is fully appreciated that monetary payment is not always sufficient compensation for the loss of homes and in some cases a reduction in the aesthetic appeal of the valley.

The studies carried out in the late 1950's by the Water Resources Branch for the International Columbia River Engineering Board found that the reservoirs required for the maximum diversion proposal would displace 1,580 people, a number which has no doubt risen since then. Libby on the other hand was estimated to require the displacement of 331 people and a 10,000 cubic foot per second diversion at Canal Flats, twice the diversion finally proposed, would have affected 328 people. It can therefore be stated that the maximum diversion proposal would involve the dislocation of approximately 1,000 more people than a limited diversion plan including Libby.

4. Summary of Best Uses or Alternatives for Canada within the Columbia River Basin

The analysis of the best use of the river basin for Canada quite naturally concentrated on the problems associated with the degree of diversion of the Kootenay River which would be to Canada's best advantage. While the studies were primarily concerned with the degree of economic power generation possible, other aspects of the problem such as the effect of power projects on industrial development, fish and wildlife, recreation, transportation and the dislocation of settlements were considered directly or indirectly. Out of these studies developed a plan for best use of the river for Canada calling for a limited diversion of the Kootenay River at Canal Flats and the regulation of the Kootenay River by the Libby dam in the United States.

Note

However, the cost of hydroelectric energy produced in Canada from this best-use plan depended upon an advantageous arrangement with the United States for the construction of the Libby dam and even then was so high that the prospects of any major development ever taking place was quite doubtful. Clearly, the Columbia River, an international river, required international cooperation to make its development in Canada a viable proposition. It was with this knowledge that Canada entered international negotiations.

5. Proposals Calling for Trans-Basin Developments in Canada

(1) Power Development on the Fraser River: The studies undertaken of best use of Columbia River waters in Canada also considered the possibility of diverting water from the Columbia River to the Fraser River and therefore making use of the water in Canada for power generation over the full drop to the Pacific Ocean. Although the results of the studies which were undertaken for the Federal Government by the B.C. Engineering Company in 1956 indicated that it would be physically possible to accomplish the diversion, they also showed that the economic advantage of such a diversion would not be sufficiently attractive to recommend it for inclusion in any plan for optimum development of the hydro resources of the Columbia River basin.

In addition to the fact that no economic advantage would accrue to Canada from such a diversion it must also be recognized that the many political, legal, fisheries and other technical problems associated with such a diversion have rendered the proposal unrealistic.

(2) Trans-Basin Diversion to the Prairie Provinces: A preliminary study into the possibilities of diverting water from the Columbia River basin to the Saskatchewan-Nelson system of the Prairie Provinces was made by the firm of Crippen Wright Engineering Ltd. for the Saskatchewan Power Corporation in 1962. The consultants suggested that the following sequence should be followed in the development of additional water supplies for the Saskatchewan River system:

- (a) Diversions within the Saskatchewan basin itself.
- (b) Diversions from the Athabasca River.
- (c) Diversions from the Peace River.
- (d) Diversions from the Fraser, Columbia or Kootenay Rivers.

A comparison of the various diversion schemes as presented in the Crippen Wright report is tabulated in Table 3 and shown graphically on Plate 8 where the widths of the arrows represent the relative amounts of water involved.

Table 3

Costs of Water Delivered to South Saskatchewan Reservoir
(based on a 3 1/2% interest rate and a 60-year life)

<u>Diversion Scheme</u>	<u>Annual Diversion</u>		<u>Annual Cost</u>
	<u>Cubic Feet Per Second</u>	<u>1,000 Acre-Feet</u>	<u>\$/Acre-Foot</u>
North Saskatchewan	2,600	1,900	0.40
Athabasca	6,000	4,500	3.50
Peace River	20,000	14,500	4.60
Upper Fraser (Alt. No. 1)	1,500	1,090	6.00
Upper Fraser (Alt. No. 2)	6,000	4,350	8.30
Columbia River (Alt. No. 1)			
Mica Reservoir	6,000	4,350	7.50 ^{1,2}
Columbia River (Alt. No. 2)			
Surprise Reservoir	6,000	4,350	10.50 ²
Kootenay River	7,000	5,070	7.60 ²

It can be seen from Table 3 and Plate 8 that water diverted from the Kootenay and/or Columbia Rivers would cost roughly double that of water from the Athabasca and Peace Rivers. When the value of lost hydroelectric power generation on the Kootenay and Columbia Rivers resulting from the diversion is added, the cost would increase to about three times that for water from the Athabasca and Peace Rivers.

It would appear that the high cost schemes for diversion from the Columbia River to the Prairie Provinces do not appear as being practical considerations until such time as the available lower cost schemes for diversion both within the Saskatchewan River basin itself and from the Athabasca and Peace Rivers have been fully utilized.

It must also be recognized that in addition to the economic aspects, the diversion of water from the Columbia River basin to the Prairie Provinces would involve many other complex problems of a technical, political and legal nature. From a technical standpoint, much additional study would be required before the feasibility of any of the schemes for Columbia diversion to the Prairies could be established. The suggested schemes have been based only on paper location with very little on-site investigation of terrain and soil condition. Since the diversion schemes would involve pumping lifts of up to 2,500 feet, their

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1. Mica reservoir costs not included.
 2. No allowances made for reduction in power generation at existing and potential power developments in the Columbia River basin in Canada and the United states.

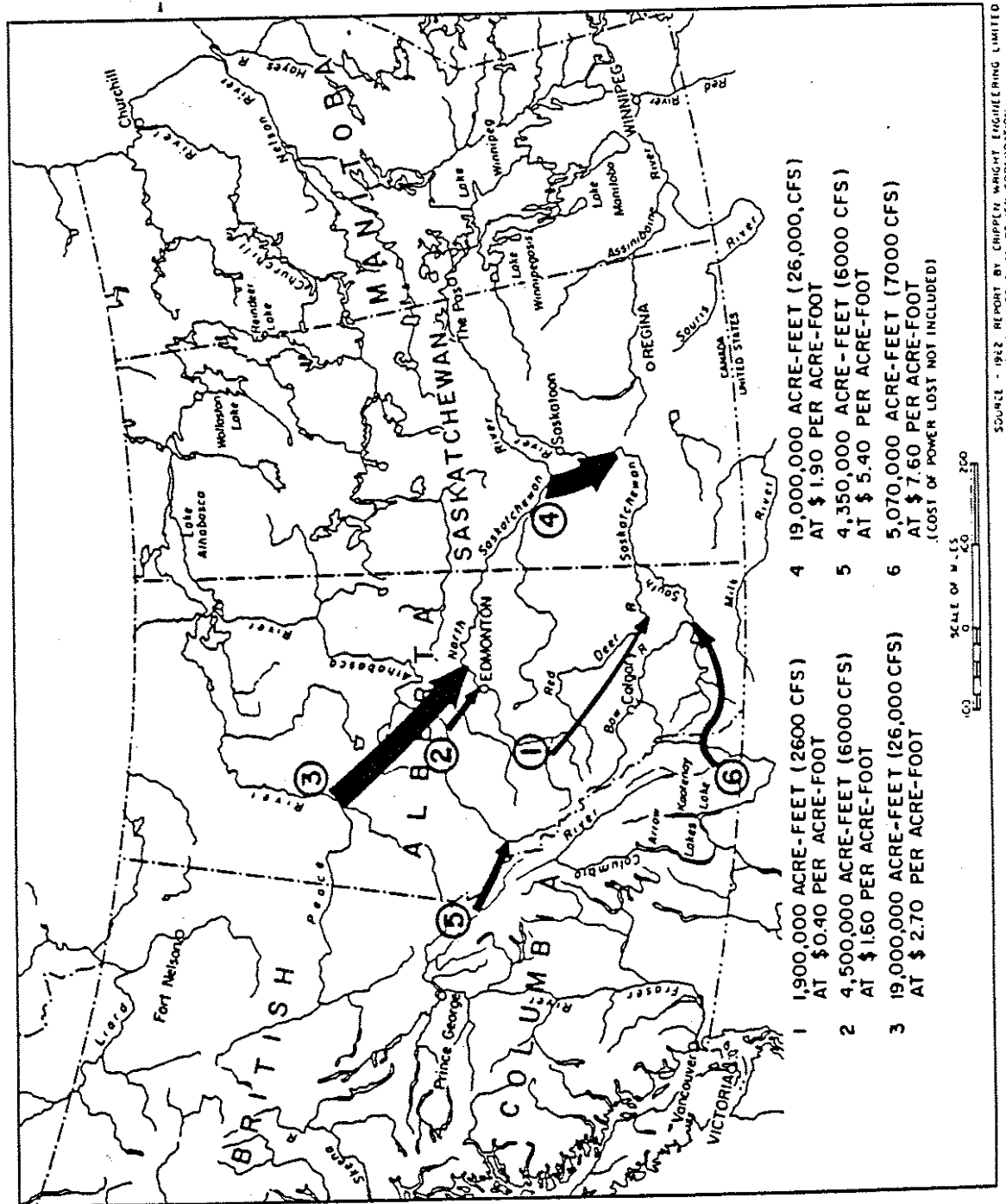


Plate 8 - Additional Prairie Water Supplies.

feasibility would depend to a considerable extent on the availability of sites on the eastern slopes of the Rockies for economic development of power projects to recover part of the pumping energy. To date, none of the investigations carried out indicates there is any real possibility of this being possible. In addition, there has been no indication that diversions of the amounts contemplated would ever be required for irrigation on the Prairies or that the limited amounts of land which could be successfully irrigated would support the high cost of the diversion proposals.

It would not appear to be practical or economical to adopt now, a higher cost and less attractive scheme, that would involve considerably more flooding and dislocation problems in the upper Columbia and Kootenay Valleys, in order to facilitate diversions to the Prairies that may or may not materialize in the very distant future, probably many years after the termination of the Columbia Treaty. If such diversions are required, and are economical at some time in the future, Canada has the right under the Columbia River Treaty to make the diversions if they are for consumptive uses such as domestic, municipal and irrigation use. After the Treaty is terminated our diversion rights revert to the Boundary Waters Treaty, 1909. Moreover, it cannot be overlooked that jurisdiction over the water resources of the Columbia River is vested in the Province of British Columbia and that therefore its view of the best use of its resources, short of challenging some vital national interest, must be respected. N.C.

6. Best Use of the River under Cooperative International Development

The knowledge of the Columbia River in Canada gained from these many years of research on the question of independent development and of the integrated development studied by the International Columbia River Engineering Board provided a substantial basis from which Canada could negotiate to obtain the benefits of a cooperative development so essential to the economics of any Canadian construction programme. The International Joint Commission in its 1959 "Principles" for cooperative use of the storage of the Columbia River recommended in General Principle No. 2 that:

"Cooperative development of the water resources of the Columbia River basin should result in advantages in power supply, flood control, or other benefits, or savings in costs to each country as compared with alternatives available to that country."

What were the "alternatives" available to Canada? Certainly they were not promising. The studies of two competent engineering firms had concluded that even the best independent plans would not necessarily be competitive with alternative sources of power supply available to the Province.

It was evident to those closely associated with the planning studies in Canada that the "alternative" development available to Canada might

he at best a partial development of the river and at worst, no development.

The one outstanding problem facing Canada was that while hydroelectric power is a renewable resource once developed, the power potential of the Columbia River, because of its dependence upon an early agreement with the United States, might become a vanishing resource unless developed at an early stage. The United States had two alternatives: cooperative development with Canada which would be considerably less expensive in the short run, or independent development which might possibly be the less expensive plan for the United States in the long run. If the negotiations failed, and the United States proceeded with even a portion of its independent plan, the benefits available for sharing under a cooperative development would be reduced to a point which would threaten the economic gains possible to Canada in the form of the downstream benefits for power and flood control and therefore threaten the whole development of the river in Canada. NO

Canada naturally desired to retain effective control of its own resources and wished also to achieve economic gains which would either make its own plan of best use viable or, alternatively, to arrive at an even more advantageous plan of best use having consideration of the benefits possible through cooperative development. The negotiations with United States which followed stretched over almost a full four years with Canada not only retaining its flexibility of operation, but also being successful in making the Columbia River development one of the largest and most economic hydroelectric resources in Canada. The process of arriving at this goal is described in the following two chapters.

CHAPTER IV

THE TREATY PROJECTS - WHY SELECTED?

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1. The Benefits of Cooperative Development

The main objectives of the cooperative Treaty to be negotiated between the two countries were the power and flood control benefits that could be produced downstream in the United States by storage provided upstream in Canada. Before an objective analysis of the results of the negotiations can be made it is essential to have a general understanding of the peculiar nature of these benefits themselves, particularly the power benefits. A more detailed analysis of both power and flood control benefits is given by Chapter V.

(1) The Two-Component Nature of Downstream Power Benefits:
In its December 1959 report on "Principles for Determining and Apportioning Benefits from Cooperative Use of Storage", the International Joint Commission defined downstream power benefits as follows:

"Power Principle No. 4"

(firm) "The amount of power benefits determined to result in the downstream country from regulation of flow by storage in the upstream country would normally be expressed as the increase in dependable hydroelectric capacity in kilowatts under an agreed-upon critical streamflow condition, and the increase in average annual usable hydroelectric energy output in kilowatt hours on the basis of an agreed-upon period of stream flow record". (first added)

These two components of power while calculated in different ways are of equal importance. The dependable capacity benefits are a measure of the increased potential of the United States system to meet peak loads during a period of critically low streamflow conditions, while the increase in usable energy is a measure of the average amount of extra energy that can be generated and used over a period of streamflow including both high and low streamflow conditions. A more detailed explanation of these components is given in Section 1 of Chapter V.

(2) The Value of a "First-Added" Credit to a Storage: A very important characteristic of both the downstream power and flood control benefits is the fact that the storage project next (or first) added to the system produces a considerably larger benefit per unit of storage added than any storage added thereafter. Progressively added units of storage produce progressively smaller benefits in both power and flood control. This principle was explicitly recognized with regard to power benefits in the International Joint Commission "Discussion" of their "Power Principle No. 3" and recognized with regard to flood control benefits in the introduction to the section of the "Principles" dealing with flood control.

An illustration of the value of a first-added credit to storage for the generation of downstream power benefits is given on Plate 9. Taking increments of 5 million acre-feet of storage from Plate 9 and comparing them with the incremental power benefits produced, results in the tabulation given below:

Table 4

AN ILLUSTRATION OF THE ANNUAL POWER VALUE
OF A "FIRST-ADDED" STORAGE CREDIT

Increments of 5 million acre-feet of storage added after existing storage	Increments of Power Benefits for the Upstream Country (1970-75 conditions)	
	<u>Average Energy</u>	<u>Dependable Capacity</u>
1st Added Increment	400 Megawatt Years	670 Megawatts
2nd " "	260 " "	500 "
3rd " "	100 " "	230 "
4th " "	60 " "	160 "

The table shows that the 4th added increment of 5 million acre-feet of storage is only worth about 20 per cent of the value of the 1st added increment. It also points out that if Canada were negotiating for downstream benefits for 15 million acre-feet of storage, a loss of first-added credit to only 5 million acre-feet of equally effective United States storage would reduce Canada's potential downstream power benefits by approximately 40 per cent.

It was therefore essential that if Canada was to obtain the maximum benefit possible out of a cooperative development, the storage that it proposed for construction under such a development would have to obtain a "first-added" credit immediately after existing United States storages. This was achieved by the Treaty in the case of downstream power benefits, and an even more advantageous position was agreed to for flood control benefits as the Canadian Treaty storage was not only considered "first-added" before additional United States storage, but was given a storage credit equal to the United States flood control storage already existing.

(3) The Effect of Time on Downstream Benefits: The passage of time affects the downstream power and flood control benefits differently. In the case of flood control the benefits will increase as the value and extent of property in the potential flood plain increases through the years. That was why the flood control benefits of storage were based on an estimated 1985 level of property development, rather than the existing development. The power benefits to the United States on the other hand diminish with time as the United States power system becomes larger, more flexible, and therefore less dependent upon Canadian storage. The decreasing dependence on Canadian storage affects the capacity and energy components of the power benefits at different rates.

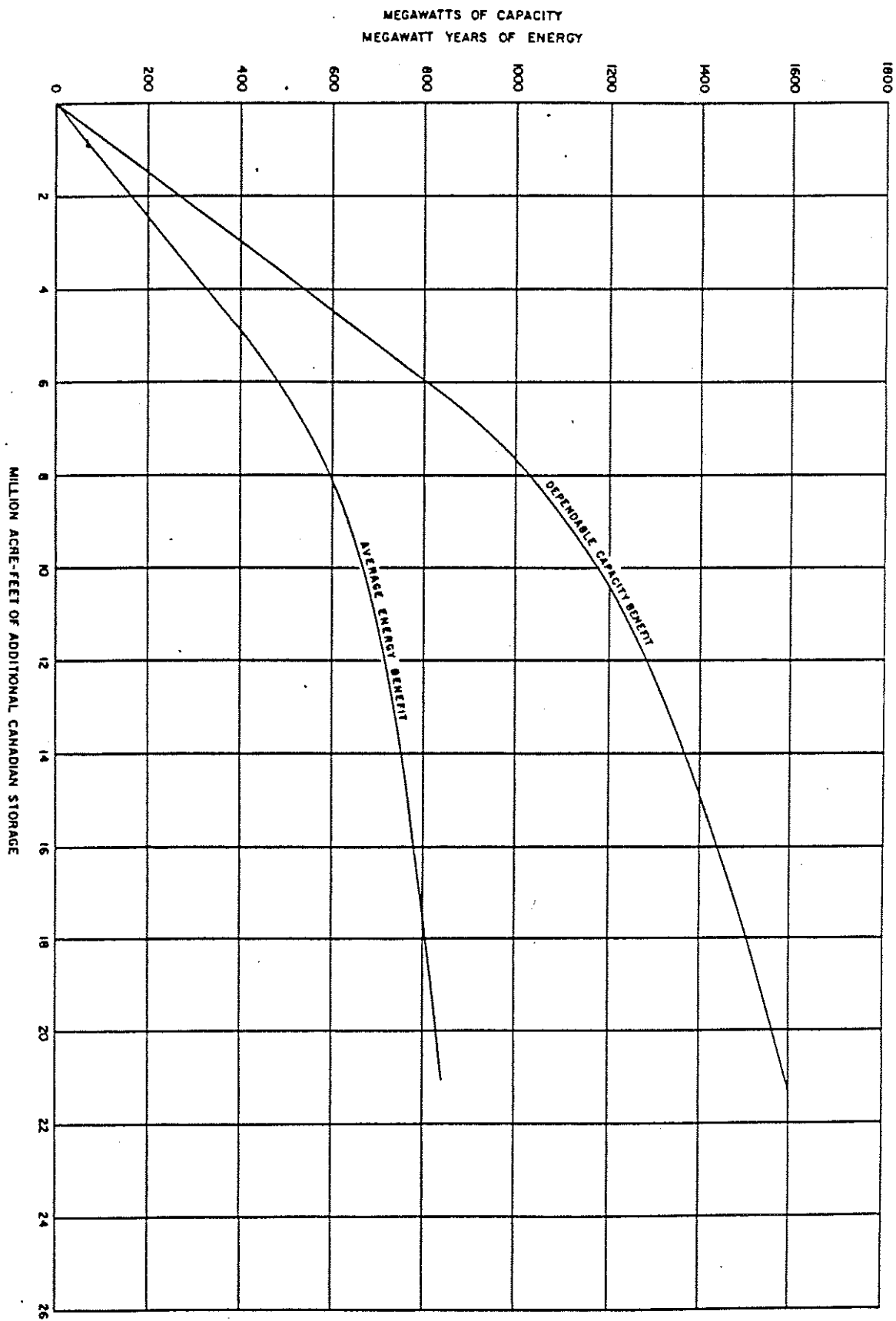


Plate 9 - Approximate Half Share of Downstream Power Benefits from New Storage, 1970-75 Conditions.

While the energy benefits are affected considerably by United States system load growth in the early years, this effect reduces with continued growth of the system and later it will have largely disappeared so that during the latter part of the Treaty the energy benefits will continue at a more or less constant rate. Capacity benefits on the other hand, while suffering smaller percentage reductions than those of energy in the early years, could be considerably reduced in the later years of the Treaty to the extent that they could even diminish to zero before the end of the Treaty.

The International Joint Commission report on "Principles" recognized this diminishing nature of the power benefits and noted that:

"It is expected that both dependable capacity and energy benefits will result during the early and intermediate stages of the storage operation, but during the latter stages the power benefit may consist only of increased usable energy."

2. How Valid are the Choices of Projects Under the Treaty?

Canada entered into the negotiations for the Treaty projects with not only the background of many years of study of the best independent plan of development for Canada, but also with the knowledge that it must negotiate for the very favourable "first-added" credit position for its Treaty storages. At the same time Canada was guided by the International Joint Commission "Principles" which, among other things, called generally for the most economical project — yielding the highest benefit-cost ratio — to be built first, and for the upstream country operating the storage to provide the downstream country with an "assured plan" of operation of the storage. All of these factors had a bearing on the final selection of the Treaty projects.

While the best use plan of independent development of the river in Canada was one of limited diversion of the Kootenay River at Canal Flats, the margin of benefit this plan held over alternatives depended upon the construction of the Libby storage dam on the Kootenay River at United States expense, with Canada retaining all the resulting benefits downstream on that river in Canada. Such an arrangement was of course a matter of negotiation and a United States requirement that Libby be given a "first-added" storage credit position before Canadian storage would have destroyed the advantages this plan held out since it would have downgraded the value of Canadian storage built under the Treaty. It also may have been possible for Canada to negotiate sufficient first-added downstream benefit credits for its storage, including the East Kootenay storage of the maximum diversion plan, so that the increase in benefits thus obtained would offset the disadvantages of that plan thereby making it the plan of best use for Canada. This and all of the many other possibilities considered by the Canadian negotiators depended upon the attainment of a large share of the limited supply of downstream benefits which could be achieved in no other way but through negotiations with the United States, who naturally had their own plans for cooperative

development. Canadian success in the negotiations on both the Treaty and Protocol can best be emphasized by the following analysis of the Treaty projects selected.

(1) The General Position of Canada in Proposing the Canadian Treaty Projects in the Negotiations

(a) Arrow Lakes Storage: While the Arrow Lakes dam was not included in any studies of independent development by Canada because of its limited benefit to generation within Canada, it was always recognized that the project would play a major role in any cooperative development. In its 1959 report to the International Joint Commission the International Columbia River Engineering Board noted that the Arrow Lakes project was "... one of the most economical storage reservoirs in the plans of development". This conclusion was arrived at even though the project was assumed as being developed simultaneously with many other storages. Consulting engineering firms also favoured the inclusion of the project in a cooperative plan. For example the 1957 report of the Montreal Engineering Company found that:

"In the integrated programme the Arrow Lakes storage is the most productive project that could be undertaken as an initial stage."

It was with this knowledge that Canada entered negotiations in early 1960. As explained below, the Arrow Lakes dam became an indispensable project for Canada during those negotiations and was, therefore, included in all Canadian proposals made throughout the course of the negotiations. This was consistent with the recommendation of the British Columbia - Canada Technical Liaison Committee that Arrow Lakes and Duncan Lake storages be the initial projects in Canada and be credited as first-added storage. That recommendation was made after considering a great many possible methods of development.

The value of the project to Canada was based upon a number of considerations such as the following:

(i) Benefit-Cost Ratio: I. J. C. General Principle No. 1 recommended that storage facilities "... to the extent it is practicable and feasible to do so, be added in the order of the most favourable benefit-cost ratio, with due consideration of factors not reflected in the ratio". The Arrow Lakes project was unassailable in its benefit-cost position and therefore to have withdrawn the project from consideration would have weakened Canadian support for the I. J. C. Principles. While the cost of the project has risen considerably since the Treaty negotiations, its benefits are of such magnitude that they still support the inclusion of the project in the position it holds in the Treaty. Not reflected in the benefit-cost ratio are the other essential roles of the project as explained below.

(ii) Timing of Construction and Physical Availability: Early in the negotiations the United States delegation noted that the phrase in

I. J. C. General Principle No. 1 "...with due consideration of factors not reflected in the (benefit-cost) ratio" meant to them the physical availability of the project. Projects therefore that could be provided in the shortest time to meet forecast load requirements should, in their estimation, receive the benefit of the first-added storage credit position. As both the Arrow Lakes and Duncan Lake projects could be completed before the Libby dam, the Canadian negotiators were able to meet not only the benefit-cost ratio requirement for a first-added credit, but also the one of physical availability. Arrow Lakes therefore, played a very essential role in Canada's negotiations for the essential first-added credit for storage.

As well as being an important argument for the attainment of a first-added storage credit to Canada, the project was consistent with an orderly development of the river in Canada. As it was strictly a storage project, economic on the basis of the downstream benefits alone, Canada was not required to accelerate the construction of at-site generation in Canada to make the project viable. The value of having the projects fit into a reasonable construction schedule was emphasized by testimony in March of 1960 by General A. G. L. McNaughton, then Chairman of the Canadian Section of the International Joint Commission. He said in part:

"The reports and information we give have to be looked at most carefully, from the Canadian point of view, to see that the timing of these developments fits closely in with the market for the one product that we have in that early phase, and that is regulated flow. That is the only source of our revenue. We must not build anything ahead of time; otherwise, with these very large amounts of capital expenditure, the whole economics of the project would be destroyed."

The economics of the starting period was therefore critical, and it was both the timing of the Arrow Lakes project and its very great economic return to Canada that provided a sound economic, indeed an essential solution to this problem of what project to select and build first.

(iii) Flexibility of Operation: It was imperative that in any agreement reached on cooperative development that Canada retain the flexibility required to operate its projects in Canada so as to be able to make the best use of their at-site generating potential. This large and continuing potential naturally could not be sacrificed in the attainment of an important but declining amount of downstream benefits. It was clear, however, that in a cooperative arrangement, the United States could not be expected to have to rely solely on downstream benefits resulting incidentally from Canadian storage operation for Canadian needs. Such an operation would not only make effective planning in the United States impossible but would be contrary to the I. J. C. Principles which called for "an assured plan of operation" by the upstream country. The Arrow Lakes project effectively met the requirements of a cooperative undertaking and yet adequately protected Canada's own generating potential.

It did this by providing a reregulating reservoir downstream from the main Canadian generating plants planned for Mica Creek, Downie Creek and Revelstoke Canyon. This reservoir at Arrow Lakes made it possible to operate the upstream projects to generate power in Canada for Canadian needs and then to reregulate the resulting river flows so that they crossed the border to the United States in a flow pattern suitable for downstream benefit generation and consistent with our Treaty commitments. The adequacy of the protection provided to Canadian generating needs has been confirmed by studies undertaken by the Montreal Engineering Company, Sir Alexander Gibb and Merz-McLellan, and Casco Consultants Ltd., (a firm owned by the consulting engineering firms of Crippen Wright Engineering, Shawinigan Engineering and H.G. Acres and Company). This latter firm for example has concluded that:

"The provisions in the treaty which are intended to safeguard Canadian power interests do indeed ensure that a satisfactory pattern of generation can be achieved at all development stages of the Canadian reaches of the Columbia River and its main tributaries."

It also has noted that:

"It is reasonable to expect that actual operating conditions will be even more favorable than assumed."

The essential role which Arrow Lakes storage plays in the operations under the Treaty therefore makes it the key to a cooperative development which adequately protects Canada's own generating freedom.

(iv) Location: The location of the Arrow Lakes dam accounts in a large way for its value to Canada in a cooperative development. It not only acts as a very effective buffer between the Canadian and United States generating systems, but its downstream location in the river system in Canada ensures that the full use of its storage capacity is possible in a year of average streamflow, even when the Mica project is completed upstream. This is so because the inflow between Mica and the Arrow Lakes is almost as great as the inflow to Mica itself. As downstream energy benefits are based on the annual use of storage, the location of the Arrow Lakes dam provides for the maximum return of such benefits without sacrificing Canada's generating capacity. It complements rather than competes with the best-use plan of the river in Canada.

The location of this storage, downstream of Canadian generators and immediately upstream of the large United States generating plant of Grand Coulee, also means that the project is ideally situated to provide special types of operation not required by the Treaty, but which could produce additional downstream power or flood control benefits for which payment could be arranged between the operating agencies. These benefits might well be of a continuing nature and could be produced with little or no effect on Canadian generation.

(b) Duncan Lake Storage: As the Duncan Lake project was included in the plan of best-use which was established for independent development by Canada, the development of the project under a co-operative arrangement would not add to the overall Columbia River development cost to Canada. Like the Arrow Lakes dam, the Duncan project proved useful in the negotiations with the United States because of its favourable benefit-cost ratio and short construction period. Because of these similarities the two projects were presented by Canada during the negotiations as a combined offer of storage for cooperative development. Both projects were instrumental in Canada obtaining the essential first-added credit for Canadian Treaty storage.

Because of the location of the Duncan Lake project in the Kootenay River basin the project was directly competitive with the Libby project, not only for the production of downstream power benefits, but also for the control of the flood waters of the Kootenay. The first-added credit Canada negotiated for this Treaty storage ensured the maximum benefits possible to Canada from storage on the Kootenay River consistent with what had been determined as the best use plan of independent development.

The value of the project is not, of course, limited to the downstream benefits produced in the United States, but has the added benefit of increasing very considerably the amounts of energy which can be generated in Canada at the existing Canadian dams on the Kootenay River.

(c) Mica Creek Storage: The Mica project was recognized early in the studies of development of the Columbia River as being the key project in a system of development for the best use of the river for Canada. However, the very size of the development was one of its disadvantages in an independent development of the river. The large amount of capital required to be expended on the project before any generation was possible, as well as the long period of time before Mica's full generating capacity could be used by British Columbia loads made its economic development doubtful. A lower dam at Mica was proposed by consulting engineers if Canada was to proceed with an independent development of the river and, even then, the lower dam did not appear competitive with alternative energy supplies. However, the consultants noted that in any cooperative development with the United States the development of the high dam at the Mica site was desirable.

The Mica project therefore depended upon cooperative development of the river with the United States and the extra benefits Canada could obtain from such a development. It was essential that, as with the other reservoirs, Canada should negotiate a first-added credit for Mica storage before new United States storage. Two problems presented themselves in these negotiations; first, the nine-year engineering and construction period for the project signified that it could not compete on the basis of physical availability with United States projects such as Libby which could be built sooner; and second, the Mica project was known to be an essential element for generation within Canada itself and

it was therefore imperative that the plan of operation required of the storage under the Treaty not detract from Mica's major importance to Canada, namely generation at-site and downstream in Canada.

During the negotiations on both the Treaty and the Protocol, Canada not only attained a first-added credit for Mica storage along with the Duncan and Arrow Lakes storage, but the agreement was formulated so as to protect the Canadian generating potential both at Mica and downstream of Mica, in Canada. This has been achieved by the Treaty projects in a number of ways:

(i) By the previously noted reregulating value of the Arrow Lakes dam lying between Mica and United States generators.

(ii) By concentrating over 99% of Canada's annual Treaty storage commitment for flood control operation at the Arrow Lakes and Duncan Lake projects where little or no at-site generation will be involved. This removed any possible conflict between operating requirements for this flood control and for at-site generating needs. Only 80,000 acre-feet of storage at Mica, or approximately one half of one per cent of its useful storage, is committed for annual flood control operation.

(iii) By permitting the transfer of flood control storage between Mica and High Arrow.

(iv) By requiring that Treaty flood control calls on any storage at Mica other than the 80,000 acre-feet, require full compensation to Canada for power lost in providing the flood control.

(v) By limiting the storage commitment at Mica for downstream or combined United States-Canada system power needs to 7 million acre-feet, the approximate amount of storage which can be used and refilled annually at the site. The balance of the usable storage at Mica can be used by Canada to increase firm generation in Canada in critically dry years with the storage being refilled in years of above average flow.

(vi) By providing that Canada has the option of meeting its Treaty storage commitments for power from any combination of its storage projects.

(vii) By retaining jurisdiction over the daily releases at Mica and the other Treaty storages.

All of these safeguards were essential to Canada in a Treaty that committed any portion of Mica storage to a cooperative operation.

(d) The East Kootenay Projects: The Kootenay River contributes about 40% of the flow of the Columbia at the point where the two rivers join, just north of the Canada-United States boundary. Like the Columbia itself, its flow is extremely variable. One of the main United States objectives in any agreed plan was to secure adequate storage on it,

both to provide flood protection and also to enable the maximum development of power, both on the Kootenai itself (the name is spelled with an "i" in the United States) and on the lower reaches of the Columbia.

From the Canadian point of view storage on the Kootenay was also important. It would provide flood protection on the lower Kootenay after it re-entered Canada, and it would permit a substantial increase in the production of power between the Kootenay Lakes and the Columbia River. These would be the benefits of storage if the water remained in the Kootenay itself. The other possibility to be considered was that of diverting some, much, or nearly all of its flow northward into Columbia Lake and thence into the Columbia River. The former advantages could be obtained for Canada either by storages on the East Kootenay in Canada or by a storage at Libby, Montana. The latter advantages could be obtained only by storages in Canada.

There were a number of disadvantages in the East Kootenay storages in Canada. They would be expensive; diversion of water northward would reduce the potential power supply to the industrialized lower Kootenay area in Canada; the diverted water would not produce added power output in Canada until generators were installed at Mica and other places on the upper Columbia, which would not be for some years; and finally, they would mean very extensive flooding -- some 86,600 acres -- in the East Kootenay valley in Canada.

Against these disadvantages were two considerations. One was that, in the long term, a major diversion would produce slightly more power in Canada -- about 10 per cent more -- than a plan with a limited diversion although at such cost that it would be of dubious value. The second arose out of the negotiating situation when the bargaining began.

The importance of "first-added" status for a storage has already been referred to. To gain maximum advantage for the Canadian storages, and therefore maximum return to Canada, it was essential to get "first-added" status for them. The I.J.C. had recommended in General Principle No. 1 that "... storage facilities... be added in the order of the most favourable benefit-cost ratio" although it went on to say that there should be "due consideration of factors not reflected in the ratio." Such a factor, it said, could be "an urgent need" to provide regional flood control and other special requirements.

The Libby storage in the United States was fully engineered, and would provide at an early date the urgently needed flood control on the Kootenay River in the United States. It could be ready to operate as quickly as the Canadian storages in the East Kootenay, and earlier than Mica. On the other hand, its benefit-cost ratio was somewhat less favourable. Because the project could in fact be in operation before Mica, it was natural that the United States stressed the date of delivery of storage as being the proper determination of "first-added" status.

The logic of the Canadian situation indicated that its negotiating position would be strongest if based on the storages that showed the highest benefit-cost ratios: High Arrow, Duncan, Mica and the Canadian East Kootenay storages at Dorr and Bull River-Luxor. This was the position adopted, despite the knowledge that, taken by themselves, it was doubtful the East Kootenay storages would be the best bargain for Canada. It was recognized by the Canadian engineers on the Technical Liaison Committee from the outset that they would not be the best bargain if (1) a first-added position could be secured for the other Canadian storages, placing all of them ahead of Libby, regardless of the fact that Libby could be built ahead of Mica, and (2) Canada had almost no cost to pay on Libby and got substantial benefits from it.

Canada accordingly argued for its storages and rested its case squarely on General Principle No. 1. British Columbia had accepted the position with some reluctance because of the flooding involved in the East Kootenays. The United States made it clear that "factors not reflected" in the benefit-cost ratio were of great importance to it and that, if Canada would not agree to the Libby storage, it would not agree to first-added position for the Canadian storages unless it got the kind of advantages it knew it could get from Libby. This would have involved a sale of power by Canada to the United States to the extent of 275,000 kilowatts at about 2.5 mills per kilowatt hour. Any such conditions would rob the Canadian East Kootenay storages of the marginal advantages they had. In that situation the province of British Columbia decided it could not agree to the extensive flooding in Canada that our storages would require.

A further consideration altered the position somewhat. At the outset it was important for Canada to be able to offer as much storage as possible, since it was not entirely clear precisely how much would be of value for power and flood control in the United States; or precisely how the value to Canada for that service would balance against the value of keeping larger parts of our storages uncommitted and entirely available for our own uses. The full array of the Canadian storages put forward at the outset would have provided about 25 million acre-feet of storage. It became clear that the greatest balance of advantage to Canada could be secured by committing less. (The Treaty provides for 15.5 million acre-feet for power, of which 8,450,000 acre-feet are committed also for flood control operating plans.) In this situation, the Canadian East Kootenay storages were of small value for downstream benefits. Their value for power in Canada was known to be remote in point of time and marginal as to cost.

The Canadian objective thus shifted to retaining the first-added position that had been secured for our other storages by our insistence on these cost-benefit ratios and, with it, getting the best possible arrangement in relation to Libby. This objective was secured. Libby comes after the Canadian storages in credit position; Canada pays no costs except the relatively minor ones for the reservoir in Canada; and Canada retains whatever benefits in power and flood control are produced

in Canada. Having achieved these objectives, the net result for Canada is better than it would have been with the dam at Dorr, Bull River and Luxor.

A further point should be noted. If, at some time in the future, after generation has been installed on the Columbia in Canada, it is worth while to divert the Kootenay waters northward, that can be done under Article XIII of the Treaty. The Treaty thus secures the best arrangement for the immediate future together with freedom to adjust to other circumstances that cannot now be foreseen.

(2) Economic and Engineering Considerations

While the basic reasons for selecting the three Canadian Treaty projects have now been explained, it is also necessary to comment upon the particular economic and engineering considerations associated with the projects. This is particularly true with respect to the Arrow Lakes project as it was not included in the "best use" plan for independent development by Canada and therefore must be justified solely on the basis of its contribution under a system of cooperative development.

(a) Arrow Lakes Storage: The Arrow Lakes dam was one of the many sites studied for the International Joint Commission by the International Columbia River Engineering Board. As has already been stated both the studies of that Board and independent studies by Canadian consulting engineering firms have emphasized the value of the project to Canada in a cooperative development of the river with the United States.

The Arrow Lakes dam itself will be a relatively low structure five miles upstream from Castlegar, B. C., and will store water to approximately 40 feet above the present high water levels around the shores of the Arrow Lakes. Further details of the project are given in Table 5 and the site itself is shown on Plate 10.

The reservoir of the project will flood approximately 22,000 acres of land above the normal high water level of the lakes or 27,000 acres above the normal water surface of the lakes during the growing season. A considerable percentage of the land area so affected is found in the river valley north of the Arrow Lakes rather than around the Lakes themselves. With the exception of alluvial fans on which communities such as Renata have formed, and land in the "Narrows" between the Lakes, there is relatively little flooding around the lakeshores because of the steep, rocky nature of the shoreline. Of the 27,000 acres of land affected during the growing season, the Federal Department of Agriculture reports that some 5,400 acres can be classified as existing agricultural land which is now, or has at some time, been under cultivation. The "potential" agricultural land to be flooded and which was viewed by the Agriculture Department as being "physically but not necessarily economically suitable for agricultural use" totals some

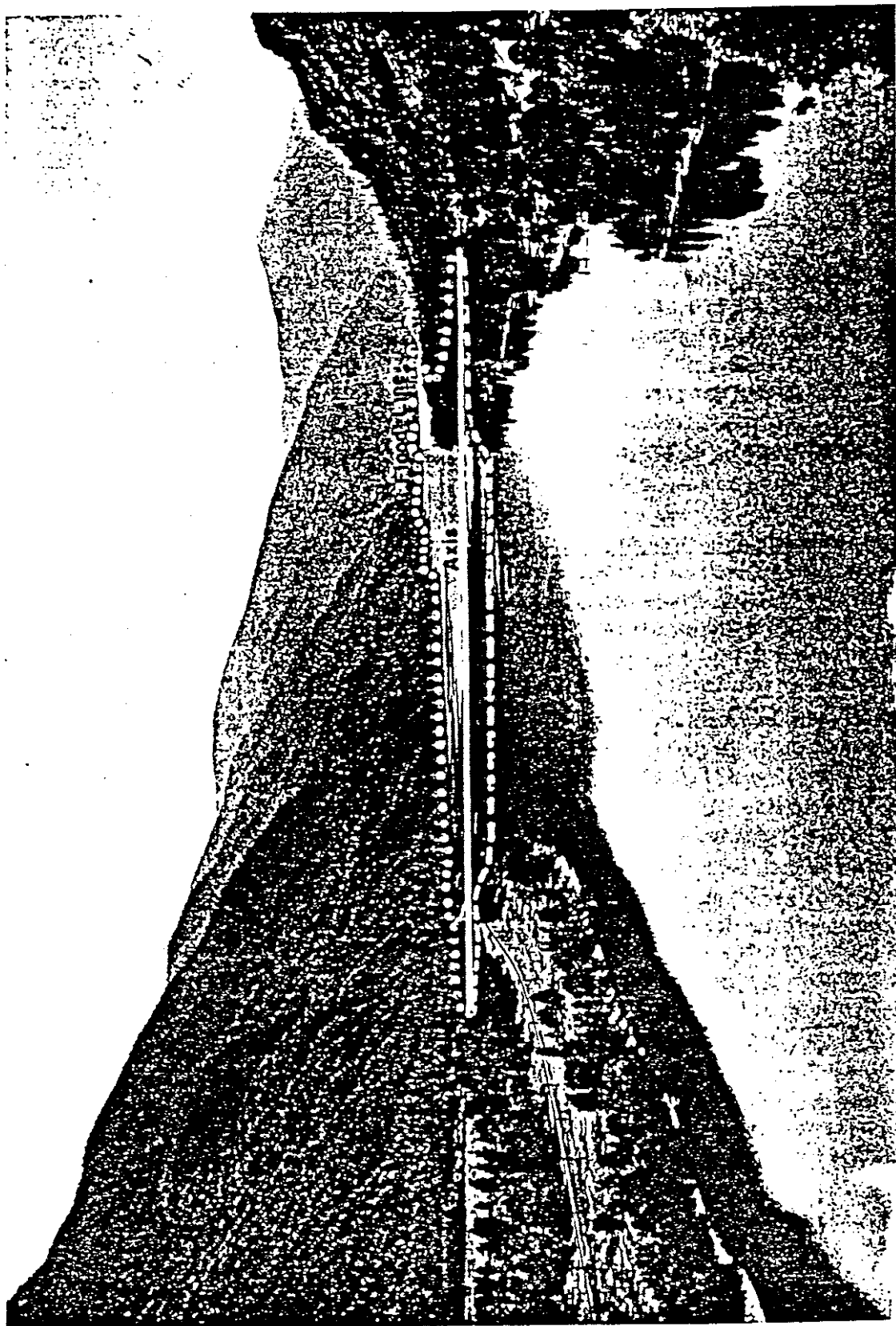


Plate 10 - Arrow Lakes Site.

12,300 acres of which over 10,000 acres are heavily wooded.

The settlement and land use of the area to be affected by the reservoir was reported on by the Department of Agriculture as follows:

"During the early years of this century settlement occurred in the valley of the Arrow Lakes. Unfortunately, many of the original settlers purchased land from speculators who had held out promise of a great fruit growing industry for the area. The original settlers purchased small lots of from 10 to 20 acres which presented a challenge in the form of a formidable clearing and breaking problem. However the lots proved to be too small in extent and of limited inherent physical productivity. Many of the original settlers did plant fruit trees on their small clearings with varying success. The valley does have a history of disease for orchards and this coupled with other problems which will be discussed later did not bode well for the settlers."

"Abandonment of holdings have been common since settlement, with many of the remaining farms being operated only on a casual basis. Prospecting and mining in the early years presented a local market for some produce. However, this activity declined and so has this market. The main source of income for the settlers and subsequent inhabitants of the area has been the forests. Lumbering and pulpwood harvesting have and still are the primary source of income, with the many small farms continuing to be nothing more than residence sites in most cases."

The information available and the judgment of agriculture officials familiar with the area led to the following summary of the agricultural potential to be affected by erecting the dam:

"A comparatively small acreage has been improved over the past 50 years. If a substantial economic potential had existed in the valley for agricultural development there would have been more improvements than have taken place to date. If the dam is not constructed, it is most unlikely that agriculture would prosper in this area in the foreseeable future. The exceedingly high cost of land clearing in the area, the limited precipitation, making irrigation a requirement for intensive cropping, the susceptibility of the valley to diseases of fruit trees, the presence of many soils of low inherent fertility, and the limited acreage of land, all indicate limited possibilities for the further development of the land for agricultural purposes.

This review by the Department of Agriculture did not suggest that small portions of the affected area would not support profitable farms nor was it intended to minimize the serious human question of adjustments by the families who would be affected by the reservoir.

As the above report states, the forest industry is the primary source of income in the area. At the time of the original Water Resources Branch survey of the reservoir area in 1956 for the I. C. R. E. B., provision was made for either the purchase or relocation of the then existing forest industries affected by the proposed reservoir. Since the time of that first survey the economy of the whole area has benefited greatly from the establishment of the large sawmill and pulp-mill of the Columbia Cellulose Co. immediately north of Castlegar and downstream of the dam site. The commencement of operations of this plant in early 1961 has both directly and indirectly affected the cost estimates of the Arrow Lakes reservoir. The provision of a large navigation lock in the plans for the dam to permit the passage of log bundles has, by itself, increased the project cost considerably. In spite of these increases however, the project continues to have a very favourable benefit-cost ratio of almost two to one based solely on its contribution of downstream benefits.

The 1956 survey of the reservoir area indicated that some 1,600 persons would be affected by the flooding. More recent estimates now place the number affected at about 2,000 persons or 650 families. (1) At the British Columbia Water Rights Hearings held in the area in 1961, Dr. H. L. Keenleyside, Co-Chairman, British Columbia Hydro and Power Authority stated that each case of compensation would be given individual, fair and sympathetic consideration. More recently he has stated:

"We at B. C. Hydro are fully aware of the problems of the people in the Arrow Lakes area, many of whom have spent their lives living and working in the area and who will now be required to move. It is unfortunate that momentous changes of this kind so often must involve disruption of old established patterns of life. But I can assure you that the Hydro is not a soulless engineering machine and that it will deal generously and sympathetically with each person who has to move his home or his business. The Government has repeatedly endorsed this approach to this serious human problem."

The cost of compensation to families affected and other costs associated with the reservoir of the dam amount to over 40 per cent of the estimated cost of the project of \$129,500,000 including interest during construction.

The whole of the Kootenay area has extensive possibilities for recreation and tourism and the Arrow Lakes Valley is no exception. However, the development of this potential is dependent to a considerable extent upon the construction of new highways in the area.

(1) For comparison purposes some 6,500 persons were affected in Canada by the St. Lawrence Seaway Development.

The effect of the Arrow Lakes dam on the recreation facilities of the area fortunately will be minimized by the predominantly steep shoreline of the Lakes. While existing beaches will be flooded and the construction of new ones made necessary, the essential beauty of the large expanse of water and the surrounding mountains will remain. To help ensure that the lakes will continue to contribute to the tourist and recreation qualities of the area, the water licence issued for the project by the British Columbia Comptroller of Water Rights in April of 1962 included provisions calling for government control on the clearing of the reservoir, public access to the reservoir, and investigations of any remedial measures required for the protection of fisheries and wildlife.

The engineering soundness of the Arrow Lakes dam has been thoroughly investigated. The project was examined with care by the International Columbia River Engineering Board and the plan has since had detailed engineering studies concerning it carried out by the C. B. A. Engineering Co. Ltd. Its stability and safety has been firmly established through studies by some of the world's foremost specialists in the field of soil mechanics.

To summarize: The cost of the Arrow Lakes dam and reservoir and the problems of dislocation are considerable, but the project from the engineering aspects is completely sound and remains very economical. Equally important-- and this was the role it played during the negotiations--Arrow Lakes was, and still remains, the key to a successful cooperative development of the river by Canada. Such a beneficial cooperative development in turn makes possible the further economic development of over four million kilowatts of installation on the river in Canada. The Arrow Lakes project is therefore an essential undertaking by Canada.

(b) Duncan Lake Storage: As noted by Table 5 the Duncan Lake project will be an earthfill structure some 120 feet in height. Its location near the northern end of Kootenay Lake immediately upstream of the confluence of the Duncan and Lardeau Rivers is pictured on Plate 11. The project is identical to the one included in the plan of best use established for independent development by Canada and therefore Canada can only benefit from its inclusion in a cooperative plan of development and the sharing of the downstream benefits so produced. Solely on the basis of the payments obtained from the United States for flood control benefits and downstream power benefits, the Duncan project has a benefit cost ratio of 1.9 to 1. The project costs are therefore more than covered just through its portion of the Canadian share of the benefits of cooperative development. Therefore, the downstream benefits Duncan produces at downstream sites in Canada are obtainable solely at the cost of adding one or two new generating units at existing Kootenay River plants. The average energy benefits so obtained are approximately 500 million kilowatt hours a year while additional benefits would be possible through a 40,000 kilowatt installation at the Duncan Lake dam itself.

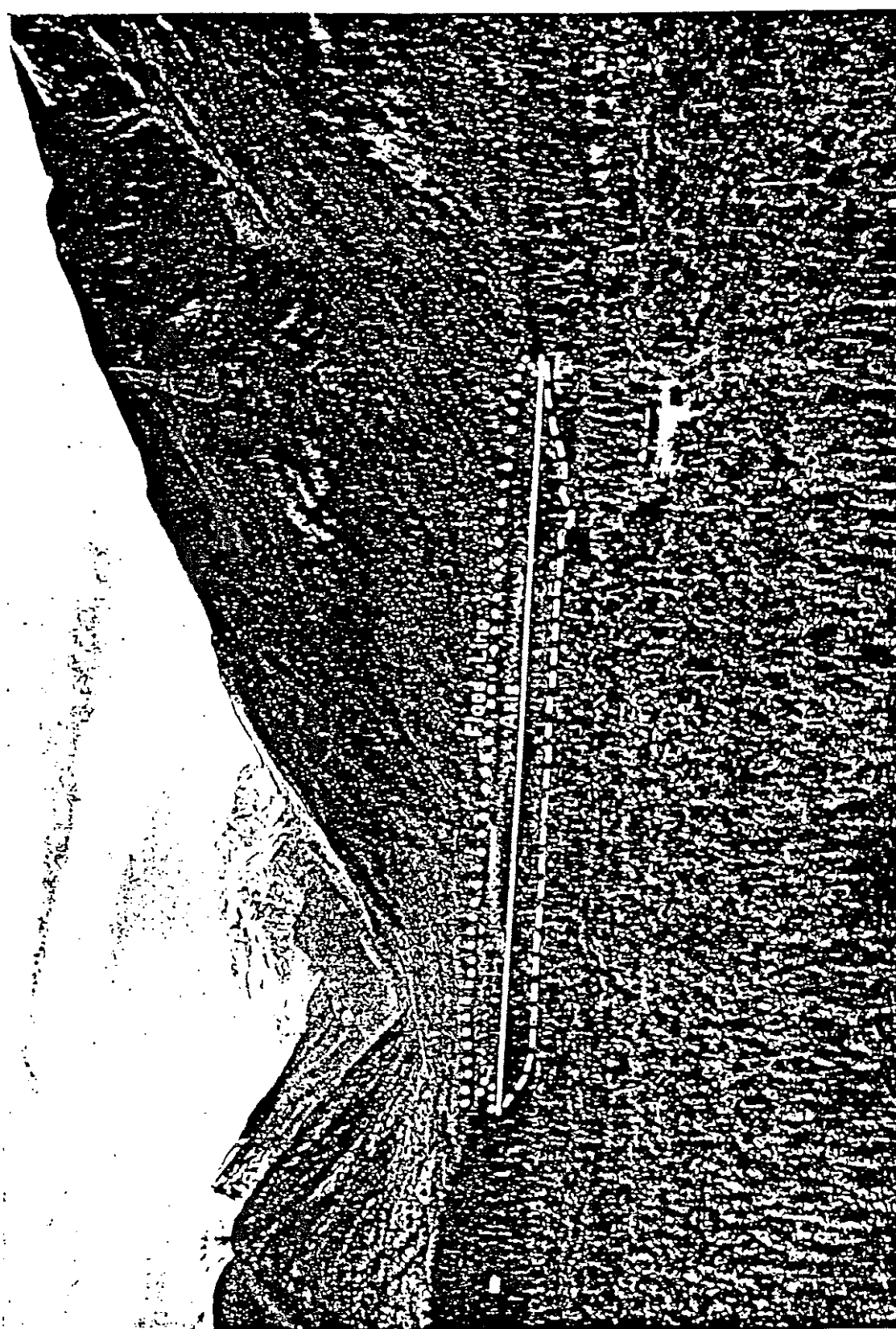


Plate 11 - Duncan Site.

The storage of 1,400,000 acre-feet of water behind the Duncan Lake dam which will raise the existing high water level of Duncan Lake by some 90 feet, can be carried out with minimum dislocation problems because of the remoteness of the site. A 1958 survey indicated that the flooding of the reservoir of approximately 10,000 acres of land would displace about 30 people. Only one small community would be affected. No railways and only short sections of dirt road are involved. The major reservoir cost would be the cost of clearing the flooded area. The detailed engineering for the structure has been carried out by the Montreal Engineering Company and the cost of the project is estimated to be \$33,000,000 including interest during the construction period.

(c) Mica Creek Storage: The project contemplated at the Mica Creek site will be about 650 feet in height with a storage capacity of approximately 20 million acre-feet. Of this total volume of storage about 8 million acre-feet will be inactive ("dead") storage used to develop head at the site and 12 million acre-feet will be available for release for the generation of power at-site and downstream in Canada. Seven of this 12 million acre-feet of active or "live" storage have been committed for operation under the terms of the Treaty. The protection to Canada's own generating needs already has been noted and therefore does not require repetition here.

The Mica site is shown on Plate 12 and the project to be constructed there is the most important project for the development of power from the Columbia River in Canada. Therefore, any benefits attainable from the United States through cooperative development that at the same time would not detract from Mica's at-site generating potential would yield a very important net advantage to Canada. This has been accomplished now through the present Treaty and Protocol. While the incremental downstream benefits provided by 7 million acre-feet of storage at Mica are not sufficient to pay fully for the 20 million acre-foot storage project, nevertheless these benefits, plus the benefits surplus to cost from the Duncan and Arrow Lakes projects, more than accomplish this goal. This major Canadian storage resource at Mica is therefore fully paid for from the benefits of cooperative development.

While the flooding of some 100,000 acres resulting from the development of Mica is considerably greater than that caused by the other Treaty projects, the isolated location of the Mica site minimizes the effects of the flooding. The 1958 survey of the Water Resources Branch for the I. C. R. E. B. indicated that only about 10 people lived in the reservoir area. Since then logging activity may have increased that number slightly, but the closing of the Big Bend Highway through the reservoir area would have an offsetting effect. The new Trans-Canada Rogers Pass route has replaced the Big Bend Highway as east-west access in the area.

The engineering for the Mica site is being carried on by Caseco Consultants Ltd. and the estimated cost of the project before the installation of generating facilities is approximately \$245,000,000.

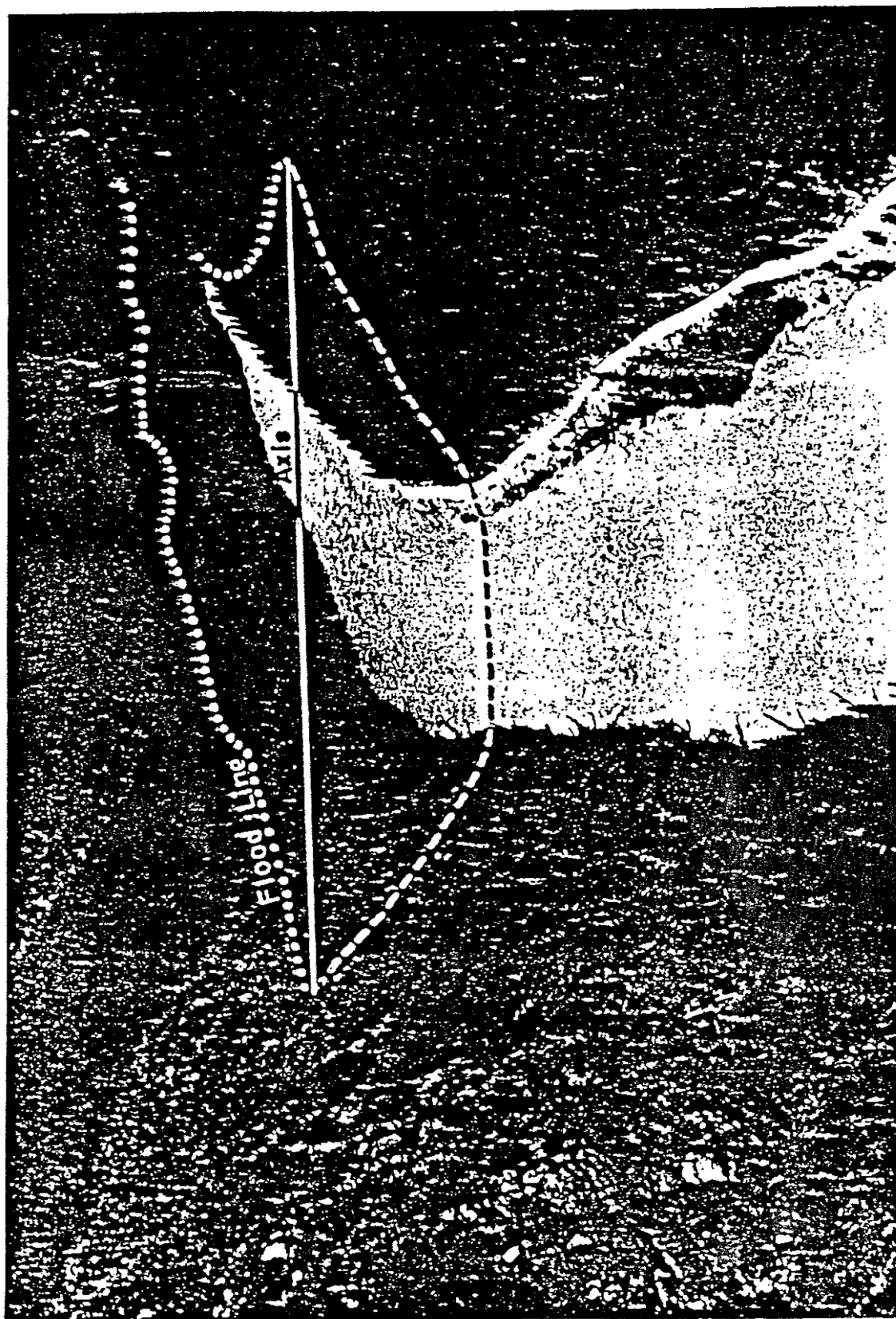


Plate 12 - Mica Site.

(d) The East Kootenay Projects: The part played in the negotiations by the East Kootenay projects in Canada of Dorr, Bull River and Luxor has already been given. In the consideration of the economics of these projects, it should be reemphasized that the primary purpose of the projects would be to divert Kootenay River water to generating plants on the Columbia River in Canada. If such a diversion was only of marginal benefit to Canada even with the Columbia River in Canada fully developed, it was obvious that it would be quite impractical to go to the great expense of diverting these waters to the Columbia before there was any significant development on that river. Even for an independent Canadian development the obvious solution was to postpone construction of the diversion structures until the last stage of such Canadian development. In a cooperative development with the United States however, if a project was to share in the limited supply of downstream benefits, it had to be developed at an early date, particularly if it was to be truly competitive in any comparison with the Libby project in the matter of providing the badly needed flood control benefits on the Kootenai River in the United States. The early provision of such flood control was one of the prime Treaty requirements by the United States. Therefore, if Canada wished to obtain downstream benefits for the East Kootenay projects, those projects would have had to be built many years in advance of the time required for their power benefits within Canada. Such accelerated development for the limited downstream benefits available did not appear economic.

In an attempt to offset this problem Canada considered the construction of the Bull River and Dorr projects only, with no immediate provision for the Luxor project or the maximum diversion of Kootenay River water. However, bearing in mind the costs of construction, the resulting flooding of land in Canada, the head available for at-site generation in Canada, and the limited downstream benefit returns from the United States to be derived from the projects, such a proposal was not to Canada's advantage as opposed to the construction of Libby, at United States expense, and with Canada retaining the right to make the Treaty diversions at Canal Flats.

In view of these factors Canada considered a plan of development that included the Libby project with its downstream benefit credit position "last-added" after the Arrow Lakes, Duncan Lake and Mica projects. The conditions associated with the acceptance of Libby are as follows:

- (i) The United States pays for the full cost of the Libby dam and reservoir with the exception of the \$12 million cost of land required in Canada.
- (ii) Canada retains all the downstream power and flood control benefits produced in Canada in the West Kootenays by the Libby dam.
- (iii) Canada retains specific rights of diversion (not terminable on

short notice as in the case of the Boundary Waters Treaty, 1909) of the Kootenay River in Canada for increased power generation on the Columbia River. These diversion rights protect Canada's long-term use of the river flows and are for about 20 per cent of the Kootenay flow after 20 years from ratification; about 75 per cent of the Kootenay flow after 60 years; and about 90 per cent of the Kootenay flow after 80 years.

- (iv) Canada has the immediate right (also not terminable on short notice) to make the 90 per cent diversion (equivalent to the Dorr, Bull River - Luxor diversion) if the United States does not act within five years on its option to commence to construct Libby or violates the time limitation of seven years placed on carrying out the construction once commenced.
- (v) The United States is to operate Libby for the advantage of the downstream plants in Canada if such operation does not detract from their own benefits.
- (vi) No operation of Libby is to result in a violation of the I. J. C. Order calling for specified maximum levels on Kootenay Lake.

Under these conditions the acceptance of Libby provided Canada with very low cost power benefits as well as flood control benefits in the Creston Flats area. The indirect control Canada has over the releases from Libby through the I. J. C. Order on Kootenay Lake levels and through the reregulation of those releases in Kootenay Lake itself, ensure about 200,000 kilowatts of average annual energy gain (1.75 billion kilowatt hours) downstream in Canada. The at-site cost of this benefit is less than 2 mills per kilowatt hour. These benefits, plus those produced by Duncan Lake storage, provide the low cost energy essential for the continued industrial development of the area.

The International Joint Commission "Principle" which dealt with trans-boundary projects such as Libby stated:

"...the entitlement of each country to participate in the development and to share in the downstream benefits resulting from storage, and in power generated at-site, should be determined by crediting to each country such portion of the storage capacity and head potential of the project as may be mutually agreed."

As Canada did not wish to participate in the development of the relatively expensive Libby project other than providing the reservoir area required in Canada, the mutual agreement reached by the negotiators was therefore consistent with this very general principle. The payment for the land area flooded in Canada is a small charge for the very large benefits recovered by Canada and is consistent with the maintenance of Canadian sovereignty, a position that characterized all aspects of the Treaty and its negotiation.

3. How Valid Were The Treaty Project Choices? - A Conclusion

Canada entered into the Treaty negotiations with much detailed knowledge of various plans of development in Canada and the benefits and problems of those plans when developed independently by this country. We emerged from the negotiations not only with a plan of development very similar to the best independent plan, but with sufficient benefits from the cooperative development to make the full development of the Columbia River basin in Canada a guaranteed source of low cost power for Canada. These benefits of cooperative development were achieved without prejudicing Canada's freedom to operate the power system in Canada for the benefit of Canada itself.

The selection of the Arrow Lakes, Duncan Lake and Mica projects, and the details of the cooperative development program itself, are essentially consistent with the "Principles" of cooperative development recommended by the International Joint Commission. The Treaty is not only generally consistent with those Principles, but also with the massively detailed findings resulting from a large number of studies on these problems undertaken over the past 20 years. The Treaty's projects and general approach also have the complete agreement of the Province of British Columbia, the owner of the resource. Finally after meticulous examination and most careful negotiation, the program was acceptable to the Government of the United States, without whose agreement the benefits of a system of cooperative development could not have been attained.

Table 5

COLUMBIA RIVER -
GENERAL & PHYSICAL CHARACTERISTICS

GENERAL DATA	Canada	U.S.A.
Source of Columbia River	Columbia Lake	
Mouth of Columbia River		Astoria, Oregon
Length in Miles	480	740
Drainage Area in Square Miles	39,500	219,500
Total Fall of River in Feet	1,360	1,290

TREATY PROJECTS

Project	Arrow Lakes	Duncan Lake	Mica Creek
Location	5 miles upstream from Castlegar	Outlet of Duncan Lake	90 miles upstream of Revelstoke
Consultants	CBA Engineering Co. Ltd.	Montreal Engineering Co. Ltd.	Caseco Consultants Ltd.
Drainage Area	14,100 sq. miles	925 sq. miles	8,220 sq. miles
Average Flow	39,000 cfs	3,600 cfs	20,000 cfs
Max. Recorded Flow	220,000 cfs	21,400 cfs	112,000 cfs
Min. Recorded Flow	4,800 cfs	268 cfs	2,140 cfs
Dam Type	Earthfill	Earthfill	Earth and Rockfill
Dam Height	190 feet	120 feet	645 feet ±
Dam Crest Length	2,850 feet	2,600 feet	2,500 feet ±
Dam Volume	8,500,000 cu.yds.	6,400,000 cu.yds.	37,000,000 cu.yds.
Live Storage Capacity	7,100,000 ac.ft.	1,400,000 ac.ft.	Stage 1 - Storage only 7,000,000 ac.ft. Stage 2 - with at-site gen. 12,000,000 ac.ft.
Length of Reservoir	145 miles	28 miles	85 miles
Completion period after ratification	5 years	5 years	9 years
Flood Control Payment in U.S. Dollars	\$52,100,000	\$11,100,000	\$1,200,000

CHAPTER V

IS THE TREATY FAIR TO CANADA?

IS THE TREATY FAIR TO CANADA?

To evaluate properly the fairness to Canada of the Treaty, and its associated Protocol and Sales Agreement, it is necessary to determine first, the specific benefits of the arrangement; second, the value to the United States of their share of those benefits; third, the value to the United States of the power benefits to be purchased; fourth, the costs which Canada incurs; fifth, what Canada gets in return; and finally whether the overall deal is fair and advantageous to Canada. The following sections therefore approach the problem in this sequence.

1. What are the Benefits of the Cooperative Development? Were they Fairly Evaluated?

By far the largest immediate benefits from the regulation of Columbia River flows by storage projects in Canada will be the increase in power generation and flood control protection provided downstream. These immediate downstream benefits therefore require a detailed analysis both of their nature and of the specific amounts credited to Canada under the Treaty.

(1) Downstream Power Benefits: As noted in Chapter IV, the downstream power benefits consist of the increase in dependable hydroelectric capacity and average annual usable hydroelectric energy. As these two components of power differ considerably it is perhaps best to evaluate Canada's contribution to each component separately.

(a) Dependable hydroelectric capacity is a measure of the capacity of a system to meet peak load demands up to the limits of the generating capacity of the plants concerned. To meet such peak demands during a period of critically low streamflow conditions a system must have a guaranteed source of energy and sufficient generating capacity to produce that energy at the rates required by the load. Canadian storage provides no generating capacity to the United States; that capacity must be installed downstream at the United States power developments themselves. However, Canadian storage does supply the increased streamflows necessary to make the United States installed capacity useful when the load demands it. It is for this reason that Canada sought and received a capacity benefit from the United States. At the same time however, it is acknowledged in the Treaty and Protocol that as the United States becomes increasingly capable of using its full generating capacity without the assistance of Canadian storage, the capacity benefit credited to that storage will diminish and, as acknowledged by the International Joint Commission Principles, may in fact disappear toward the latter stages of the cooperative agreement.

While the Treaty entitles Canada to a half share of the capacity

benefit made possible by the regulation of the river through Canadian storage, and is therefore consistent with recommendations of the International Joint Commission in this regard, it has been suggested that Canada will provide a further peaking service for which no credit will be received. This peaking service refers to operation of Canadian storages in such a way as to meet daily peak loads in the United States rather than seasonal ones. To understand properly the validity of this claim it is essential to realize that the ability to meet short duration daily peaks is dependent on sufficient generating capacity and at least a limited supply of stored water which can be released to the generators at the instant the generators require it. The United States has (1) the generating capacity to meet such loads as well as (2) the supplies of storage necessary to meet the short duration calls for high streamflow. Such storage supplies are referred to as "pondage" and are available at all existing United States generating stations on the main stem of the Columbia River. Grand Coulee of course, with a storage capacity in excess of 5 million acre-feet, is capable of meeting peaking requirements on a seasonal as well as a short-term daily basis. It is obvious therefore, that the United States system is self-sufficient in the field of daily peaking and is not dependent on Canadian storage for this service.

If the United States were not capable of meeting daily peak loads unassisted it is interesting to study the possibility of a Canadian contribution to this operation through the detailed release of Canadian storage. Consider, for example, the problem of operating the Mica Creek dam so that a high release of storage from that reservoir would travel the 400 miles to Grand Coulee undiminished and unaltered in duration and would arrive at the exact time of day necessary for peaking use at the Grand Coulee generators. Such an operation is, of course, wholly impracticable.

It is true that releases of Canadian storage might not have to be in a very specific and detailed pattern to assist United States generators, if such assistance was needed. A sustained average release for example might mean that the United States would not have to draw on its storage or pondage to the same extent to meet daily peaks. Two points should be noted on this aspect however, first, any such saving of storage and conservation of generating head would be small, and secondly and of more importance, Canada is not required to provide storage releases to the United States either on a daily peaking pattern or on a sustained flow pattern. The Protocol is very specific that Canada has complete jurisdiction over the daily releases of storage that meet the general monthly storage releases called for by the agreed assured plans of operation (see Protocol Item 7). Daily peaking benefits from Canadian storage, if any, would therefore be of an incidental nature only and would not fall under the category of "dependable capacity".

The downstream capacity credits to Canadian storage are measured in a manner entirely consistent with the principle of measurement recommended by the International Joint Commission and are divided equally between Canada and the United States. Such a treatment is

considered fair and reasonable.

(b) Average annual usable energy is a component of Canada's downstream power credit and requires little more definition than the name itself provides. It is the increase brought about by Canadian storage in the amount of energy which can be generated at downstream United States generators (the supply side) and used by system loads (the demand side). The procedure for measuring this benefit is set forth in "Power Principle No. 4" of the International Joint Commission which states:

"... the increase in average annual usable hydro-electric energy output in kilowatt-hours on the basis of an agreed upon period of streamflow record."

The period of streamflow record "agreed upon" by the Treaty was the 20-year period from 1928 to 1948. The Protocol to the Treaty however, has increased this agreed period by ten years up to and including 1958. These extra ten years are years of relatively high streamflows which require control by Canadian storage to prevent spill or wastage at United States generators. The added usefulness of the Canadian storage is reflected in an increase of estimated energy benefits of about 18% over the period of the Treaty.

While the term "usable energy" as recommended by the I.J.C. Principles would seem self-explanatory, there has been a considerable amount of controversy over its proper definition, with the suggestion being made by some critics of the Treaty that "usable energy" was not meant to include any energy other than that which could be sold on a guaranteed supply basis (firm energy). This definition would exclude any consideration of the very large amount of "secondary" or non-guaranteed energy which presently makes up a very considerable portion of the total United States load. The exclusion of such secondary energy from the calculation of downstream energy benefits would deny the United States any credit for large amounts of secondary energy which they are already generating without the assistance of Canadian storage and selling at rates roughly equivalent to firm energy rates. The end result would be that the United States would receive less than the 50% share of increased energy which the I.J.C. Principles call for.

When the problem of definition of the word "usable" arose during the negotiations the Canadian Section of the International Columbia River Work Group was asked for their opinion. They reported as follows:

"The term 'usable' was not defined in either the International Joint Commission Principles or the discussions of these Principles. Nowhere was it stated that 'usable' was related only to the firm load of the downstream country. In the absence of any indication to the contrary in the I.J.C. report, the word was assumed to have its ordinary meaning and, since the beginning of negotiations

with the United States, 'usable energy' has been assumed to mean energy usable in both the firm and secondary portions of the load in the United States."

It should be noted that the definition placed on the word "usable" by Annex B of the Treaty limits the use of energy to a very considerable extent to the Pacific Northwest Area of the United States and therefore reduces the value of the coordination benefits which may be possible between utilities of the Pacific Northwest and California. It should also be noted that both the energy and capacity benefits to Canada are calculated on the basis of the very valuable "first-added" credit position, a position which gives Canadian storage a priority position over all future United States storages and even over the Bruces Eddy (Dworshak) project which is already under construction in the United States.

In summary, the calculation of energy benefits under the Treaty is considered a fair assessment of the actual energy gain produced in the United States from Canadian storage.

(2) Flood Control Benefits: With the exception of the limited controlled storage available on Kootenay Lake, flood waters from the Columbia and Kootenay Rivers in Canada presently flow unchecked across the border to contribute to the flood damage experienced within the United States. Examples of the percentage contribution of these flood flows to the total flood flows experienced at The Dalles, Oregon, in 1894, 1948 and 1956 are noted in Table 6:

Table 6

Percentage Flood Contribution

	<u>1894 Flood</u>	<u>1948 Flood</u>	<u>1956 Flood</u>	<u>Average</u>
Columbia River Above the Kootenay	22.7%	15.8%	16.5%	18%
Kootenay River Above Its Mouth	17.3%	15.1%	19.8%	17%
Columbia River at The Dalles, Oregon	100%	100%	100%	100%

While it would be physically possible for the United States to control flood flows through existing and additional storage in the country, the percentage contribution of the floods which result from Canadian water is so high that the independent United States system would be an unbalanced system in relation to the sources of the flood threat. Similarly, Canadian storage constructed on the main stem of the Columbia River alone could possibly adequately meet the initial or

"primary" United States requirement to control the floods to 800,000 cubic feet per second at The Dalles, Oregon, but this system would also be out of balance if the large flood flows of the Kootenay River remained unchecked. It was for these reasons that during Treaty negotiations a system of "rational distribution" of flood control storage was agreed upon whereby the limited amount of additional storage needed to meet the United States "primary" flood control requirement would be allocated to the Kootenay and Columbia Rivers roughly in the proportion to their contribution to the flood threat.

The extra flood control storage required by the United States to meet their "primary" flood control needs was 6.5 million acre-feet of storage which, in addition to their existing control, would give them 17,300,000 acre-feet of usable flood control storage. While the percentage contribution of flood flows was about 18% for the Columbia River above the Kootenay and 17% for the Kootenay River, the final distribution agreed upon was as follows:

Additional Flood Control Storage Provided

<u>Columbia River above The Kootenay</u>		<u>Kootenay River</u>	
Arrow Lakes	3,820,000 acre-feet	Duncan Lake	1,270,000 acre-feet
Mica Creek	<u>80,000 acre-feet</u>	Libby	<u>1,330,000 acre-feet</u>
Total	3,900,000 acre-feet	Total	2,600,000 acre-feet

Percent of Total Basin

Requirement of

17,300,000 acre-feet: 22.6%

15%

Combined Totals 6,500,000 acre-feet

It should be noted that while the Arrow Lakes project will control some 7.1 million acre-feet of storage for flood control, about 3.3 million acre-feet of this is already provided by the lakes in their natural condition. Therefore, while Canada has committed the full storage at Arrow Lakes as part of its 8,450,000 acre-foot commitment, only 3.8 million acre-feet is truly additional flood control storage to the United States for which payment is warranted. Canada's total

commitment for flood control can be broken down as follows:

<u>Additional Storage For Which Payment is Made:</u>	Arrow Lakes	3,820,000 acre-feet
	Mica Creek	80,000 acre-feet
	Duncan Lake	<u>1,270,000</u> acre-feet
		5,170,000 acre-feet
<u>Storage Already Existing:</u>	Arrow Lakes	<u>3,324,000</u> acre-feet
<u>Total:</u>		8,494,000 acre-feet
<u>Total Commitment:</u>		8,450,000 acre-feet

(The difference of 44,000 acre-feet results from the "rounding" of Canada's commitment at Arrow Lakes to 7,100,000 acre-feet from 7,144,000 acre-feet.)

Other factors reflected in the final allocation of the flood control credits to particular storages were as follows:

- (i) The actual amount of water which passes the site during the flood threat period. It was obvious that a large flood control storage project would be of limited use unless there was an equally large amount of water to control.
- (ii) The remoteness of the storage from the area where the flood damage would occur. The degree of remoteness affects the degree of effectiveness of the particular storage.
- (iii) The amount of extra "primary" flood control storage required by the United States was limited to 6.5 million acre-feet.
- (iv) The savings Canadian storage produced by preventing what otherwise would be a necessary overdevelopment of storage in the United States. Canadian storage received a 22% bonus on this account.

The actual value of the flood control provided by Canadian storage cannot of course be evaluated in advance with any degree of certainty as no one can accurately forecast the extent of the floods which will occur in the future or the amount of damage which those floods would produce if left uncontrolled. The problem of assessing the value of the flood control storage selected must of necessity be based on forecasts. In the case of the Treaty, the damage prevented is based upon an estimated

1985 level of development in the affected portions of the basins and includes consideration of the land enhancement that adequate flood protection makes possible. The damage so prevented by the storage was then evaluated in terms of 1957 United States dollars.

While flood control storage is similar to power storage in that progressively added units of storage produce progressively less in the way of benefits, this type of approach was not applied to the calculation of flood control benefits. Rather, all storage effective in reducing potential floods to the level of 800,000 cubic feet per second at The Dalles was considered to be of equal value. This placed Canadian storage on equal grounds with the very valuable 13 million acre-feet of existing United States storage and thus resulted in a more favourable benefit to Canada than would have resulted from an incremental approach.

The average damage prevented by reducing flood levels to 800,000 cubic feet per second at The Dalles, Oregon was put on an acre-foot basis. On this basis the 8,450,000 acre-feet of storage which Canada commits for flood control operation on an annual basis during the Treaty period, and of which only about 5 million acre-feet is new storage, was credited with an annual benefit to the United States of \$5,700,000 U.S. (average from years with and without floods). As the 5 million acre-feet of storage available at Libby for flood control was relegated to a last-added position after Canadian storage it was not all required to meet the primary flood control aim and was therefore credited with only \$1,650,000 annually. Under the terms of the Treaty Canada was credited with half of the \$5,700,000 annual benefit of its storage which, when discounted to lump sum payments as each of the Treaty storages become operative, amounted to a total payment of \$64,400,000 (U.S.).

A similar approach was adopted for flood control protection provided by Canada in addition to the 8,450,000 acre-feet of storage. However, rather than commit Canada to an annual operation of this additional storage for the limited benefit attainable, it has been committed for use only when the need for it actually arises. For each of the first four calls made by the United States for this additional storage, payments of \$1,875,000 each must be made to Canada. If these four calls are spaced uniformly over the Treaty period the four payments will have the same value to Canada as the annual payments possible.

Further details of the Treaty flood control arrangements are summarized in Table 7.

In summarizing the benefits to Canada arising from operation of storage for flood control, the following points should be considered:

- (i) The flood control payments to Canada under the Treaty are based upon estimates of the actual damage prevented in the United States. Canada receives a half share of the monetary value of this damage prevention.

Table 7

Flood Control Operation of Canadian Storage Under U.S. - Canada Treaty and Protocol

Type of Operation	Degree of Protection	Period of Obligation	Amount of Storage Committed	Factors Governing Canadian Storage Operation	Corresponding United States Obligation to Canada
1. Assured Plant: (to 800,000 cfs) at The Dalles, Oregon	Primary	60 years	Up to 8,450,000 ac.-ft. Comprising: 80,000 ac.-ft. at Mica 7,100,000 ac.-ft. at Arrow 1,270,000 ac.-ft. at Duncan with provision for interchange between Arrow and Mica.	Canada shall operate in accordance with operating plans under which: - evacuation of storage will be governed by storage reservation diagrams based on survey data under Annex A, paragraph 2. - Operation will be to minimize U.S. and Canadian flood damage. - refill of storage will be as requested by U.S. entity after consultation with Canadian entity.	\$64,400,000 (U.S.) \$69.6 million (Can.) which is the capitalized value at 3 7/8% interest of one half the annual benefits over the 60-year period.
2. Other Operation: (below 800,000 cfs) at The Dalles, Oregon	Secondary	60 years	Any additional storage in basin within limits of existing facilities.	Canada shall operate as required to meet flood control needs after the Canadian entity and/or the Permanent Engineering Board has considered the need. No calls for this storage can be made unless 1961 U.S. storage, Libby storage and storage under Item 1 cannot control floods to 600,000 cfs at The Dalles.	\$1,875,000 (U.S.) for each of the first four calls made, plus electric power loss at Canadian plants in regard to each and every call made.
3. Operation after 60 years: (includes both primary and secondary protection)	As long as Columbia R. in Canada contributes to flood potential	As long as Columbia R. in Canada contributes to flood potential	Any storage in basin within limits of existing facilities.	Canada shall operate as required to meet flood control needs after the Canadian entity and/or the Permanent Engineering Board has considered the need. No calls for this storage can be made, unless all United States storage existing at the end of 60 years after ratification cannot control floods to 600,000 cfs at The Dalles.	Canadian operating cost in providing flood control plus Compensation for any Canadian economic loss resulting from provision of flood control (including any power losses).

- (ii) Canadian storage is given equal credit with United States storage already existing; a more favourable treatment than an incremental approach.
- (iii) Canadian storage is given a 22% bonus because of its effective location in the Columbia River basin.
- (iv) The Canadian storage entitlement to the limited flood control credits available is calculated prior to any consideration of the Libby project. Canada therefore receives a "first-added" credit before Libby.
- (v) The annual flood control payments due Canada have been discounted at an interest rate of 3 7/8% to lump sum payments at the commencement of operation. If these payments had been discounted at a Canadian interest rate of 5 1/2% the total lump sum payment would have been \$15,300,000 (U.S.) less.
- (vi) The \$64,400,000 (U.S.) payment which Canada receives under the Treaty, and which benefits from the 3 7/8% United States discount rate, is 24% greater than the value to Canada at 5 1/2% interest of annual payments made in perpetuity for the flood control.
- (vii) Canada produces the flood control benefits from the same storage which provided for the production of downstream power benefits in the United States and power benefits at Canadian plants. The flood control commitment is such that there is no reduction in Canada's downstream power benefits and therefore the whole of the flood control payments represent a net advantage to Canada.

It is therefore apparent that not only does Canada receive credit for one half the flood control protection provided during the Treaty period, but that the very favourable treatment of the payments to Canada is such that the value of the payments can be considered as being in excess of the total value of annual flood control payments made in perpetuity.

2. What is the Value to the United States of their Half of the Downstream Benefits?

(1) Flood Control Benefits: It is of course imperative that the value of flood control protection to the United States be "measured" in monetary terms since this is the only way of sharing the non-transportable benefits produced. It was for this reason the "Flood Control Principle No. 3" of the International Joint Commission stated that:

"The monetary value of the flood control benefit to be assigned to the upstream storage should be the estimated average annual value of the flood damage prevented by such storage."

The "Discussion" of that Principle by the Commission was as follows:

The average annual value of flood damage prevented by upstream storage can be computed by conventional methods using stage-frequency and damage-frequency relationships. The methods are described and their application illustrated in the most recent report of the Corps of Engineers on the Columbia River Basin recently submitted by the Division Engineer, US Army Engineer Division, North Pacific, to the Chief of Engineers under the title "Water Resources Development, Columbia River Basin" dated June 1958.

The previously explained derivation of Canada's flood control benefits is consistent with this Principle. The benefit to Canada is one half of the estimated value of the flood protection to the United States. The sharing of the total value to the United States is consistent with the International Joint Commission "Flood Control Principle No. 4" which states:

"The upstream country should be paid one half of the benefits as measured in Flood Control Principle No. 3, i.e., one half of the value of the damages prevented."

Under this arrangement the United States receives flood control protection at one half the cost of the flood damage which might otherwise occur.

It has been suggested by critics of the Treaty that flood control payments to Canada should have been larger since the cost to the United States of providing the same flood control would be considerably greater than \$64,400,000. A calculation of flood control benefits to Canada on the basis of alternative costs would of course be contrary to the International Joint Commission Principles. "General Principle No. 2" of those Principles suggests the use of alternative costs to the two countries only as an internal measure of the comparative advantage of cooperative development to a country, not as a basis for payment.

While the alternative cost approach is not justified, it is probably just as well to clear up one apparent misconception concerning what the alternative costs to the United States might be. A statement made by the United States Secretary of the Interior, Stewart L. Udall, on March 8, 1961, has been incorrectly taken to suggest that the alternative cost to the United States would be \$710,000,000. The actual statement was:

"To provide flood control and power benefits equivalent to those provided by the Canadian storage as of 1970, entirely from projects in the United States, would require an investment in the United States of about \$710,000,000 (including the cost of necessary additional transmission facilities) over the next 9 years."

The seven United States projects which represent that alternative, provide benefits to the United States through power, recreation, navigation and fish and wildlife as well as flood control. Flood control represents only 14 per cent of the total annual benefits of the projects (and hence might reasonably be charged with no more than that percentage of the cost).

It should perhaps also be noted that one of the projects included in the alternative United States plan, the \$135 million Bruces Eddy (Dworshak) project is already under construction. This project is capable of contributing annually some \$1,880,000 of flood control benefit. However, because Canadian Treaty storage has maintained a "first-added" credit before Bruces Eddy, that project's Columbia River flood control benefits will be only \$155,000 annually.

The "alternative" cost to the United States of \$710,000,000 is therefore not applicable only against flood control construction, and in any event the analysis is no longer applicable at all as almost 20 per cent of the "alternative" \$710,000,000 expense has already been undertaken.

(2) Power Benefits: The value to the United States of its half of the downstream power benefits should not be of concern to Canada. The Treaty was negotiated on the basis of the "Principles" of the International Joint Commission and as previously noted those Principles call for the division of power benefits as such. "Power Principle No. 5" did provide for the use of alternative costs if it was necessary to place a monetary value on downstream power benefits, but even then permitted agreement on "some other basis" if mutually agreed between the entities.

However, while alternative costs to the United States are not a consideration in the calculation of power benefits, it is perhaps necessary, as it was with flood control benefits, to correct a misconception as to the cost of the Treaty benefits to the United States. This misconception also arose from Secretary Udall's statement of 8 March 1963 which compared the \$710,000,000 "alternative" cost to the United States with an initial cost to the United States under the Treaty of \$150,000,000. This latter cost would result in downstream energy benefits to the United States at a unit cost of about 1 mill per kilowatt hour. What this comparison overlooks is the fact that Secretary Udall's statement went on to say that after the first nine years

"an additional estimated \$268,000,000 of expenditures in the United States will be required, again exclusive of Libby. This added expenditure would be required between 1970 and 1995 and most of it will go to install additional generating facilities to take full advantage of the Canadian storage. Among these additional facilities will be another powerhouse at Grand Coulee Dam with ultimate installed capacity of at least 2,000,000 kilowatts. In all, the total capital outlay in the United States by reason of the Treaty (exclusive of the cost associated with the Libby project) is estimated at about \$418,000,000."

The comparison which has been made also overlooks three other important aspects:

- (i) The United States has already invested almost 3 billion dollars in Columbia River projects, a large percentage of which is essential for the generation of downstream benefits. Some of this preinvestment involves a large number of generators which have been installed in advance for reasons such as economy of construction. These units will be required to produce downstream benefits yet their cost does not show up in the \$150,000,000 initial incremental cost to the United States.
- (ii) The initial and incremental cost to the United States of about 1 mill per kilowatt hour is for their increase in primary or dependable energy. However, while they gain in primary energy they lose a considerable amount of secondary energy which they are capable of generating and selling without the assistance of Canadian storage.
- (iii) The value of the Treaty project to the United States decreases with time while in Canada the value to this country increases very substantially with the installation of at-site generation. In addition, the value to the United States of the "alternatives" would have been of a continuing nature as those alternatives would have a potential of over 1,200,000 kilowatts of at-site generating capacity of increasing value.

3. What is the Value to the United States of the Power Benefits Purchased?

Section 5 of this chapter discusses the power benefits which Canada will sell to the United States over a thirty-year period and how the amount of the benefits has been estimated. The actual benefits which will be realized by the United States over the sales period cannot be determined at this time as they are dependent upon a number of future conditions. It is therefore impossible to compare the cost of these benefits to alternative sources of power which the United States could have developed by itself and thereby establish the advantage, if any, of the purchase to the United States.

A considerable advantage should result to the United States through the purchase if, lacking the sales agreement, they would have had to go immediately to alternative thermal-electric power. However, as alternative hydroelectric projects such as High Mountain Sheep and Knowles still exist in the United States portion of the basin the immediate alternative cost to the United States would be the cost of those projects. Other complicating features in the problem of arriving at the value to the United States of the power benefits purchases are the following:

- (i) The actual benefits purchased are unknown while alternatives in the United States would have produced a known amount of power.

- (ii) The benefits purchased will diminish with time and will therefore be of less value to United States utilities than a continuing amount of power from a domestic alternative.
- (iii) The benefits purchased have been paid for on the assumption that they can all be sold. The United States must now endeavour to find markets for both the Canadian and United States share of the benefits.
- (iv) The power benefits are being purchased at the generators, they must be transmitted to the United States loads. Thermal-electric plants could be located near the loads.
- (v) The total amount of money the United States must raise (in addition to the flood control payments) is approximately \$330,000,000 (U.S.) rather than the \$254,400,000 (U.S.) paid to Canada. The difference must cover items such as financing costs and interest on the bond issue until downstream benefits are available.

It is therefore impossible at this time to establish a definite value to the United States of the power benefits it has purchased. However, the fact that the arrangement has been entered into indicates that that country feels that the power purchase, as a part of the whole Treaty arrangement, will provide an advantage over purely domestic alternatives.

4. What Costs does Canada Incur?

The natural reaction to this question is to add up the full cost of the Treaty storages in Canada and to compare the total with the benefits derived from Canada's share of the downstream power and flood control benefits in the United States. It is essential that in such a comparison the following points be recognized:

- (i) That both the Mica Creek and Duncan Lake projects and also the Arrow Lakes project to a considerably smaller extent will assist in the generation of power in Canada. These costs therefore, while initially being incurred for the Treaty, also provide storage facilities of very great benefit to generation in Canada itself.
- (ii) The Treaty requires a storage capacity of only 7 million acre-feet at Mica whereas present cost estimates are for a project impounding 20 million acre-feet. Of the remaining 13 million acre-feet, 8 million acre-feet are solely for the development of head and 5 million acre-feet are for the regulation of flows for the generation of at-site and downstream power in Canada. If such Canadian generation were not planned a much smaller and much less expensive project would be built at Mica for the Treaty.

A comparison of the full Canadian Treaty project costs with the downstream benefits received by Canada from the United States is thus not a valid comparison. However, Table 8 shows that even these large expenditures are more than offset by the payments made by the United States for the downstream benefits sold to them for only 30-years.

Because of the use of the Treaty projects for power generation within Canada, a more accurate assessment of the net cost to Canada of its entitlement to downstream power benefits from the United States can be achieved by considering only the incremental costs of a cooperative development under the Treaty as compared with an independent development within Canada. This approach involves a number of assumptions both with regard to cost allocation and timing of project construction, but even the most conservative approach made in the analyses indicates the cost of the Treaty downstream power benefits to Canada as being almost 2 mills per kilowatt hour less than the 4.4 mills per kilowatt hour value of the United States payment under the terms of sale.

It can therefore be clearly established that Canadian benefits from the Treaty far exceed the monetary cost of the Treaty to Canada. What of the other costs to Canada? Do we retain adequate control of Canadian resources; and, equally as important to Canada as a whole and more particularly to the people directly affected, what of the cost of losing the potential use of 27,000 acres of land in the Arrow Lakes Valley?

Chapter IV and the Appendix to this paper establish that the control which Canada retains over its resources will provide the flexibility necessary to produce large amounts of energy from the Columbia River in Canada for its own needs. The small degree of flexibility that may be lost in any such cooperative undertaking as this is more than compensated for by the benefits achieved and also by the fact that a very major resource is made economically viable.

The value of the land to be flooded has also been discussed previously, and while the Government fully recognizes the personal problems inherent in any such flooding and sympathizes with those affected who may not wish to be relocated, the essential and immense economic benefit made possible by the Arrow Lakes dam cannot be denied. To view it otherwise would mean that the benefits of Columbia River development to the Province of British Columbia and to the nation as a whole should risk being lost. The previously noted assurance of the Chairman of the British Columbia Hydro and Power Authority indicates that in this case, as with similar dislocation caused for example by the St. Lawrence Seaway Development, adequate compensation will be made to those people affected and each individual case of such compensation will be dealt with separately and justly.

Table 8

Comparison of Revenues and CostsColumbia River Treaty ProjectsA. Payments to be made by United States of America

<u>Payment for</u>	<u>Amount of Payment \$Millions (Can.)</u>	<u>at date of</u>	<u>Value on 1 April 1973 \$Millions (Can.)</u>
Power benefits	274.8	1 Oct. 1964	416.1
Flood Control			
Duncan	12.0	1 April 1968	15.3
Arrow	56.3	1 April 1969	68.4
Mica	1.3	1 April 1973	1.3
		Total	501.1

B. Capital Costs of Projects

<u>Project</u>	<u>Capital Cost \$Millions (Can.)*</u>	<u>at in-service date of</u>	<u>Cost on 1 April 1973 \$Millions (Can.)</u>
Duncan Storage	33.3	1 April 1968	42.5
Arrow Storage	129.5	1 April 1969	157.4
Mica Storage	245.2	1 April 1973	245.2
General Costs	2.6	1 April 1973	2.6
		Total	447.7

C. Surplus

Total payments less total capital cost, ie A - B \$53.4 million
 This surplus represents approximately one-half the cost of Mica at-site generation.

NOTE: (1) Interest rate assumed at 5 per cent both on costs and investment of payments.

(2) Exchange rate assumed to be \$1.00 (U.S.) - \$1.08 (Canadian).

* - Includes interest during construction at 5 per cent per annum.

5. What Benefits does Canada Receive from the Treaty, Protocol and Sales Agreement?

(1) Payments For Flood Control In The United States: The flood control payments which Canada will receive from the United States and the obligations of Canada to provide flood control are tabulated on Table 7 of this Chapter. The obligations of Canada are set forth in more detail in the discussion under Article IV of the Treaty and Item I of the Protocol as contained in the Appendix of this paper. Briefly the payments to Canada are as follows:

During the Period 60 Years from Ratification

(i) \$64.4 million U.S. (\$69.6 million Canadian) to be paid as follows:

\$11.1 million on 1 April 1968

\$52.1 million on 1 April 1969

\$ 1.2 million on 1 April 1973

(ii) Four payments of \$1,875,000 U.S. each for each of the first four calls for flood control storage in addition to that paid for under (i). (These payments have not been included in any cost-benefit comparisons as the date of payments, if any, is not definite and the probability of occurrence of a flood which would entitle the United States to call on this extra flood control is about once in twenty years.)

(iii) Electric power equal to any power lost by Canada in providing any call for flood control in addition to that paid for under (i).

After 60 Years from Ratification

(Floods of sufficient magnitude to meet the Protocol conditions for calls on Canadian flood control storage in this period have a probability of occurrence only once every 15 to 20 years.)

(i) Operating costs incurred by Canada in providing the flood control.

(ii) Compensation for any economic loss arising directly from Canada foregoing alternative uses of the storage (reservoir space) used to provide the flood control. Any part of this compensation which involves lost power will be paid to Canada, at its option, in either power or cash.

As previously noted the payments for flood control benefits are produced by the same reservoirs as provide the downstream power

benefits and are provided in a manner which protects the value of the projects for the at-site generation of power. The payments are therefore a true net benefit to Canada.

(2) Downstream Power Benefits in the United States: As Canada, under the Sales Agreement, will sell to the United States the first 30 years of each Treaty project's entitlement to downstream power benefits, the total Treaty power benefits can best be described under sections dealing with the power benefits sold and the power benefits not covered by the sales agreement.

(a) Power Benefits Sold: The amount of downstream power benefits to which Canada is entitled under the Treaty depends upon a number of conditions which cannot be accurately defined at this time. One of the more important of the variables involved is the rate of load growth in the United States. The effect of two different load growth rates on Canada's estimated benefits is shown by Table 9 which presents year by year estimates of energy and capacity benefits over the 35 years which encompass the 30-year sale period for each of the Treaty projects. The load growth forecast marked "High" is based on recent studies by the United States Federal Power Commission and the Bonneville Power Administration, while the forecast marked "Low" is based on an average load growth forecast prepared in 1956. The estimates of Canada's entitlement to downstream energy and capacity benefits under these two load conditions are as shown by the table. Also given by that table are the estimates of energy and capacity benefits finally agreed upon for the purposes of the sales agreement.

As can be noted by Table 9, a high load growth rate has the effect of reducing Canada's power benefit entitlement. This is caused by a faster development of United States resources and results in that country becoming increasingly less dependent on Canadian storage for efficient operation of its Columbia River system.

As the final and agreed estimate of Canada's downstream benefits indicated by Table 9 is the basis for payment made to Canada during the thirty-year sale period, the increase over the benefits which could have resulted under the recent or "High" load forecast condition represent a considerable improvement in what might otherwise have been Canada's Treaty returns. These increases were brought about through agreement on an estimate of load growth falling midway between the "High" and "Low" estimates, agreement on the addition of an extra 10 years of streamflow record in the calculation of the downstream energy benefits, and agreement on the treatment of the power used at the irrigation pumps of the Grand Coulee project. The actual amounts of energy for which Canada is paid under the sales agreement are slightly less than the total quantities indicated by Table 9 as the sales agreements for the Duncan Lake and Arrow Lakes benefits terminate in 1998 and 1999 respectively. Canada's payment for downstream power benefits is based on an estimated total energy benefit of about 130 billion kilowatt hours at an average load factor of about 48 per cent.

Table 9
Estimated Canadian Entitlement During 30-Year Sale Period

Year	Energy Entitlement in Average Megawatt Years			Capacity Entitlement in Megawatts		
	Under "High" Load Forecast	Under "Low" Load Forecast	Agreed Entitle- ment(1)	Under "High" Load Forecast	Under "Low" Load Forecast	Agreed Entitle- ment(2)
1968-69 ⁽³⁾	106	105	113	191	191	191
1969-70 ⁽⁴⁾	536	540	572	956	956	972
1970-71	536	540	572	956	956	980
1971-72	536	540	572	956	956	987
1972-73	536	540	572	956	956	995
1973-74 ⁽⁵⁾	714	714	759	1331	1331	1377
1974-75	714	714	759	1331	1331	1385
1975-76	664	707	739	1318	1326	1379
1976-77	615	700	719	1305	1322	1373
1977-78	566	672	689	1292	1310	1362
1978-79	516	645	658	1279	1297	1350
1979-80	470	617	621	1251	1285	1331
1980-81	424	590	583	1224	1272	1311
1981-82	378	562	545	1196	1260	1297
1982-83	355	535	520	1131	1247	1254
1983-84	332	507	495	1066	1235	1216
1984-85	309	480	468	1001	1216	1172
1985-86	285	454	444	937	1197	1134
1986-87	262	427	418	872	1178	1093
1987-88	239	401	393	807	1159	1052
1988-89	216	374	368	942	1140	1012
1989-90	194	358	349	782	1109	1017
1990-91	173	342	330	822	1078	1022
1991-92	168	326	318	685	1048	732
1992-93	164	310	305	548	1018	844
1993-94	160	294	293	411	987	755
1994-95	155	278	279	274	957	666
1995-96	150	263	268	137	926	576
1996-97	146	247	254	0	896	486
1997-98	145	231	246	0	865	471
1998-99	144	215	236	0	835	457
1999-00	143	199	228	0	804	442
2000-01	143	183	219	0	774	427
2001-02	142	167	210	0	743	413
2002-03	141	163	207	0	660	371

- NOTES: (1) Agreed energy entitlement is based upon a 30-year period of stream flows whereas the entitlement under high and low load forecasts is based upon a 20-year period of streamflows.
- (2) Agreed capacity entitlement includes Grand Coulee pumping load as part of the system load. The entitlement under high and low load forecasts omits Grand Coulee pumping load from the system load.
- (3) Sale period for Duncan benefits 1968-69 to 1997-98 incl.
- (4) Sale period for Arrow benefits 1969-70 to 1998-99 incl.
- (5) Sale period for Mica benefits 1973-74 to 2002-03 incl.

The amount of power benefits indicated as being sold must of necessity be an estimate of the actual benefits which Canada would have been entitled to sell under the year by year calculation called for by the Treaty. The estimate, however, is considered a favourable one to Canada, particularly if the actual load growth in the United States follows the most recent load estimates. By arranging a sale based on the above noted estimate and calling for payment in advance, Canada is assured of sufficient revenues to more than cover the cost of the three Treaty projects in Canada.

The payment received from the power sales will, under the terms of the sales agreement, be \$254,400,000 U.S. or \$274,800,000 Canadian on the first of October 1964. This payment, made in advance and with interest earned at 4 1/2 per cent is equivalent to 4.4 mills per kilowatt hour for the total energy benefit sold, and 5.3 mills per kilowatt hour if the revenues for flood control are also included.

The value to Canada of the advance payment for power along with the flood control payments of \$69.6 million Canadian can be expressed in a number of ways, one of which has been given on Table 8 where the total value of payments on 1 April 1973 of \$501 million Canadian is compared with the total value of compounded capital cost of the three storage dams of \$447.7 million. The surplus revenues on that date (April 1973) are sufficient to pay about one half the cost of installing 1.8 million kilowatts of generating capacity at the Mica dam. This installation is twice that of the Canadian generating installation at the Barnhart plant of the St. Lawrence River Development.

A second approach to the value of the payments is to apply them year by year to the cost of constructing and maintaining the Treaty storage over the full construction and sales period (1964 to 2003). Under this approach we find that all construction costs are paid as they occur and all operating and maintenance costs of the storage are fully covered. In addition, a revenue surplus of \$40 million remains at the end of the period. Over the full period of construction and sale, the value to Canada of the initial payments plus interest earned on the unused portions of those payments, totals \$488 million.

No matter which approach is used the end result is the full coverage of all Treaty costs and with surplus revenues to be applied against Mica generation so that the average cost of the 6.6 billion kilowatt hours of energy produced annually at that site will be less than 1.5 mills per kilowatt hour.

The power benefits have been sold to the United States for an advance payment which is of equal value to a payment year by year of 4.4 mills for every kilowatt hour of Canadian entitlement or 5.3 mills per kilowatt hour with flood control revenues included. The sale of the benefits at this rate is not only a very profitable arrangement for Canada but is essential at this time because of the lack of markets in British Columbia to use the power if it were transmitted to Canada. If Canada

had waited for these domestic markets to develop, the chance for co-operative development may well have passed and the whole development of the Columbia River in Canada would have been jeopardized.

(b) Power Benefits in Addition to Those of the Sales Agreement: The same variables which make it impossible to forecast the actual benefits which the United States has purchased over the 30-year sales period also complicate an accurate estimate of the benefits remaining for Canada after that sale and available either for an additional sales contract or transmitted to Canadian loads. As can be seen from Table 9 the capacity benefit is, in the latter part of the Treaty period, very susceptible to the load growth in the United States and may diminish to zero before the end of the Treaty in the year 2024. However, as the average energy benefit is largely dependent upon the ultimate installation of generating units the United States will make at its existing Columbia River plants, the minimum energy benefit possible can be fairly accurately determined and should be about 190 average megawatts or 1.7 billion kilowatt hours a year. The annual value of the power benefits not covered by the sales agreement is approximately \$5 million at today's values and between \$5 to \$10 million if allowance is made for the inflation of those values.

(c) Other Benefits: It is also possible that the project referred to by Article IX of the Treaty (Ben Franklin) will be constructed downstream in the United States from the Canadian storage. As the possible downstream benefits from this project are not covered by the sales agreement, the benefits Canada might receive from the development by the United States of this limited amount of head (44 feet) would be an additional revenue not considered in present benefit-cost calculations.

(3) Benefits on the Kootenay River in Canada: While it is generally recognized that downstream power and flood control benefits are produced in the United States from the upstream Treaty dams of Canada, the very substantial downstream benefits produced in Canada on the Kootenay River are also of substantial importance. These benefits played a significant part in Treaty negotiations and are derived from the storage provided by the Duncan Lake and Libby dams. The flood control benefits are produced primarily by the Libby dam as it is upstream of the Creston area of British Columbia which, as noted in Chapter III of this report, "is the only area in the Kootenays (both the Columbia and Kootenay Valleys) where the economy is based on agriculture". Both the power and flood control benefits produced in Canada by Duncan Lake and Libby will be retained in their entirety by Canada.

It has been argued that the total cost of the Libby dam, which exceeds \$300 million, is greater than the cost of the alternative dams of Dorr, Bull River and Luxor which could be constructed on the Kootenay and Upper Columbia Rivers in Canada, and therefore its inclusion is not the most economic use of the river potential from a purely international standpoint. Such an approach does not of course

consider the relative values of the valley areas which would be flooded by the two plans. However, while a purely non-national approach is perhaps commendable, the practicalities of the problem and the alternative use approach of the International Joint Commission Principle's dictate that national interests be considered. On that basis, United States acceptance of all the costs of Libby (apart from the relatively small land costs involved in Canada) not only made this the most economic plan for Canada but also prevented the flooding and loss of about 73,000 acres of land in the East Kootenay Valley in Canada and avoided the relocation and dislocation problems inherent with such flooding.

The energy benefits which Canada will receive on the Kootenay River in Canada from the Treaty development are approximately 250,000 kilowatt years of energy (2.2 billion kilowatt hours). Of this gain, about 50,000 kilowatts can be produced at the existing Kootenay River plants from the regulation provided by Duncan Lake, and 200,000 kilowatts will be produced at the existing plants and the new Canal Plant by the extra regulation provided by Libby. These benefits will be produced for Canada under the Treaty proposal for less than 2 mills per kilowatt hour.

(4) Generation at the Mica Creek Project in Canada: The Mica Creek project as presently planned will have a generator installation totalling 1.8 million kilowatts and will be capable of producing 6.6 billion kilowatt hours of energy annually from Columbia River flows. This large generating potential, and the fact that the regulation of the river flows provided by the project is also essential for the economic development of generating projects downstream in Canada, is why the Mica dam is the key development for at-site generation in Canada.

How does the Treaty affect the cost of power at this essential project? During the 30-year period of downstream power sales to the United States the at-site cost of the Mica generation is less than 1.5 mills per kilowatt hour. If there were no Treaty the cost of Mica generation during the same period would be approximately 4 mills per kilowatt hour. The savings to Canada at full production at the Mica site are therefore approximately \$16 million a year up to April of the year 2003. After that time and for a period of at least 20 years the saving is about \$13 million a year. These multi-million dollar savings are a direct result of the Treaty and sales agreement.

(5) Total Generation in the Columbia River Basin in Canada: While the immediate benefits of the Treaty development will appear at the Mica Creek site and Kootenay River plants, the long term benefit of the Treaty is to make the full development of the best-use plan for Canada an economically viable undertaking. Immediately downstream of Mica Creek a total of 1.9 million kilowatts of installation are made possible at the sites of Downie Creek, Revelstoke Canyon and Murphy Creek. The Murphy Creek site immediately north of Trail is shown by Plate 13. Altogether the total power potential of the Columbia River basin within Canada based on development under the Treaty, will amount to over 4 million kilowatts of installed capacity producing at-site energy



Plate 13 - Murphy Creek Site.

at an average cost of approximately 2 mills per kilowatt hour. These benefits will be increased even further through coordination with other resources within Canada. For comparison purposes the total hydroelectric generating capacity in Canada at the end of 1963 was 20 million kilowatts. The additional hydroelectric capacity potentially available on the Columbia River therefore represents 1/5 of today's total for Canada. The installations possible under the full development of the river basin in Canada are given in Table 10.

(6) Diversion Rights for Canada: Other sections of this presentation and its Appendix present the diversion rights available to Canada under the terms of the Columbia River Treaty and Protocol.

To have secured clear rights of diversion must be counted as a benefit from the Columbia River Treaty. These rights are substantial and benefit Canada both in the field of power production and in safeguarding the country's water requirements for "consumptive" purposes. (See Section 5 (2) of Chapter III).

(7) Other Benefits: Other benefits Canada will receive from the Columbia River Treaty are as follows:

(a) Flood Control Benefits in Canada: Canada will benefit from flood control protection provided by the three Canadian dams and the Libby dam. Canada is not required to pay the United States for the flood protection given by the United States dam at Libby.

(b) Balance of Payments Situation: Canada's foreign exchange resources will benefit directly from the payment by the United States of \$319 million in United States funds, of which \$254 million will be paid in 1964.

(c) Employment: During the nine-year construction period of the Treaty storage projects an average of some 1,350 men will be employed at the dams, and in the peak years of construction about 3,000 men. Expenditures by this labour force and by industries for the dams will create a great many more jobs. Following the construction of Duncan, Arrow and Mica there will be a continuing building program for a further 10 to 15 years for other large dams on the Columbia River.

6. Summary

Is the Treaty fair to Canada? On the basis of Canada's contributions and the returns from the proposed cooperative development the answer must definitely be in the affirmative. Canada's costs under the Treaty are exceeded by the Treaty benefits even under a most critical standard of analysis. The agreements which have been reached on the measurement and division of downstream power and flood control benefits are generally consistent with "Principles" recommended in 1955 by the International Joint Commission. The payments made by the United States for the portion of benefits sold to that country are not only

Table 10

Proposed Hydroelectric Projects
in the Columbia River Basin in Canada
Summary of Data

Name of Project	Live Storage Ac. Ft.	Normal Full Pool Elevation	Maximum Gross Head Feet	Number of Units	Installed Capacity KW
Mica Creek	12,000,000	2475	570	10	1,820,000
Downie Creek	480,000	1905	255	10	1,000,000(a)
Revelstoke Canyon	220,000	1650	196	9	630,000
Arrow Lakes	7,100,000	1444	42	-	-
Murphy Creek	Pondage	1402	62	6	300,000
Duncan Lake	1,400,000	1892	110	-	-
Lower Bonnington (additions only)	Pondage	1620	70	1	13,700
Brilliant (additions only)	Pondage	1470	70(b)	2	54,600
Kootenay Canal Plant	817,000	1745	272	3	270,000
Seven Mile	Pondage	1714	198	4	350,000
Total					4,438,300

(a) Output is reduced to 930,000 kw when tailwater is at normal full pool elevation of Revelstoke Project.

(b) Following completion of Murphy Project which reduces head by 26 feet.

reasonable but are guaranteed, whereas the actual amount of the product sold is dependent upon a number of future and undefinable conditions.

Canada's contribution to the cooperative undertaking will be a regulation service for the flows of the Columbia River, no new water is being made available to the United States by this country. In providing this regulation service Canada has maintained sufficient flexibility of operation to protect its own generating projects in Canada. It will also benefit substantially from the Libby dam in the United States. All of this has been accomplished under Treaty provisions that are fair and fully acceptable to all three governments concerned. The end result for Canada is the assured development of a major and renewable resource yielding large and varied benefits for an entire region and for the country as a whole.

CHAPTER VI

CONCLUSIONS: THE TREATY APPRAISED

CONCLUSIONS: THE TREATY APPRAISED

The conclusions that follow from the foregoing analyses point to the very serious efforts on the part of the Government of Canada and the Government of British Columbia to be seized fully of all the facts underlying the economic, engineering and general benefits to Canada in entering into a plan of cooperative Columbia River development with the United States.

This Presentation has already stated fully the case for the Treaty. However, it is desirable that there should be no public misunderstanding as to the degree of conviction with which the Government of Canada, and no doubt the Government of British Columbia, view the specific gains for Canada resulting from the Treaty, the Protocol, the Terms of Sale and the collateral arrangements with the Government of British Columbia.

What are these gains?

(1) Best Use of the River

No serious or practical support is to be found among studies of Columbia River developmental potential for any program other than a primary use of the river for power and flood control within the Columbia River basin itself. Diversions for power to the Fraser River or for power and irrigation to the Prairies represent very high cost developments and, in addition, raise very serious questions of altering watersheds and preventing basin development when the immediate advantages of such diversions are not present to justify so radical a use of these waters. The Prairies can obtain water closer to home more cheaply if the need for that water does arise; and the diversion of Columbia River water into the Fraser River has been shown to be an uneconomic method of power development.

(2) Downstream Benefits

It was a substantial achievement to obtain the consent of the United States to the downstream benefits theory. Without these benefits it would not have been possible to finance economically Canadian construction upstream.

(3) The Best Projects Were Chosen

Years of detailed technical study by the International Columbia River Engineering Board, supplemented by the International Joint Commission, by officials of the Government of British Columbia, by the Water Resources Branch of the Government of Canada and by several private consulting firms of engineers, as well as specific

cost-benefit analyses of many sites and of over one hundred combinations of sites, led to the selection of Arrow Lakes, Duncan Lake and Mica and to preservation of a variety of possible Kootenay River diversions. As to Libby, it was essentially a United States project and in view of its relatively low cost to Canada (\$12 million for land flooded in Canada) and the substantial downstream benefits obtained by Canada and not shared with the United States (in the West Kootenays), its selection resulted in important power and flood control advantages for Canada. Every one of the Canadian projects, particularly Arrow Lakes and Duncan Lake, has a highly attractive benefit-cost ratio. All were given an advantageous first-added position before new United States projects. When it is realized that Arrow Lakes serves not only to regulate effectively for downstream benefits but helps to provide the flexibility of operation essential for generation of power at Mica Creek and downstream of Mica Creek in Canada, there is no doubt that the Arrow Lakes project was a valid choice. Both Mica Creek and Duncan Lake have never been challenged in any other proposed plan for the Columbia Basin including purely Canadian development programmes.

(4) Prices Paid for Power and Flood Control

The calculations set out in Chapter V are impressive evidence of the fact that Canada obtained prices for flood control and power that were acceptable from the United States point of view and fair and profitable for Canada. All Canadian construction is paid for with enough of a surplus left to cover more than half the generation installation costs at Mica Creek. Canada (and British Columbia) has obtained, under the proposed sales agreement, for the Canadian share of the downstream power benefits and for the flood control benefits, sums in cash, discounted, which, by 1973, if invested at 5%, will amount in total to about \$501 million. Canada has sold its downstream power benefits, therefore, for thirty years for a lump sum which in terms of mill-rates amounts to about 4.4 mills per kilowatt hour; and if to these were added the flood control payments, the rate becomes 5.3 mills per kilowatt hour. A mill-rate calculation is far less significant than the practical results: Canada has three valuable installations on the Columbia River at little or no cost and British Columbia will have at Mica Creek the cheapest at-site power generation to be found in North America.

(5) Will Flood Control Claims Interfere with Canadian Interests?

The Treaty and the Protocol have many built-in protections against arbitrary claims for flood control that would interfere with Canadian at-site generation programmes. For that part of the Canadian storage committed for flood control, Canada is well paid. For that part for which calls may be made and for which there is as yet no payment the cost to the United States as well as other provisions protect Canada from abuses, losses of power and any general economic loss; and, in any case, such calls are likely to be very infrequent.

(6) Consumptive Uses

The Treaty and the Protocol are explicit in their assurance of the right to divert for consumptive uses which, of course, includes irrigation. The precise application of this right will have to be determined from time to time in particular cases.

(7) Sale of Benefits After Thirty Years

While Canada's downstream power benefits will decline with time a continuing benefit will remain after the sale period and will be available for a further sale. But should Canada wish to have that continuing share of the downstream power benefits returned to Canada there is no obligation to sell it and Canada can have such power transmitted back to Canadian grid systems.

(8) The Sale is Consistent with Sound Export Policy

Although the sale is not an export of power, nevertheless, with all due safeguards to Canadian needs, surplus hydroelectric power should be sold to available United States markets with market considerations in mind not unlike those that determine the sale of non-renewable energy resources. Indeed, it would be unwise to wait too long to tap hydroelectric power sources because not only may a Canadian market not readily be available for much of this power, but the United States market may be a vanishing one as alternate power sources are developed from thermal and atomic energy plants. Canadian employment and Canadian exchange reserves will be affected substantially by hydroelectric power construction programmes and the subsequent sale of the energy to the United States. With proper safeguards there is no longer any need to treat exports of power other than as a realistic commercial policy.

(9) The Arrow Lakes and its People

While numbers of families will be affected by the additional flooding of the Arrow Lakes, public opinion in the area has shown an increasing understanding of the comparative benefits from the building of the High Arrow Dam. For although the provision of alternative housing for families is a serious matter, nevertheless, it cannot be doubted that all those affected will be treated with greatest consideration and fairness. Short-run dislocations are greatly offset by the new advantages in the region's economy. Full compensation is included in all cost estimates.

(10) The Contribution to International Law

The Treaty makes a useful and distinctive contribution to the developing programme of international river basin management and concepts. Here the international law of the Columbia River Treaty tries to reassemble under the umbrella of reciprocity and reason what i

nature may have been divided by boundaries, thereby providing protection for vital Canadian interests while making possible the cooperative management of the common Columbia River basin. The world leadership of Canada and the United States in the matter of boundary and trans-boundary river control and cooperation is further advanced by this agreement.

(11) Canadian Operational Independence is Maintained

The analysis in the foregoing chapters makes it clear that care has been taken to safeguard the independence of Canada throughout the Treaty and the Protocol. The Canadian management of storage on a day-to-day basis; the common agreement required for assured plans of operation; the independence of the entities in their normal contractual relations; the controls over flood call commitments; the supervisory role of the Permanent Engineering Board; the reference of disputes to the Board, as well as to the International Joint Commission and, if these fail, to international arbitration; the Kootenay diversion rights and the general consumptive rights--all of these are evidence of the discretion that remains vested in Canada as it engages in this cooperative programme. Canada's essential position under the Boundary Waters Treaty, 1909 has been preserved both in relation to the Columbia River Treaty once it terminates and, of course, in relation to all other Canadian-United States International rivers.

Great policies that involve long-term international programmes of an economic-engineering nature, for a whole region, that have important demographic consequences, and that raise significant legal and administrative questions, necessarily require the most serious attention of government in bringing these policies into operation. This Presentation has attempted to demonstrate that such care was taken in the research, thought and negotiations concerned with the fashioning of the best plans for Canada in the cooperative approach to the uses of the waters of the Columbia River basin. Many years of complex technical research, of difficult negotiations, of federal-provincial liaison activity, and of corresponding studies by the United States itself, now have led to the Treaty, the Protocol, the Terms of Sale and the Canada-British Columbia Agreements. This "package" of interlacing obligations is witness to a full generation of constructive effort. The Columbia River Treaty, and the program of development envisaged by it, is designed to serve the best interest of the people of the region, of Canada as a whole, and, indeed, of the common continental river basin.

APPENDIX

Appendix

This Appendix provides a commentary on each Article of the Treaty and each Item of the Protocol which together comprise the complex regime of the Columbia which is being submitted to Parliament for approval. Each provision is set out and followed by a brief comment on relevant legal, economic or engineering implications.

This Appendix also contains a description of and commentary on the proposed Terms of Sale and the two agreements between Canada and British Columbia relating to implementation of the Treaty in Canada.

The Treaty consists of twenty-one Articles, two Annexes and one Statistical Table. The various principles central to the Treaty and underlying the grand scheme are:

- (a) the jointly planned use of Canadian storage;
- (b) the obligation of the United States to make the best use of the improved streamflow for maximum power production;
- (c) equal sharing of the downstream power benefits so produced;
- (d) payment to Canada by the United States for flood protection;
- (e) permission for the United States to build a dam at Libby, Montana with special benefits for Canada;
- (f) diversion rights for Canada;
- (g) the establishment of separate Canadian and United States operating entities to manage the power and flood control programmes;
- (h) the creation of a joint Permanent Engineering Board;
- (i) the establishment of machinery for settlement of disputes;
- (j) limited liability for injuries payable only for Treaty breaches;
- (k) the preservation of Canada's rights of diversion under the Boundary Waters Treaty, 1909, once the Columbia Treaty regime is at an end; and
- (l) the establishment of principles for operating the Canadian storage and for measuring the downstream power benefits.

Of primary importance in the Treaty is the principle that freedom of planning and operation should prevail in each country within the limits necessary for a cooperative programme of development of a common river.

TREATY BETWEEN CANADA AND THE UNITED STATES OF
AMERICA RELATING TO COOPERATIVE DEVELOPMENT OF
THE WATER RESOURCES OF THE COLUMBIA RIVER BASIN

Signed at Washington 17 January 1961

The Governments of Canada and the United States of America:

Recognizing that their peoples have, for many generations, lived together and cooperated with one another in many aspects of their national enterprises for the greater wealth and happiness of their respective nations, and

Recognizing that the Columbia River basin, as a part of the territory of both countries, contains water resources that are capable of contributing greatly to the economic growth and strength and to the general welfare of the two nations, and

Being desirous of achieving the development of those resources in a manner that will make the largest contribution to the economic progress of both countries and to the welfare of their peoples of which those resources are capable, and

Recognizing that the greatest benefit to each country can be secured by cooperative measures for hydroelectric power generation and flood control, which will make possible other benefits as well,

Have agreed as follows:

Comment

The Preamble states certain general concepts of cooperation between Canada and the United States in the river basin and stresses two main principles: that resource development should be carried on to effect the largest contribution to the economic progress of both countries; and, that the greatest benefit to each country in hydroelectric power and flood control can be secured by cooperative measures.

ARTICLE I

Interpretation

- (1) In the Treaty, the expression
 - (a) "average critical period load factor" means the average of the monthly load factors during the critical stream flow period;

- (b) "base system" means the plants, works and facilities listed in the table in Annex B as enlarged from time to time by the installation of additional generating facilities, together with any other plants, works or facilities which may be constructed on the main stem of the Columbia River in the United States of America;
- (c) "Canadian storage" means the storage provided by Canada under Article II;
- (d) "critical stream flow period" means the period, beginning with the initial release of stored water from full reservoir conditions and ending with the reservoirs empty, when the water available from reservoir releases plus the natural stream flow is capable of producing the least amount of hydroelectric power in meeting system load requirements;
- (e) "consumptive use" means use of water for domestic, municipal, stock-water, irrigation, mining or industrial purposes but does not include use for the generation of hydroelectric power;
- (f) "dam" means a structure to impound water, including facilities for controlling the release of the impounded water;
- (g) "entity" means an entity designated by either Canada or the United States of America under Article XIV and includes its lawful successor;
- (h) "International Joint Commission" means the Commission established under Article VII of the Boundary Waters Treaty, 1909, or any body designated by Canada and the United States of America to succeed to the functions of the Commission under this Treaty;
- (i) "maintenance curtailment" means an interruption or curtailment which the entity responsible therefor considers necessary for purposes of repairs, replacements, installations of equipment, performance of other maintenance work, investigations and inspections;
- (j) "monthly load factor" means the ratio of the average load for a month to the integrated maximum load over one hour during that month;
- (k) "normal full pool elevation" means the elevation to which water is stored in a reservoir by deliberate impoundment every year, subject to the availability of sufficient flow.
- (l) "ratification date" means the day on which the instruments of ratification of the Treaty are exchanged;

(m) "storage" means the space in a reservoir which is usable for impounding water for flood control or for regulating stream flows for hydroelectric power generation;

(n) "Treaty" means this Treaty and its Annexes A and B;

(o) "useful life" means the time between the date of commencement of operation of a dam or facility and the date of its permanent retirement from service by reason of obsolescence or wear and tear which occurs notwithstanding good maintenance practices.

(2) The exercise of any power, or the performance of any duty, under the Treaty does not preclude a subsequent exercise or performance of the power or duty.

Comment

Fifteen expressions used in the Treaty and its Annexes are defined for convenience in drafting, greater certainty in interpretation and in order to avoid repetition.

The definition of "storage" ought to be borne in mind. It is related to empty space in a reservoir rather than a structure or a quantity of water.

The operating agencies of each government, which in Canada will be the British Columbia Hydro and Power Authority, are defined as "entities".

Paragraph (2) is a technical device used to avoid cumbersome language and to make it abundantly clear that whenever circumstances require some action to be taken pursuant to the Treaty it may be taken even though on some previous occasion the same action already was taken.

ARTICLE II

Development by Canada

(1) Canada shall provide in the Columbia River basin in Canada 15,500,000 acre-feet of storage usable for improving the flow of the Columbia River.

(2) In order to provide this storage, which in the Treaty is referred to as the Canadian storage, Canada shall construct dams:

(a) on the Columbia River near Mica Creek, British Columbia, with approximately 7,000,000 acre-feet of storage;

(b) near the outlet of Arrow Lakes, British Columbia, with approximately 7,100,000 acre-feet of storage; and

(c) on one or more tributaries of the Kootenay River in British Columbia downstream from the Canada-United States of America boundary with storage equivalent in effect to approximately 1,400,000 acre-feet of storage near Duncan Lake, British Columbia.

(3) Canada shall commence construction of the dams as soon as possible after the ratification date.

Comment

The basic plan of the Treaty is the storage of water in Canada at the three locations mentioned in the Article, i.e. Arrow Lakes, Duncan Lake and Mica Creek, during the highflow period of the summer months and its regulated release over the lowflow period of late fall, winter and early spring, so as to improve the flow of the Columbia River both in Canada and the United States for power generation and flood control purposes.

In the British Columbia-Canada agreements British Columbia has agreed to construct the three dams needed to provide this storage of water at its own expense and has specifically agreed that Canada is to have no financial obligation whatever with respect to the financing of construction.

The storage reservoir of the dam at the Mica Creek site will provide approximately 20,000,000 acre-feet of storage but only 7,000,000 acre-feet has been committed for operation under the Treaty for power. It is of advantage to Canada to retain complete freedom of operation of the remaining storage for at-site generation or generation at "run of the river" plants downstream in Canada, since the additional downstream power benefits that would result from a committal of the balance of the storage to operation under the Treaty would be very small.

Construction must be started as soon as possible after the Treaty is ratified. Article IV (6) sets out the construction time schedule, which is 9 years for Mica Creek and 5 years for both Arrow Lakes and Duncan Lake. The construction time is decreased by Section A.1(a) of the Terms of Sale for Duncan Lake from 5 to 3 1/2 years and for Arrow Lakes from 5 to 4 1/2 years, based on the assumption that the Treaty is ratified on October 1, 1964. The shortened construction period is practicable because of the amount of engineering already done and will result in a substantial increase in the amount of downstream power benefits accruing to Canada over the period of the Treaty.

Certain engineering criteria for the dams are set out in Annex A, Section 3. The operating entities will consult during the construction phase on designs and other related matters as provided for in Article XIV (2)(a).

ARTICLE III

Development by the United States of America Respecting Power

(1) The United States of America shall maintain and operate the hydroelectric facilities included in the base system and any additional hydroelectric facilities constructed on the main stem of the Columbia River in the United States of America in a manner that makes the most effective use of the improvement in stream flow resulting from operation of the Canadian storage for hydroelectric power generation in the United States of America power system.

(2) The obligation in paragraph (1) is discharged by reflecting in the determination of downstream power benefits to which Canada is entitled the assumption that the facilities referred to in paragraph (1) were maintained and operated in accordance therewith.

Comment

The United States agrees to make full use of the improved stream-flow brought about by the Canadian storages so that maximum benefits will be available to Canada. However, since the determination of Canada's share of the downstream power benefits is always calculated five years in advance, and is a theoretical amount based on historic streamflows rather than the actual amount of power produced at any given time, paragraph (2) requires that the calculation of the downstream power benefits must assume optimum use of the regulation provided by the Canadian storages. Therefore it is ensured that Canada will receive the greatest possible amount of power. If the United States operates its generating facilities in a way that is less than optimum there is no loss to Canada but only loss to the United States.

Details of the method of calculation are found in Articles V and VII and in Annex B.

ARTICLE IV

Operation by Canada

(1) For the purpose of increasing hydroelectric power generation in Canada and the United States of America, Canada shall operate the Canadian storage in accordance with Annex A and pursuant to hydroelectric operating plans made thereunder. For the purposes of this obligation an operating plan if it is either the first operating plan or if in the view of either Canada or the United States of America it departs substantially from the immediately preceding operating plan must, in order to be effective, be confirmed by an exchange of notes between Canada and the United States of America.

(2) For the purpose of flood control until the expiration of sixty years from the ratification date, Canada shall

(a) operate in accordance with Annex A and pursuant to flood control operating plans made thereunder

(i) 80,000 acre-feet of the Canadian storage described in Article II (2)(a),

(ii) 7,100,000 acre-feet of the Canadian storage described in Article II (2)(b),

(iii) 1,270,000 acre-feet of the Canadian storage described in Article II (2)(c),

provided that the Canadian entity may exchange flood control storage under subparagraph (ii) for flood control storage additional to that under subparagraph (i), at the location described in Article II (2)(a), if the entities agree that the exchange would provide the same effectiveness for control of floods on the Columbia River at The Dalles, Oregon;

(b) operate any additional storage in the Columbia River basin in Canada, when called upon by an entity designated by the United States of America for that purpose, within the limits of existing facilities and as the entity requires to meet flood control needs for the duration of the flood period for which the call is made.

(3) For the purpose of flood control after the expiration of sixty years from the ratification date, and for so long as the flows in the Columbia River in Canada continue to contribute to potential flood hazard in the United States of America, Canada shall, when called upon by an entity designated by the United States of America for that purpose, operate within the limits of existing facilities any storage in the Columbia River basin in Canada as the entity requires to meet flood control needs for the duration of the flood period for which the call is made.

(4) The return to Canada for hydroelectric operation and the compensation to Canada for flood control operation shall be as set out in Articles V and VI.

(5) Any water resource development, in addition to the Canadian storage, constructed in Canada after the ratification date shall not be operated in a way that adversely affects the stream flow control in the Columbia River within Canada so as to reduce the flood control and hydroelectric power benefits which the operation of the Canadian storage in accordance with the operating plans in force from time to time would otherwise produce.

(6) As soon as any Canadian storage becomes operable Canada shall commence operation thereof in accordance with this Article and in any event shall commence full operation of the Canadian storage described in Article II (2)(b) and Article II (2)(c) within five years of the ratification date and shall commence full operation of the balance of the Canadian storage within nine years of the ratification date.

Comment

This Article contains the basic agreement of Canada to operate the storages at Arrow Lakes and Duncan Lake and the committed portion of the storage at Mica Creek for power generation and for flood control downstream. This operation will be in accordance with Annex A of the Treaty and operating plans established from time to time by the entities.

Because of the importance of the operating plans for power generation, a certain degree of control has been retained by the Governments of Canada and United States. While the entities are free to formulate the plans with the assistance, in appropriate cases, of the Permanent Engineering Board, the plans must be submitted to the Governments for approval if they depart substantially from those prepared for the previous years.

Canada's obligation to operate for flood control is described by reference to two periods of time, the first being the initial 60 year of the Treaty and the second comprising the years thereafter.

For the first period the obligation is two-fold, i.e.

- (1) 8,450,000 acre-feet of the 15,500,000 acre-feet of storage committed for operation under the Treaty will be operated in accordance with flood control operating plans prepared in accordance with Annex A of the Treaty. It is for this operation that Canada receives the \$64,400,000 (U.S.) advance flood control payment in three portions as each dam commences operation. It should be noted that all but 80,000 acre-feet of the storage committed for operation under these operating plans is located at Arrow Lakes and Duncan Lake where its use for flood control will not interfere with power generation capabilities in Canada, whether they be installed at Mica Creek or downstream from Mica Creek.
- (2) In addition to the operation of that 8,450,000 acre-feet during this first period any other storage in the Columbia River basin within the limits of the facilities that exist from time to time will be operated in accordance with flood control calls made from time to time by the United States entity. The procedure for making these calls is now governed by Item 1 of the Protocol, and they are expected to be very infrequent, perhaps one every twenty years. The payment for this operation is set out in Article VI and consists of all hydro-electric power which Canada may have lost in complying with any call and, in addition, payment of \$1,875,000 (U.S.) for each of the first four flood control periods for which a call is made.

For the second period the obligation is to operate for flood control any storage in the Columbia River basin provided by facilities

existing from time to time as specific flood control calls are made by the United States entity. Canada is not required under this obligation to build, create or even maintain any particular project or dam, unless, of course, the Treaty is still in force and the maintenance of the dam is required for purposes connected with downstream power benefits. This obligation exists only if the flows of the Columbia River in Canada do, in fact, contribute to flood hazard in the United States. Consequently if Canadian development, including diversion, has removed this contribution Canada has no obligation. The payment for this operation is set out in Article VI and consists of reimbursement for the broadest possible description of loss, i.e., the economic loss to Canada.

The Protocol modifies this obligation to operate for flood control so that no greater degree of flood control protection can be called for than that permitted during the first period.

The Protocol, in addition to the modification described above, limits the frequency and extent of all calls made by the United States entity during both periods by establishing procedures for making calls and by providing an objective test of the need for flood control. The Protocol ensures that the Canadian operating entity and the Permanent Engineering Board will have a substantial role in determining whether or not the need for flood control is real.

Article IV also establishes the times at which operation of the Canadian storages are to commence (these have been superseded in part by the Terms of Sale) and requires that water resource developments in Canada, constructed after the ratification of the Treaty, shall not derogate from the benefits which would otherwise be possible under the operating plans agreed to under the Treaty. This requirement does not, of course, apply to developments specially authorized by the Treaty such as the diversions pursuant to Article XIII.

ARTICLE V

Entitlement to Downstream Power Benefits

- (1) Canada is entitled to one half the downstream power benefits determined under Article VII.
- (2) The United States of America shall deliver to Canada at a point on the Canada-United States of America boundary near Oliver, British Columbia, or at such other place as the entities may agree upon, the downstream power benefits to which Canada is entitled, less
 - (a) transmission loss,
 - (b) the portion of the entitlement disposed of under Article VIII (1), and,

(c) the energy component described in Article VIII (4).

(3) The entitlement of Canada to downstream power benefits begins for any portion of Canadian storage upon commencement of its operation in accordance with Annex A and pursuant to a hydroelectric operating plan made thereunder.

Comment

This Article establishes Canada's right to one-half of the increase in power generation at the United States plants due to the improved streamflow resulting from the operation of the Canadian storages. The increase in power generation, referred to in the Treaty as downstream power benefits, is defined generally in Article VII and in greater detail in Annex B.

Paragraph (2) provides for the return to Canada of its share of the downstream power benefits less

- (a) the amount lost in transmission to the Canadian border;
- (b) any amount sold in the United States;
- (c) any amount for which no market exists either in Canada, or, through sales agreements, in the United States.

Canada, by virtue of the Terms of Sale, no longer has the responsibility of finding markets for this power for at least 30 years since the responsibility for marketing it rests with the United States Purchaser.

Paragraph (3) ensures credit to Canada for any portion of its storage committed under the Treaty, as soon as such storage commences operation under an agreed operating plan.

Article VIII (3) provides safeguards so that no portion of Canada's share of the downstream power benefits can be used in the United States without the agreement of Canada.

ARTICLE VI

Payment for Flood Control

- (1) For the flood control provided by Canada under Article IV (2)(a) the United States of America shall pay Canada in United States funds:
 - (a) 1,200,000 dollars upon the commencement of operation of the storage referred to in subparagraph (a)(i) thereof,
 - (b) 52,100,000 dollars upon the commencement of operation of the storage referred to in subparagraph (a)(ii) thereof, and

(c) 11,100,000 dollars upon the commencement of operation of the storage referred to in subparagraph (a)(iii) thereof.

(2) If full operation of any storage is not commenced within the time specified in Article IV, the amount set forth in paragraph (1) of this Article with respect to that storage shall be reduced as follows:

(a) under paragraph (1)(a), 4,500 dollars for each month beyond the required time,

(b) under paragraph (1)(b), 192,100 dollars for each month beyond the required time, and

(c) under paragraph (1)(c), 40,800 dollars for each month beyond the required time.

(3) For the flood control provided by Canada under Article IV (2)(b) the United States of America shall pay Canada in United States funds in respect only of each of the first four flood periods for which a call is made 1,875,000 dollars and shall deliver to Canada in respect of each and every call made, electric power equal to the hydroelectric power lost by Canada as a result of operating the storage to meet the flood control need for which the call was made, delivery to be made when the loss of hydroelectric power occurs.

(4) For each flood period for which flood control is provided by Canada under Article IV (3) the United States of America shall pay Canada in United States funds:

(a) the operating cost incurred by Canada in providing the flood control, and

(b) compensation for the economic loss to Canada arising directly from Canada foregoing alternative uses of the storage used to provide the flood control.

(5) Canada may elect to receive in electric power, the whole or any portion of the compensation under paragraph (4) (b) representing loss of hydroelectric power to Canada.

Comment

For the 8,450,000 acre-feet of storage committed to operation for flood control for the first period (see Article IV) Canada receives a total payment, in advance, of \$64,400,000 (U.S.). The portion of the payment associated with each project will be made when that project commences operation and, since it is based upon agreed construction schedules, Article VI (2) provides for reductions in the payments for each month that operation of the projects is late.

If during this first period Canada is called upon to provide flood control in addition to the 8,450,000 acre-feet, the United States will pay Canada for each of the first four flood control periods for

which a call is made \$1,875,000 (U.S.), and for each and every call made the United States will also give Canada an amount of power equal to the power lost by Canada as a result of operating the Canadian storages to meet the flood control need.

For the flood control calls made during the second period Canada will be reimbursed for all operating costs incurred and further will be compensated for all economic loss to Canada arising directly from Canada having foregone other uses of the storage. Canada has the option of receiving money or power for the portion of the total economic loss consisting of lost power.

ARTICLE VII

Determination of Downstream Power Benefits

- (1) The downstream power benefits shall be the difference in the hydroelectric power capable of being generated in the United States of America with and without the use of Canadian storage, determined in advance, and is referred to in the Treaty as the downstream power benefits.
- (2) For the purpose of determining the downstream power benefits:
 - (a) the principles and procedures set out in Annex B shall be used and followed;
 - (b) the Canadian storage shall be considered as next added to 13,000,000 acre-feet of the usable storage listed in Column 4 of the table in Annex B;
 - (c) the hydroelectric facilities included in the base system shall be considered as being operated to make the most effective use for hydroelectric power generation of the improvement in stream flow resulting from operation of the Canadian storage.
- (3) The downstream power benefits to which Canada is entitled shall be delivered as follows:
 - (a) dependable hydroelectric capacity as scheduled by the Canadian entity, and
 - (b) average annual usable hydroelectric energy in equal amounts each month, or in accordance with a modification agreed upon under paragraph (4).
- (4) Modification of the obligation in paragraph (3) (b) may be agreed upon by the entities.

Comment

Downstream power benefits are defined as the difference in

hydroelectric power capable of being generated in the United States with and without the use of Canadian storages. This benefit is determined five years in advance, on the basis of the calculations called for in Annex B for the year in question. The determination in advance is required so that the entities may have sufficient foreknowledge of their commitments and benefits in order to enable them to proceed with utility planning in an orderly fashion.

Paragraph (2) (b) specifies that in computing Canada's downstream power benefits the Canadian storage will be considered as next added to the existing 13,000,000 acre-feet of usable storage in the United States base system as listed in the tabulation following Annex B of the Treaty. The amount of downstream power benefits available is a limited quantity which is dependent upon such factors as the size of load, the amount of thermal installation and the effectiveness of the storage. First added storage is more effective towards increasing generation than is subsequently added storage. It receives, therefore, a larger share of credit or downstream power benefit per unit of storage added. The first added position guaranteed to Canada under paragraph (2)(b) does not permit derogation from this favourable position by any subsequently added United States storage whenever built.

Under paragraph (2)(c) it is assumed in determining the downstream power benefits that the United States base system is operated so as to make the most effective use, for hydroelectric power generation, of the improvement in streamflow resulting from the operation of Canadian storages. If such best use is not in fact carried out by the United States the result cannot affect Canada's entitlement which was computed five years earlier and which, under paragraph 6 of Annex B, cannot be adjusted retroactively. This principle is also reflected in Article III (2).

Paragraphs (3) and (4) provide for delivery by the United States to Canada of its downstream power benefits in the manner scheduled by the Canadian entity for capacity benefits, and in equal amounts each month for energy benefits. The manner of delivery of the energy benefit may be varied if agreed to by both entities. Canada's sale of its entitlement as provided for in the Terms of Sale cancels the need for return of its capacity and energy benefits during the 30-year sale period.

ARTICLE VIII

Disposal of Entitlement to Downstream Power Benefits

- (1) With the authorization of Canada and the United States of America evidenced by exchange of notes, portions of the downstream power benefits to which Canada is entitled may be disposed of within the

United States of America. The respective general conditions and limits within which the entities may arrange initial disposals shall be set out in an exchange of notes to be made as soon as possible after the ratification date.

(2) The entities may arrange and carry out exchanges of dependable hydroelectric capacity and average annual usable hydroelectric energy to which Canada is entitled for average annual usable hydroelectric energy and dependable hydroelectric capacity respectively.

(3) Energy to which Canada is entitled may not be used in the United States of America except in accordance with paragraphs (1) and (2).

(4) The bypassing at dams on the main stem of the Columbia River in the United States of America of an amount of water which could produce usable energy equal to the energy component of the downstream power benefits to which Canada is entitled but not delivered to Canada under Article V or disposed of in accordance with paragraphs (1) and (2) at the time the energy component was not so delivered or disposed of, is conclusive evidence that such energy component was not used in the United States of America and that the entitlement of Canada to such energy component is satisfied.

Comment

Paragraph (1) permits sale in the United States of portions of Canada's downstream power benefits if such sales are authorized by an exchange of notes between the two Governments. This Article envisages that the arrangements for the initial disposals would be made only after ratification of the Treaty. It should be noted that Item 3 of the Protocol now provides that the exchange of notes confirming such arrangements shall take place simultaneously with ratification. The general conditions and limits of the sale planned at present are outlined in the "Attachment Relating to Terms of Sale".

The entities are also permitted to enter into agreements for the exchange of the two components constituting downstream power benefits, i.e., average annual energy and dependable capacity. Such exchanges would permit the downstream power benefits to be put in a form more usable by the Canadian entity.

Paragraphs (3) and (4), which protect Canada against the unauthorized use of any portion of Canada's downstream power benefits and which also protect the United States against Canada selling surplus power below market prices in the United States are, in view of the Terms of Sale, no longer of significance during the 30-year period of the sale.

ARTICLE IX

Variation of Entitlement to Downstream Power Benefits

(1) If the United States of America considers with respect to any hydro-electric power project planned on the main stem of the Columbia River between Priest Rapids Dam and McNary Dam that the increase in entitlement of Canada to downstream power benefits resulting from the operation of the project would produce a result which would not justify the United States of America in incurring the costs of construction and operation of the project, Canada and the United States of America at the request of the United States of America shall consider modification of the increase in entitlement.

(2) An agreement reached for the purposes of this Article shall be evidenced by an exchange of notes.

Comment

There is one undeveloped power site on the main stem of the Columbia River in the United States, the economics of which are marginal. The United States is permitted, in certain circumstances, to request a modification of the equal sharing of downstream power benefits with regard to this project. It should be noted that this project (Ben Franklin) has not been included in the estimates of Canada's downstream power benefits and therefore the terms of Sale do not include the downstream power benefits to which Canada would be entitled as a result of development of this project.

If this project is built, Canada can, under Article VIII, enter into a separate sale agreement for the resulting benefits or alternatively require the return of these benefits for domestic loads.

ARTICLE X

East-West Standby Transmission

(1) The United States of America shall provide in accordance with good engineering practice east-west standby transmission service adequate to safeguard the transmission from Oliver, British Columbia, to Vancouver, British Columbia, of the downstream power benefits to which Canada is entitled and to improve system stability of the east-west circuits in British Columbia.

(2) In consideration of the standby transmission service, Canada shall pay the United States of America in Canadian funds the equivalent of 1.50 United States dollars a year for each kilowatt of dependable hydro-electric capacity included in the downstream power benefits to which Canada is entitled.

(3) When a mutually satisfactory electrical coordination arrangement is entered into between the entities and confirmed by exchange of notes between Canada and the United States of America the obligation of Canada in paragraph (2) ceases.

Comment

The practical significance of this Article has been substantially modified as a result of the proposed sale of Canada's entitlement to downstream power benefits. The Protocol, Item 4, relieves Canada of the standby charge and the United States of the obligation to provide the service during any sale period. Consequently the proposed sale makes unnecessary, at least for the 30-year sale period any standby service by the United States, as all Canada's downstream power benefits will be sold in the United States. The Protocol also removes the responsibilities of each country in this regard for any portion of Canada's downstream power benefits returned to Canada at any time during the Treaty period at any point other than Oliver, British Columbia.

Article V (2) of the Treaty required the United States, unless otherwise agreed by the entities, to deliver Canada's downstream power benefits to a point on the Canada-United States boundary near Oliver, British Columbia. Any power so delivered would then be transmitted by the Canadian entity to British Columbia loads with the major transmission lines running between Oliver and Vancouver. In the event of a failure of these transmission lines, Article X required the United States to provide standby east-west transmission service in the United States so that the delivery of the power to loads in the Vancouver area is guaranteed. The charge to Canada for the standby service would be \$1.50 (U.S.) per year for each kilowatt of Canada's capacity credit. This annual charge would terminate as soon as a mutually satisfactory electrical coordination agreement is reached between the two entities.

ARTICLE XI

Use of Improved Stream Flow

(1) Improvement in stream flow in one country brought about by operation of storage constructed under the Treaty in the other country shall not be used directly or indirectly for hydroelectric power purposes except:

(a) in the case of use within the United States of America with the prior approval of the United States entity, and

(b) in the case of use within Canada with the prior approval of the authority in Canada having jurisdiction.

(2) The approval required by this Article shall not be given except upon such conditions, consistent with the Treaty, as the entity or authority considers appropriate.

Comment

This provision ensures that the use of the improved streamflow by anyone to produce more hydroelectric power shall take place only under conditions approved by the appropriate authority.

Insofar as Canada is concerned the British Columbia Water Rights Act requires governmental approval of any use of streamflow for power purposes.

ARTICLE XII

Kootenai River Development

(1) The United States of America for a period of five years from the ratification date, has the option to commence construction of a dam on the Kootenai River near Libby, Montana, to provide storage to meet flood control and other purposes in the United States of America. The storage reservoir of the dam shall not raise the level of the Kootenai River at the Canada-United States of America boundary above an elevation consistent with a normal full pool elevation at the dam of 2,459 feet, United States Coast and Geodetic Survey datum, 1929 General Adjustment, 1947 International Supplemental Adjustment. .

(2) All benefits which occur in either country from the construction and operation of the storage accrue to the country in which the benefits occur.

(3) The United States of America shall exercise its option by written notice to Canada and shall submit with the notice a schedule of construction which shall include provision for commencement of construction, whether by way of railroad relocation work or otherwise, within five years of the ratification date.

(4) If the United States of America exercises its option, Canada in consideration of the benefits accruing to it under paragraph (2) shall prepare and make available for flooding the land in Canada necessary for the storage reservoir of the dam within a period consistent with the construction schedule.

(5) If a variation in the operation of the storage is considered by Canada to be of advantage to it the United States of America shall, upon request, consult with Canada. If the United States of America determines that the variation would not be to its disadvantage it shall vary the operation accordingly.

(6) The operation of the storage by the United States of America shall

be consistent with any order of approval which may be in force from time to time relating to the levels of Kootenay Lake made by the International Joint Commission under the Boundary Waters Treaty, 1909.

(7) Any obligation of Canada under this Article ceases if the United States of America, having exercised the option, does not commence construction of the dam in accordance with the construction schedule.

(8) If the United States of America exercises the option it shall commence full operation of the storage within seven years of the date fixed in the construction schedule for commencement of construction.

(9) If Canada considers that any portion of the land referred to in paragraph (4) is no longer needed for the purpose of this Article Canada and the United States of America, at the request of Canada, shall consider modification of the obligation of Canada in paragraph (4).

(10) If the Treaty is terminated before the end of the useful life of the dam Canada shall for the remainder of the useful life of the dam continue to make available for the storage reservoir of the dam any portion of the land made available under paragraph (4) that is not required by Canada for purposes of diversion of the Kootenay River under Article XIII.

Comment

The United States is given a five-year option to commence construction of the Libby project on the Kootenai River in the United States. The option is to be exercised by the United States providing Canada with written notice and a schedule of construction. Full operation of the project must commence within seven years of the date fixed for commencement of construction in the schedule of construction, which, in turn, must be within five years of the ratification date. Article XIII (5) gives Canada full rights under this Treaty to divert all Kootenay River water in Canada above the border other than the lesser of 1,000 cubic feet per second or the natural flow of the river if the United States does not observe the various time limitations.

All hydroelectric power and flood control benefits of the Libby project will be retained, in whole, by the country in which they occur. Thus Canada will not be required to share with the United States the flood control and substantial hydroelectric power benefits produced downstream in Canada, amounting to approximately 200,000 kilowatt years per annum.

In view of these benefits and in order to ensure that Canadian ownership and control of the land and water surface in Canada is not lost Canada will provide the land required in Canada for the reservoir (approximately 13,700 acres) for the useful life of the dam unless the Governments agree the land is no longer required.

for the project or if Canada should require a portion of the land to make the Kootenay diversion it is entitled to make under Article XIII (4).

Item 5 of the Protocol reaffirms the benefits to Canada from the Libby Dam and reinforces the undertaking by the United States in paragraph (5) of this Article to cooperate in the operation of the Libby project for the benefit of Canadian plants downstream.

Any operation of Libby must not, through the discharge of excessive flows, violate International Joint Commission orders of approval of the levels of Kootenay Lake. With this curtailment of extremes in operation of Libby, the downstream generating plants in Canada will be able to make a more effective use of the improvement in streamflow.

ARTICLE XIII

Diversions

- (1) Except as provided in this Article neither Canada nor the United States of America shall, without the consent of the other evidenced by an exchange of notes, divert for any use, other than a consumptive use, any water from its natural channel in a way that alters the flow of any water as it crosses the Canada-United States of America boundary within the Columbia River basin.
- (2) Canada has the right, after the expiration of twenty years from the ratification date, to divert not more than 1,500,000 acre-feet of water a year from the Kootenay River in the vicinity of Canal Flats, British Columbia, to the headwaters of the Columbia River, provided that the diversion does not reduce the flow of the Kootenay River immediately downstream from the point of diversion below the lesser of 200 cubic feet per second or the natural flow.
- (3) Canada has the right, exercisable at any time during the period commencing sixty years after the ratification date and expiring one hundred years after the ratification date, to divert to the headwaters of the Columbia River any water which, in its natural channel, would flow in the Kootenay River across the Canada-United States of America boundary, provided that the diversion does not reduce the flow of the Kootenay River at the Canada-United States of America boundary near Newgate, British Columbia, below the lesser of 2,500 cubic feet per second or the natural flow.
- (4) During the last twenty years of the period within which Canada may exercise the right to divert described in paragraph (3) the limitation on diversion is the lesser of 1,000 cubic feet per second or the natural flow.

- (5) Canada has the right:
- (a) if the United States of America does not exercise the option in Article XII (1), or
 - (b) if it is determined that the United States of America, having exercised the option, did not commence construction of the dam referred to in Article XII in accordance therewith or that the United States of America is in breach of the obligation in that Article to commence full operation of the storage,
- to divert to the headwaters of the Columbia River any water which, in its natural channel, would flow in the Kootenay River across the Canada-United States of America boundary, provided that the diversion does not reduce the flow of the Kootenay River at the Canada-United States of America boundary near Newgate, British Columbia, below the lesser of 1,000 cubic feet per second or the natural flow.
- (6) If a variation in the use of the water diverted under paragraph (2) is considered by the United States of America to be of advantage to it Canada shall, upon request, consult with the United States of America. If Canada determines that the variation would not be to its disadvantage it shall vary the use accordingly.

Comment

As was stated in the opening comment of this Appendix, fundamental to the Treaty is the provision of an improvement in the streamflow of the Columbia River in order to improve the power generation capabilities of its waters. It follows then that any substantial diminution of the quantity of water in the river would strike at the root of this principle and would substantially reduce the benefits that would normally result from the Treaty arrangement. It was, therefore, reasonable and necessary to provide, as this Article does, that neither country could interfere with the natural system of water courses in the basin without the consent of the other. Having committed the waters of the basin to a joint use for power and flood control it would be manifestly unfair for one country to undertake development entirely inconsistent with that committal. However, because of the importance to life of the consumptive aspect of water resources it was agreed that the prohibition against diversion would not extend to a diversion for a consumptive use. Because of the way in which this exception was drafted some doubt arose as to whether the intention was sufficiently well expressed and accordingly Item 6(1) was included in the Protocol.

In addition to the right to divert for consumptive uses certain diversions from the Kootenay River to the Columbia River are expressly authorized. These valuable rights, which, in effect, allow Canada to carry out the whole Kootenay diversion in stages are of particular importance since they will result in substantial power generation in Canada at Mica Creek and run of the river

plants when such plants exist and generation is installed. These provisions compare favourably from a Canadian point of view with the position of diversions under the Boundary Waters Treaty, 1909 or under customary International Law.

The three stages or steps leading to the final maximum Kootenay River power diversion authorized by this Article are as follows:

- FIRST: after twenty years from the ratification date, approximately 20 per cent of the Kootenay River flow (Canal Flats diversion scheme),
- SECOND: between the 60th and 100th years of the Treaty period, approximately 75 per cent of the Kootenay flow (Bull River-Luxor diversion scheme),
- THIRD: between the 80th and the 100th year of the Treaty period, approximately 90 per cent of the Kootenay flow. (Dorr-Bull River-Luxor diversion scheme)

In addition, if the United States does not build Libby, or if it violates any of the various time requirements set out in Article XII, Canada may forthwith carry out the maximum Kootenay diversion, which is the third stage described above.

The timing of the three stages of diversion is consistent with economic river basin planning. If the United States exercises its option to build Libby, it clearly must be assured of continued flows of water of sufficient scale to enable it to secure an adequate return for the investment it has made. Accordingly, Canada has agreed not to divert at all for 20 years. A delay of this period is not likely to be of any important consequence to Canada as generators will probably not be installed on the Columbia in Canada to use diverted water for at least 10 to 15 years after ratification. While 20 per cent of the water can be diverted after 20 years, an adequate flow must be left until a reasonable amortization period for the Libby investment has expired. This has been set at 60 years. The timing of the second stage is consistent with planning for further run of the river plants in Canada. The third stage, which is of questionable advantage, has nonetheless been retained as a protection against changing circumstances.

In connection with the meaning of "consumptive use" it should be noted that a diversion carried out for a true consumptive use, such as irrigation, does not cease to be an "authorized diversion" merely because the water while en route produces hydroelectric power, either incidentally or even as an integral part of the diversion scheme. The essential question will be: what is the real and genuine purpose of the diversion? If it is a consumptive purpose, it is provided for.

Just as the United States has given a comparable undertaking in connection with the Libby Dam (Article XII) if and when constructed, Canada has agreed that if the operation of diversion works can accommodate United States' needs without interfering with Canadian needs then the operation will be modified.

The Protocol, in Item 6 (2), clears up an ambiguity in this Article by expressly stating that once a diversion is properly instituted under this Article it may be carried on forever.

ARTICLE XIV

Arrangements for Implementation

- (1) Canada and the United States of America shall each, as soon as possible after the ratification date, designate entities and when so designated the entities are empowered and charged with the duty to formulate and carry out the operating arrangements necessary to implement the Treaty. Either Canada or the United States of America may designate one or more entities. If more than one is designated the powers and duties conferred upon the entities by the Treaty shall be allocated among them in the designation.
- (2) In addition to the powers and duties dealt with specifically elsewhere in the Treaty the powers and duties of the entities include:
 - (a) coordination of plans and exchange of information relating to facilities to be used in producing and obtaining the benefits contemplated by the Treaty,
 - (b) calculation of and arrangements for delivery of hydroelectric power to which Canada is entitled for providing flood control,
 - (c) calculation of the amounts payable to the United States of America for standby transmission services,
 - (d) consultation on requests for variations made pursuant to Articles XII (5) and XIII (6),
 - (e) the establishment and operation of a hydrometeorological system as required by Annex A,
 - (f) assisting and cooperating with the Permanent Engineering Board in the discharge of its functions,
 - (g) periodic calculation of accounts,
 - (h) preparation of the hydroelectric operating plans and the flood control operating plans for the Canadian storage together with determination of the downstream power benefits to which Canada is entitled,

- (i) preparation of proposals to implement Article VIII and carrying out any disposal authorized or exchange provided for therein,
 - (j) making appropriate arrangements for delivery to Canada of the downstream power benefits to which Canada is entitled including such matters as load factors for delivery, times and points of delivery, and calculation of transmission loss,
 - (k) preparation and implementation of detailed operating plans that may produce results more advantageous to both countries than those that would arise from operation under the plans referred to in Annexes A and B.
- (3) The entities are authorized to make maintenance curtailments. Except in case of emergency, the entity responsible for a maintenance curtailment shall give notice to the corresponding Canadian or United States entity of the curtailment, including the reason therefor and the probable duration thereof and shall both schedule the curtailment with a view to minimizing its impact and exercise due diligence to resume full operation.
- (4) Canada and the United States of America may by an exchange of notes empower or charge the entities with any other matter coming within the scope of the Treaty.

Comment

The actual day-to-day operation of the Canadian storages and the generating facilities in the United States will be carried on by "operating entities" designated by each Government. Paragraphs (2) and (3) set out their powers and duties. The British Columbia Hydro and Power Authority will be the operating entity in Canada. On the United States side the expectation is that a new organization, consisting of representatives of the Federal power distributing system (Bonneville Power Administration) and the Army Corps of Engineers will be established and will be the "operating entity" in that country.

The primary joint activity of the entities will be the preparation of the annual operating plans and the calculation of the downstream power benefits. If the entities are unable to agree, provision is made in the next Article for the settlement of their differences.

It is important to notice the equality of status of the Canadian operating entity in the preparation and implementation of the operating plans, in the calculation of downstream power benefits and generally with respect to control of the river and associated power producing facilities. Thus there is no question of dependency of one entity on the whims of the other. The Canadian entity is left free to manage its own day-to-day operations in the way most suited to Canadian needs.

It might be thought that it would follow from the proposed sale that the Canadian entity, for at least the 30-year period, had no interest in the annual calculation of benefits and related matters; however such is not the case. The Terms of Sale in section B.4 expressly prevent any impairment of the equality and freedom described above. Notwithstanding sale, the Canadian entity continues to have a real and important interest in the joint activities contemplated by this Article.

ARTICLE XV

Permanent Engineering Board

- (1) A Permanent Engineering Board is established consisting of four members, two to be appointed by Canada and two by the United States of America. The initial appointments shall be made within three months of the ratification date.
- (2) The Permanent Engineering Board shall:
 - (a) assemble records of the flows of the Columbia River and the Kootenay River at the Canada-United States of America boundary;
 - (b) report to Canada and the United States of America whenever there is substantial deviation from the hydroelectric and flood control operating plans and if appropriate include in the report recommendations for remedial action and compensatory adjustments;
 - (c) assist in reconciling differences concerning technical or operational matters that may arise between the entities;
 - (d) make periodic inspections and require reports as necessary from the entities with a view to ensuring that the objectives of the Treaty are being met;
 - (e) make reports to Canada and the United States of America at least once a year of the results being achieved under the Treaty and make special reports concerning any matter which it considers should be brought to their attention;
 - (f) investigate and report with respect to any other matter coming within the scope of the Treaty at the request of either Canada or the United States of America.
- (3) Reports of the Permanent Engineering Board made in the course of the performance of its functions under this Article shall be prima facie evidence of the facts therein contained and shall be accepted unless rebutted by other evidence.
- (4) The Permanent Engineering Board shall comply with directions, relating to its administration and procedures, agreed upon by Canada and the United States of America as evidenced by an exchange of notes.

A Permanent Engineering Board consisting of four members, two appointed by Canada and two by the United States, is established. Section 6 (2) of the Main Agreement between Canada and British Columbia provides that British Columbia may nominate one of the two Canadian members. The principal functions of the Board are to assemble and keep records of the flows of the Columbia and Kootenay Rivers; to review and report to the two Governments on the activities of the operating entities and to help the entities resolve any differences that may arise between them in the operation of the storages and calculation of the downstream power benefits.

Appropriate legal status is given to reports of the Board by paragraph (3).

Detailed administrative arrangements concerning the establishment and operation of the Board will be agreed upon from time to time by the two Governments in exchanges of notes.

ARTICLE XVI

Settlement of Differences

- (1) Differences arising under the Treaty which Canada and the United States of America cannot resolve may be referred by either to the International Joint Commission for decision.
- (2) If the International Joint Commission does not render a decision within three months of the referral or within such other period as may be agreed upon by Canada and the United States of America, either may then submit the difference to arbitration by written notice to the other.
- (3) Arbitration shall be by a tribunal composed of a member appointed by Canada, a member appointed by the United States of America and a member appointed jointly by Canada and the United States of America who shall be Chairman. If within six weeks of the delivery of a notice under paragraph (2) either Canada or the United States of America has failed to appoint its member, or they are unable to agree upon the member who is to be Chairman, either Canada or the United States of America may request the President of the International Court of Justice to appoint the member or members. The decision of a majority of the members of an arbitration tribunal shall be the decision of the tribunal.
- (4) Canada and the United States of America shall accept as definitive and binding and shall carry out any decision of the International Joint Commission or an arbitration tribunal.

- (5) Provision for the administrative support of a tribunal and for remuneration and expenses of its members shall be as agreed in an exchange of notes between Canada and the United States of America.
- (6) Canada and the United States of America may agree by an exchange of notes on alternative procedures for settling differences arising under the Treaty, including reference of any difference to the International Court of Justice for decision.

Comment

A referral by either Government to the International Joint Commission is the general procedure established for the settlement of differences. However, if that Commission delays beyond three months in arriving at a decision either Government may then refer the matter to a special arbitration tribunal.

Paragraph (6) enables the two Governments to agree on other methods of settling differences, including special references to the International Court of Justice.

ARTICLE XVII

Restoration of Pre-Treaty Legal Status

- (1) Nothing in this Treaty and no action taken or foregone pursuant to its provisions shall be deemed, after its termination or expiration, to have abrogated or modified any of the rights or obligations of Canada or the United States of America under then existing international law, with respect to the uses of the water resources of the Columbia River basin.
- (2) Upon termination of this Treaty, the Boundary Waters Treaty, 1909 shall, if it has not been terminated, apply to the Columbia River basin, except insofar as the provisions of that Treaty may be inconsistent with any provision of this Treaty which continues in effect.
- (3) Upon termination of this Treaty, if the Boundary Waters Treaty, 1909, has been terminated in accordance with Article XIV of that Treaty the provisions of Article II of that Treaty shall continue to apply to the waters of the Columbia River basin.
- (4) If upon the termination of this Treaty Article II of the Boundary Waters Treaty, 1909, continues in force by virtue of paragraph (3) of this Article the effect of Article II of that Treaty with respect to the Columbia River basin may be terminated by either Canada or the United States of America delivering to the other one year's written notice to that effect; provided however that the notice may be given only after the termination of this Treaty.

(5) If, prior to the termination of this Treaty, Canada undertakes works usable for and relating to a diversion of water from the Columbia River basin, other than works authorized by or undertaken for the purpose of exercising a right under Article XIII or any other provision of this Treaty, paragraph (3) of this Article shall cease to apply one year after delivery by either Canada or the United States of America to the other of written notice to that effect.

Comment

This Article makes clear in an affirmative way that once the special legal regime relating to the Columbia River basin as established by this Treaty comes to an end as a result of its termination, the legal regime prevailing prior to the coming into force of this Treaty, including the Boundary Waters Treaty, 1909, will again apply to the basin.

Canada's rights of diversion under Article II of the Boundary Waters Treaty, 1909 in respect of the Columbia River basin are preserved intact notwithstanding that United States may have, while the Columbia River Treaty was in force, terminated the Boundary Waters Treaty, 1909 by giving the one year's notice required thereunder. It should be noted that in order to be consistent with the Boundary Waters Treaty, 1909 the special or preserved rights of diversion are also terminable on one year's notice.

Paragraph 5 relates to construction work being undertaken by Canada in connection with a diversion for power purposes out of the basin, such as a Columbia-Fraser diversion, while the Columbia River Treaty is in force. The effect of the paragraph is that if Canada actually starts construction of any physical works for the purpose of making such a diversion during the period of the Columbia River Treaty Canada runs the risk of being prevented from carrying through with the diversion since the United States is then entitled to terminate the right of diversion by one year's notice. (In other words the United States is entitled to protect itself to the same degree as it can now do by termination of the Boundary Waters Treaty, 1909 on a year's notice.) In such event Canada's rights of diversion would be governed by customary international law.

This Article should be read in conjunction with Item 12 of the Protocol which underlines the principle that the special legal regime of the Columbia does not establish any general principle or precedent applicable to waters other than those of the Columbia River basin.

ARTICLE XVIII

Liability for Damage

- (1) Canada and the United States of America shall be liable to the other and shall make appropriate compensation to the other in respect of any act, failure to act, omission or delay amounting to a breach of the Treaty or of any of its provisions other than an act, failure to act, omission or delay occurring by reason of war, strike, major calamity, act of God, uncontrollable force or maintenance curtailment.
- (2) Except as provided in paragraph (1) neither Canada nor the United States of America shall be liable to the other or to any person in respect of any injury, damage or loss occurring in the territory of the other caused by any act, failure to act, omission or delay under the Treaty whether the injury, damage or loss results from negligence or otherwise.
- (3) Canada and the United States of America, each to the extent possible within its territory, shall exercise due diligence to remove the cause of and to mitigate the effect of any injury, damage or loss occurring in the territory of the other as a result of any act, failure to act, omission or delay under the Treaty.
- (4) Failure to commence operation as required under Articles IV and XII is not a breach of the Treaty and does not result in the loss of rights under the Treaty if the failure results from a delay that is not wilful or reasonably avoidable.
- (5) The compensation payable under paragraph (1):
 - (a) in respect of a breach by Canada of the obligation to commence full operation of a storage, shall be forfeiture of entitlement to downstream power benefits resulting from the operation of that storage, after operation commences, for a period equal to the period between the day of commencement of operation and the day when commencement should have occurred;
 - (b) in respect of any other breach by either Canada or the United States of America, causing loss of power benefits, shall not exceed the actual loss in revenue from the sale of hydroelectric power.

Comment

Each country is liable to pay compensation to the other for losses of hydroelectric power resulting from breaches of the Treaty that were not brought about by war, strike, major calamity, act of God uncontrollable force or maintenance curtailment. Liability of each country to the other for other breaches of the Treaty, negligence and related conduct is accepted with damages payable as set out in paragraphs (5) (a) and (5) (b) which is limited, for the most part, to the power actually lost.

Paragraph (2) represents a major effort to eliminate damage claims. No person in the United States of America, as distinct from the Government, may make a claim against Canada on account of any damage, no matter how caused. Each country must look after the matter of compensating its own residents for any damage they may suffer.

Paragraph (3) requires each country to take every step in its country to minimize all losses and to alleviate as far as possible any damage or injury occurring or about to occur in the other country.

Paragraph (4) excuses Canada and United States from strict compliance with the construction time schedules for the three Canadian storages and Libby Dam, if the delays involved were not wilful or reasonably avoidable. However, because of the prepayment flood control payments to Canada are reduced under Article VI (2) until the service is actually provided.

Because of the fact of the sale and the prepayment by the purchaser of Canada's entitlement to downstream power benefits it was necessary to modify somewhat the liability of Canada under this Article and reference should be had to section B.3 of the Terms of Sale.

ARTICLE XIX

Period of Treaty

- (1) The Treaty shall come into force on the ratification date.
- (2) Either Canada or the United States of America may terminate the Treaty other than Article XIII (except paragraph (1) thereof), Article XVII and this Article at any time after the Treaty has been in force for sixty years if it has delivered at least ten years written notice to the other of its intention to terminate the Treaty.
- (3) If the Treaty is terminated before the end of the useful life of a dam built under Article XII then, notwithstanding termination, Article XII remains in force until the end of the useful life of the dam.
- (4) If the Treaty is terminated before the end of the useful life of the facilities providing the storage described in Article IV (3) and if the conditions described therein exist then, notwithstanding termination, Articles IV (3) and VI (4) and (5) remain in force until either the end of the useful life of those facilities or until those conditions cease to exist, whichever is the first to occur.

Comment

The Treaty may remain in force indefinitely. However, either Canada or the United States may, by giving the appropriate notice, bring the Treaty to an end once it has been in force for 60 years.

Some provisions of the Treaty are not terminable:

- (a) Certain of the rights of diversion granted to Canada by Article XIII.
- (b) The protection given to Canada under Article XVII with respect to the restoration of the pre-Treaty legal status.
- (c) If the Treaty is terminated before the end of the useful life of the dams at Arrow Lakes, Duncan Lake and Mica Creek then Canada's obligation to provide certain of the flood control described in Article IV remains in force until those dams are retired from use. However if Canadian development, particularly diversions, has removed the flood hazard then this obligation ceases, as provided in Article IV (3).
- (d) If the Treaty is terminated before Libby Dam has reached the end of its useful life, which means before the date on which it is permanently retired from service by reason of obsolescence or wear and tear (see definition in Article I (1)(o)), then the permission given by Canada to the United States to operate Libby continues to bind Canada to keep the land available for the reservoir until Libby's useful life is ended. However, if after the termination of the Treaty Canada requires any of the Libby reservoir area in Canada for use in diverting the Kootenay River, it may do so notwithstanding Libby's continued existence (see Article XII (10)).

ARTICLE XX

Ratification

The instruments of ratification of the Treaty shall be exchanged by Canada and the United States of America at Ottawa, Canada.

Comment

The exchange of the instruments of ratification is the act which brings the Treaty into full force between the two countries and until that time the Treaty has no binding effect.

ARTICLE XXI

Registration with the United Nations

In conformity with Article 102 of the Charter of the United Nations, the Treaty shall be registered by Canada with the Secretariat of the United Nations.

Comment

Canada as a signatory to the Charter of the United Nations is obligated to register with the United Nations copies of all Treaties into which it enters.

ANNEX A.

PRINCIPLES OF OPERATION

General

1. The Canadian storage provided under Article II will be operated in accordance with the procedures described herein.
2. A hydrometeorological system, including snow courses, precipitation stations and stream flow gauges will be established and operated, as mutually agreed by the entities and in consultation with the Permanent Engineering Board, for use in establishing data for detailed programming of flood control and power operations. Hydrometeorological information will be made available to the entities in both countries for immediate and continuing use in flood control and power operations.
3. Sufficient discharge capacity at each dam to afford the desired regulation for power and flood control will be provided through outlet works and turbine installations as mutually agreed by the entities. The discharge capacity provided for flood control operations will be large enough to pass inflow plus sufficient storage releases during the evacuation period to provide the storage space required. The discharge capacity will be evaluated on the basis of full use of any conduits provided for that purpose plus one half the hydraulic capacity of the turbine installation at the time of commencement of the operation of storage under the Treaty.
4. The outflows will be in accordance with storage reservation diagrams and associated criteria established for flood control purposes and with reservoir-balance relationships established for power operations. Unless otherwise agreed by the entities the average weekly outflows shall not be less than 3,000 cubic feet per second at the dam described in Article II (2)(a), not less than 5,000 cubic feet per second at the dam described in Article II (2) (b) and not less than 1,000 cubic feet per second at the dam described in Article II (2)(c). These minimum average weekly releases may be scheduled by the Canadian entity as required for power or other purposes.

Comment

This Annex sets out the basic operating procedures for 8,450,000 acre-feet of Canadian storage operated for flood control under Article IV (2)(a) and for the 15,500,000 acre-feet (inclusive of the 8,450,000) of storage generally provided by Canada under Article II.

The entities are to agree on the establishment of a hydrometeorological network which will provide the basic information required for both flood control and power operations. The entities are also to agree on the discharge capacities needed at the Canadian dams to provide the releases of water called for by the operating plans. The minimum releases which can be called for at the Canadian storages are specified in section 4.

Flood Control

5. For flood control operation, the United States entity will submit flood control operating plans which may consist of or include flood control storage reservation diagrams and associated criteria for each of the dams. The Canadian entity will operate in accordance with these diagrams or any variation which the entities agree will not derogate from the desired aim of the flood control plan. The use of these diagrams will be based on data obtained in accordance with paragraph 2. The diagrams will consist of relationships specifying the flood control storage reservations required at indicated times of the year for volumes of forecast runoff. After consultation with the Canadian entity the United States entity may from time to time as conditions warrant adjust these storage reservation diagrams within the general limitations of flood control operation. Evacuation of the storages listed hereunder will be guided by the flood control storage reservation diagrams and refill will be as requested by the United States entity after the consultation with the Canadian entity. The general limitations of flood control operation are as follows:

- (a) The Dam described in Article II (2) (a) - The reservoir will be evacuated to provide up to 80,000 acre-feet of storage, if required, for flood control use by May 1 of each year.
- (b) The Dam described in Article II (2) (b) - The reservoir will be evacuated to provide up to 7,100,000 acre-feet of storage, if required, for flood control use by May 1 of each year.
- (c) The Dam described in Article II (2) (c) - The reservoir will be evacuated to provide up to 700,000 acre-feet of storage, if required, for flood control use by April 1 of each year and up to 1,270,000 acre-feet of storage, if required, for flood control use by May 1 of each year.
- (d) The Canadian entity may exchange flood control storage provided in the reservoir referred to in subparagraph (b) for additional storage provided in the reservoir referred to in subparagraph (a) if the entities agree that the exchange would provide the same effectiveness for control of floods on the Columbia River at The Dalles, Oregon.

Comment

It should be noted that the flood control storage operated under this Annex is limited to 8,450,000 acre-feet and is to be operated

for the first 60 years only. Canada receives an advance payment of \$64,400,000 (U.S.) for this operation. The United States can call for this storage on an annual basis by submitting operating plans which, under Item 2 of the Protocol, will have the desired aim of minimizing flood damage in both the United States and Canada. The flood control plans will be based on data from the agreed hydrometeorological system and will specify storage space which must be available at indicated times of the year. The operating plans cannot require more than:

- (a) 80,000 acre-feet of storage to be available at Mica Creek by May 1 of each year (storage greatly in excess of this will be evacuated annually for power needs),
- (b) 7,100,000 acre-feet at Arrow Lakes by May 1 of each year, and
- (c) 700,000 acre-feet at Duncan Lake by April 1 and up to 1,270,000 acre-feet by May 1 of each year.

Canada's power output is adequately protected against conflict with operation for flood control needs because:

- (a) The Annex permits Canada to exchange flood control storage between the Arrow Lakes and Mica Creek projects, since each of these reservoirs to some extent controls the same flows.
- (b) As flood control operations could conceivably clash with at-site power operations, Canada has concentrated this flood control storage at Arrow Lakes and Duncan Lake, where little or no at-site generation will be installed.
- (c) Canada's downstream power benefits cannot be reduced by flood control operations under this Annex since the benefits are calculated five years in advance and there can be no retroactive adjustment (Annex B, paragraph 6), and
- (d) Any other flood control operation called for by the United States requires compensation to Canada for any power lost while operating for flood control—Article IV (3) and (4).

Power

6. For power generating purposes the 15,500,000 acre-feet of Canadian storage will be operated in accordance with operating plans designed to achieve optimum power generation downstream in the United States of America until such time as power generating facilities are installed at the site referred to in paragraph 5(a) or at sites in Canada downstream therefrom.

7. After at-site power is developed at the site referred to in paragraph 5(a) or power generating facilities are placed in operation in Canada downstream from that site, the storage operation will be changed so as to be operated in accordance with operating plans designed to achieve optimum power generation at-site in Canada and downstream in Canada and the United States of America, including consideration of any agreed electrical coordination between the two countries. Any reduction in the downstream power benefits in the United States of America resulting from that change in operation of the Canadian storage shall not exceed in any one year the reduction in downstream power benefits in the United States of America which would result from reducing by 500,000 acre-feet the Canadian storage operated to achieve optimum power generation in the United States of America and shall not exceed at any time during the period of the Treaty the reduction in downstream power benefits in the United States of America which would result from similarly reducing the Canadian storage by 3,000,000 acre-feet.

8. After at-site power is developed at the site referred to in paragraph 5(a) or power generating facilities are placed in operation in Canada downstream from that site, storage may be operated to achieve optimum generation of power in the United States of America alone if mutually agreed by the entities in which event the United States of America shall supply power to Canada to offset any reduction in Canadian generation which would be created as a result of such operation as compared to operation to achieve optimum power generation at-site in Canada and downstream in Canada and the United States of America. Similarly, the storage may be operated to achieve optimum generation of power in Canada alone if mutually agreed by the entities in which event Canada shall supply power to the United States of America to offset any reduction in United States generation which would be created as a result of such operation as compared to operation to achieve optimum power generation at-site in Canada and downstream in Canada and the United States of America.

9. Before the first storage becomes operative, the entities will agree on operating plans and the resulting downstream power benefits for each year until the total of 15,500,000 acre-feet of storage in Canada becomes operative. In addition, commencing five years before the total of 15,500,000 acre-feet of storage is expected to become operative, the entities will agree annually on operating plans and the resulting downstream power benefits for the sixth succeeding year of operation thereafter. This procedure will continue during the life of the Treaty, providing to both the entities, in advance, an assured plan of operation of the Canadian storage and a determination of the resulting downstream power benefits for the next succeeding five years.

Comment

Annex A requires that the 15,500,000 acre-feet of Canadian storage be operated to produce downstream power benefits in the United States until such time as generators are installed either at

Mica Creek or downstream therefrom in Canada. Once generators are installed this Annex requires the plan of operation to be changed so as to produce optimum power generation in both the Canadian and the United States systems. The combined systems will include power generation at plants such as those on the Pend d'Oreille River in Canada and others which are not downstream of the Canadian storages.

Operation of the Canadian storages for optimum system benefits may reduce the downstream benefits which would otherwise be produced in the United States. Therefore the Annex requires that the total reduction brought about in this manner should not exceed the reduction which would result if the Canadian storage was reduced by 3,000,000 acre-feet. Similarly, the annual reductions leading up to the permissible total reduction cannot exceed the effect of removing 500,000 acre-feet annually from the Canadian storage commitment. Because of the prepayment to Canada provided for in the Terms of Sale it was agreed in Section A.4 to compensate the Purchaser for any reduction in the Canadian half of the benefits.

The Annex permits deviations from the basic requirements of the operating plans if both entities are agreeable.

Section 9 requires that the entities agree annually on the operating plan for power production which will be followed in the sixth succeeding year. By requiring the operating plans and the calculation of benefits to be done five years in advance at all times, both the entities know their commitments and benefits sufficiently well enough in advance to enable them to proceed with their utility planning in an orderly fashion.

Finally, it should be noted that Item 7(1) of the Protocol limits Canada's commitment to operate Treaty storage to the amount of storage required to produce the downstream power benefits being shared equally by Canada. There is, therefore, a definite relationship between Canada's Treaty commitment and Canada's Treaty benefits. The Protocol also gives Canada complete discretion as to the project or projects from which storage releases required by the agreed operating plan will be made, as well as discretion as to the day-to-day operation which will provide the monthly storage release called for by the agreed operating plan made five years previously. This flexibility, plus the flexibility provided for by the location and capacity of the Arrow Lakes dam, adequately protect Canada's generating potential.

ANNEX B

DETERMINATION OF DOWNSTREAM POWER BENEFITS

1. The downstream power benefits in the United States of America attributable to operation in accordance with Annex A of the storage provided by Canada under Article II will be determined in advance and will be the estimated increase in dependable hydroelectric capacity in kilowatts for agreed critical stream flow periods and the increase in average annual usable hydroelectric energy output in kilowatt hours on the basis of an agreed period of stream flow record.
2. The dependable hydroelectric capacity to be credited to Canadian storage will be the difference between the average rates of generation in kilowatts during the appropriate critical stream flow periods for the United States of America base system, consisting of the projects listed in the table, with and without the addition of the Canadian storage, divided by the estimated average critical period load factor. The capacity credit shall not exceed the difference between the capability of the base system without Canadian storage and the maximum feasible capability of the base system with Canadian storage, to supply firm load during the critical stream flow periods.
3. The increase in the average annual usable hydroelectric energy will be determined by first computing the difference between the available hydroelectric energy at the United States base system with and without Canadian storage. The entities will then agree upon the part of available energy which is usable with and without Canadian storage, and the difference thus agreed will be the increase in average annual usable hydroelectric energy. Determination of the part of the energy which is usable will include consideration of existing and scheduled transmission facilities and the existence of markets capable of using the energy on a contractual basis similar to the then existing contracts. The part of the available energy which is considered usable shall be the sum of:
 - (a) the firm energy,
 - (b) the energy which can be used for thermal power displacement in the Pacific Northwest Area as defined in Paragraph 7, and
 - (c) the amount of the remaining portion of the available energy which is agreed by the entities to be usable and which shall not exceed in any event 40 per cent of that remainder.

Comment

In this Annex the downstream power benefits are defined and the manner in which they will be calculated is described.

The downstream power benefits which the United States shares with Canada are as recommended by "Power Principle No. 4" of the International Joint Commission "Principles" of December 1959. The benefits consist of two components, the increase in average annual usable energy and the increase in dependable hydroelectric capacity.

The capacity credit is to be determined by first calculating the amount of energy which can be produced by the United States base system projects (defined by the table in the Treaty) during periods of critical streamflow. The calculation is carried out twice, once before and again after the addition of the Canadian storages. The increase in the energy potential produced by that storage is thereby established. Because this increase in energy is based upon critical low streamflow conditions it is for all intents and purposes energy which the system can produce at all times, i.e. it is firm (or dependable) energy. The capacity credit or peaking credit of the Canadian storage is then derived by dividing the increase in firm (or dependable) energy by the average load factor of the power system during the critical streamflow period. Since the load factor is the relationship between average energy generation and peak energy generation, a measure of the Canadian contribution to the dependable peaking capacity of the system is thereby defined. For example:

$$\text{Average load factor} = \frac{\text{average energy demand}}{\text{peak energy demand}} = \frac{1}{1.43} = .7$$

$$\text{Average firm energy produced by the storage} = 100 \text{ kilowatt years}$$

$$\text{Dependable capacity credit granted} = \frac{100}{.7} = 143 \text{ kilowatts}$$

Both the Treaty and the Protocol place a limit on the amount of capacity credit which the Canadian storage can be granted. They state that at no time shall the capacity credit exceed the actual usable peaking capacity benefit to the United States system from Canadian storage. Therefore, as the United States system becomes more capable of using its peaking potential through the use of its own thermal-electric and base system hydroelectric resources, the capacity credit of the Canadian storage will decrease. If in time all the installed capacity at the base system projects in the United States can be fully utilized without the help of the Canadian storage then the capacity credit to that storage will disappear. In this event Item 7(1) of the Protocol provides that Canada's commitment to operate for downstream capacity benefits will also disappear.

The increase in annual energy credited to Canadian storage is the difference between the energy which could be generated by the United States base system projects and used in the United States before and after the addition of the Canadian storage. The determination of the energy credit is based on a study of generation

over an extended period of streamflow conditions including both high and low streamflow conditions rather than based, as is the case in the determination of the capacity credit, upon critically low streamflow conditions. Certain definitions are placed on what is to be considered "usable" and Canada is protected by these definitions against the considerable loss in energy credit which would otherwise result from large transfers of energy between the Pacific Northwest Area and the Southwest Area of the United States.

4. An initial determination of the estimated downstream power benefits in the United States of America from Canadian storage added to the United States base system will be made before any of the Canadian storage becomes operative. This determination will include estimates of the downstream power benefits for each year until the total of 15,500,000 acre-feet of Canadian storage becomes operative.

5. Commencing five years before the total of 15,500,000 acre-feet of storage is expected to become operative, estimates of downstream power benefits will be calculated annually for the sixth succeeding year on the basis of the assured plan of operation for that year.

6. The critical stream flow period and the details of the assured plan of operation will be agreed upon by the entities at each determination. Unless otherwise agreed upon by the entities, the determination of the downstream power benefits shall be based upon stream flows for the twenty year period beginning with July 1928 as contained in the report entitled Modified Flows at Selected Power Sites - Columbia River Basin, dated June 1957. No retroactive adjustment in downstream power benefits will be made at any time during the period of the Treaty. No reduction in the downstream power benefits credited to Canadian storage will be made as a result of the load estimate in the United States of America, for the year for which the determination is made, being less than the load estimate for the preceding year.

Comment

Annex B repeats the requirement in Annex A that the assured plans of operation for downstream power benefits will be made five years in advance and also requires that the benefits themselves be calculated at that time. It is expressly stated that no retroactive adjustment of the benefits can be made nor can the benefits to Canada be reduced during the load build-up period as a result of a load estimate for the year under study being less than the load estimate for the previous year. The Annex requires that the determination of the benefits be based on a 20-year period of streamflow record unless otherwise agreed. However this requirement has now been superseded by Item 8 of the Protocol which calls for the determination to be made on the basis of a 30-year period of record. The entities are authorized to agree on further change in the period of record to be used after the proposed sales agreement terminates.

7. In computing the increase in dependable hydroelectric capacity and the increase in average annual hydroelectric energy, the procedure shall be in accordance with the three steps described below and shall encompass the loads of the Pacific Northwest Area. The Pacific Northwest Area for purposes of these determinations shall be Oregon, Washington, Idaho and Montana west of the Continental Divide but shall exclude areas served on the ratification date by the California Oregon Power Company and Utah Power and Light Company.

Step I

The system for the period covered by the estimate will consist of the Canadian storage, the United States base system, any thermal installation operated in coordination with the base system, and additional hydroelectric projects which will provide storage releases usable by the base system or which will use storage releases that are usable by the base system. The installations included in this system will be those required, with allowance for adequate reserves, to meet the forecast power load to be served by this system in the United States of America, including the estimated flow of power at points of inter-connection with adjacent areas, subject to paragraph 3, plus the portion of the entitlement of Canada that is expected to be used in Canada. The capability of this system to supply this load will be determined on the basis that the system will be operated in accordance with the established operating procedures of each of the projects involved.

Step II

A determination of the energy capability will be made using the same thermal installation as in Step I, the United States base system with the same installed capacity as in Step I and Canadian storage.

Step III

A similar determination of the energy capability will be made using the same thermal installation as in Step I and the United States base system with the same installed capacity as in Step I.

8. The downstream power benefits to be credited to Canadian storage will be the differences between the determinations in Step II and Step III in dependable hydroelectric capacity and in average annual usable hydroelectric energy, made in accordance with paragraphs 2 and 3.

Comment

The Annex sets out three "Steps" or series of system studies from which Canada's downstream power benefits will be determined. Step I will be a study of the actual power system which is expected to be in existence six years in the future and will

include all United States facilities as well as the Canadian storage. This system is studied to establish the thermal-electric units which will be required at that time as well as the hydro-electric installation required at the "base system" projects in the United States. The Step I study is not used directly in the calculation of Canada's downstream power benefits but is used for the purpose of establishing generating installations required and preparing the assured plans of operation.

Having established the thermal-electric and the base system hydroelectric installations, the determination proceeds to Steps II and III which are basically "with and without" studies. They call for a determination of the capability of a system consisting of the thermal-electric units and hydroelectric installations at the base system projects established by Step I both before and after the addition of the Canadian storage. The increased power potential resulting from the addition of the Canadian storage is the downstream power benefit credited to the storage. By restricting the United States hydroelectric projects considered in the Steps II and III studies to those projects now existing and tabulated in Annex B, (referred to as the base system) Canada does not have its downstream power benefits diminished by additional United States projects such as Libby.

Annex B - Base System

Project	Stream	Stream Miles Above Mouth	Usable Storage Acre-feet	Normal Elevation		Gross Head Feet	Initial Installation		Ultimate Installation (Estimated)	
				Pool Feet	Tailwater Feet		No. of Units	Plant Kilowatts (Nameplate)	No. of Units	Plant Kilowatts (Nameplate)
Hungry Horse	S. Fk. Flathead	5	3,161,000 ⁴	3,560	3,083	477	4	285,000	4	285,000
Kerr	Flathead	73	1,219,000	2,893	2,706	187	3	168,000	3	168,000
Thompson Falls	Clark Fork	209	Pondage	2,396	2,336	60	6	30,000	8	65,000
Nixon Rapids	Clark Fork	170	Pondage	2,331	2,179	152	4	336,000	5	420,000
Cabinet Gorge	Clark Fork	150	Pondage	2,175	2,078	97	4	200,000	6	300,000
Albeni Falls	Pend Oreille	90	1,155,000	2,062	2,034	28	3	42,600	3	42,600
Box Canyon	Pend Oreille	34	Pondage	2,031	1,989	42	4	60,000	4	60,000
Grand Coulee	Columbia	597	5,232,000 ⁴	1,290 ^{3,4}	947	343	18	1,944,000	34	3,672,000
Chief Joseph	Columbia	546	Pondage	946	775	171	16	1,024,000	27	1,728,000
Wells ¹	Columbia	516	Pondage	775	707	68	6	400,000	10	666,700
Rocky Reach	Columbia	474	Pondage	707	614	93	7	711,550	11	1,118,150
Rock Island	Columbia	453	Pondage	608 ³	570	38	10	212,100	10	212,100
Wanapum	Columbia	415	Pondage	570	486	84	10	831,250	16	1,330,000
Priest Rapids	Columbia	397	Pondage	486	406	80	10	788,500	16	1,261,600
Brownlee	Snake	285	974,000	2,077	1,805	272	4	360,400	6	540,600
Oxbow	Snake	273	Pondage	1,805	1,683	122	4	190,000	5	237,500
Ice Harbor	Snake	10	Pondage	440	343	97	3	270,000	6	540,000
McNary	Columbia	292	Pondage	340	265	75	14	980,000	20	1,400,000
John Day	Columbia	216	Pondage	265	161	104	8	1,080,000	20	2,700,000
The Dalles	Columbia	192	Pondage	160	74	86	16 ²	1,119,000	24 ²	1,743,000
Bonneville	Columbia	145	Pondage	74	15	59	10	518,400	16	890,400
Kootenay Lake	Kootenay	16	673,000	1,745	-	-	-	-	-	-
Chelan	Chelan	0	676,000	1,100	707	393	2	48,000	4	96,000
Coeur d'Alene L.	Coeur d'Alene	102	223,000	2,128	-	-	-	-	-	-
TOTAL 24 PROJECTS			13,313,000 ⁴			3,128	166	11,598,800	258	19,476,650

1. The Wells project is not presently under construction; when this project or any other project on the main stem of the Columbia River is completed, they will be integral components of the base system.

2. Includes two 13,500 kilowatt units for fish attraction water.

3. With flashboards.

4. In determining the base system capabilities with and without Canadian storage the Hungry Horse reservoir storage will be limited to 3,008,000 acre-feet (normal full pool elevation of 3,560 feet) and the Grand Coulee project will not include the effect of adding flashboards, limiting the storage to 5,072,000 acre-feet (normal full pool elevation of 1,288 feet). The total usable storage of the base system as so adjusted will be 13,000,000 acre-feet.

The Protocol

Following the signing of the Treaty on January 17, 1961, there was the widest opportunity for public discussion concerning the merits of the Treaty. Out of that valuable national concern came proposals for improvements in the Treaty. Generally speaking these improvements deal with new procedures governing operation for flood control; reaffirmation and clarification of Canada's right to make diversions for consumptive and other uses; confirmation of Canadian control over the detailed operations of Canadian Treaty storage for power purposes; and increase in Canada's downstream power benefits through acceptance of more advantageous principles of calculation and a clear statement to the effect that the Treaty does not establish a precedent governing other boundary and trans-boundary rivers.

ANNEX TO EXCHANGE OF NOTES DATED 22 JANUARY 1964
BETWEEN THE GOVERNMENTS OF CANADA AND THE
UNITED STATES REGARDING THE COLUMBIA RIVER TREATY

PROTOCOL

1. If the United States entity should call upon Canada to operate storage in the Columbia River Basin to meet flood control needs of the United States of America pursuant to Article IV(2) (b) or Article IV(3) of the Treaty, such call shall be made only to the extent necessary to meet forecast flood control needs in the territory of the United States of America that cannot adequately be met by flood control facilities in the United States of America in accordance with the following conditions:

- (1) Unless otherwise agreed by the Permanent Engineering Board, the need to use Canadian flood control facilities under Article IV(2) (b) of the Treaty shall be considered to have arisen only in the case of potential floods which could result in a peak discharge in excess of 600,000 cubic feet per second at The Dalles, Oregon, assuming the use of all related storage in the United States of America existing and under construction in January 1961, storage provided by any dam constructed pursuant to Article XII of the Treaty and the Canadian storage described in Article IV(2) (a) of the Treaty.
- (2) The United States entity will call upon Canada to operate storage under Article IV(3) of the Treaty only to control potential floods in the United States of America that could not be adequately controlled by all the related storage facilities in the United States of America existing at the expiration of 60 years from the ratification date but in no event shall Canada be required to provide any greater degree of flood control under Article IV(3) of the Treaty than that provided for under Article IV(2) of the Treaty.
- (3) A call shall be made only if the Canadian entity has been consulted whether the need for flood control is, or is likely to be, such that it cannot be met by the use of flood control facilities in the United States of America in accordance with subparagraphs (1) or (2) of this paragraph. Within ten days of receipt of a call, the Canadian entity will communicate its acceptance, or its rejection or proposals for modification of the call, together with supporting considerations. When the communication indicates rejection or modification of the call the United States entity will review the situation in the light

of the communication and subsequent developments and will then withdraw or modify the call if practicable. In the absence of agreement on the call or its terms the United States entity will submit the matter to the Permanent Engineering Board provided for under Article XV of the Treaty for assistance as contemplated in Article XV(2) (c) of the Treaty. The entities will be guided by any instructions issued by the Permanent Engineering Board. If the Permanent Engineering Board does not issue instructions within ten days of receipt of a submission the United States entity may renew the call for any part or all of the storage covered in the original call and the Canadian entity shall forthwith honor the request.

Comment

As explained in the comment on Articles IV and VI Canada has undertaken to provide flood protection in two ways. Firstly, in return for a payment of \$64,400,000 (U.S.), 8,450,000 acre-feet of the storage at the three Canadian dams will be operated in accordance with flood control operating plans during the initial 60-year period of the Treaty. Secondly, other Canadian storage will be operated as and when required in accordance with flood control calls made by the United States entity. For calls made during the initial 60-year period Canada receives a total of \$7,500,000 (U.S.) in four equal payments for the first four flood control periods, as well as an amount of power equal to all power lost by Canada in operating to comply with each and every call. For calls made after the initial 60-year period Canada receives compensation for all economic loss to Canada, which includes but is not limited to loss of hydroelectric power. During both periods all calls can only relate to facilities in fact being maintained by Canada at the time the call is made. Canada is not required to construct or maintain any facilities for the purpose of these flood control calls. Moreover, if Canadian development, particularly diversions, has removed the flood hazard Canada has no obligation in this respect.

It is with these calls for flood control operation that this Item of the Protocol is concerned. The federal government was concerned with several aspects of these calls. Firstly, neither the Canadian operating entity, Canada, nor the Permanent Engineering Board had any say in determining whether the need for the flood control call was a real need. Secondly, there was no requirement that the United States should exhaust its own existing facilities before calling on Canada. Thirdly, no limit was placed on the degree of flood control that could be required from Canada, and lastly, that calls could become so frequent that they would interfere with the effective operation of Canadian facilities for Canadian needs.

It will be seen then that Item I of the Protocol improves to a substantial degree Canada's position respecting these calls for

additional flood protection. Of first importance is the establishment of an objective test to determine whether flood control is actually needed and the recognition of the right of Canada to have a substantial voice in determining the extent and frequency of these calls. It should be pointed out that notwithstanding this improvement of Canada's position the amounts of compensation payable to Canada for the various types of flood control have not been altered.

The scheme of Item I requires that the United States entity making the additional flood control call must submit its request to the Canadian operating entity, which is given the right of rejecting or suggesting modifications to the call. If agreement between the entities cannot be reached, the call is then submitted for examination to the Permanent Engineering Board, a joint Canada-United States body whose decision is binding on both entities. However, so that the possibility of loss of life will be avoided and damage to property be minimized, Canada has agreed that the "call" will be honoured in the event that the Board does not agree on the need for the call.

Item I is quite specific as to when the United States can call for additional flood control. During the initial 60-years of the Treaty period, calls for additional storage can only be made if the flood peak expected at The Dalles, Oregon, would exceed 600,000 cubic feet per second (the level of flood control at present desired by the United States) after the use of all storage facilities which existed or were under construction in the United States portion of the basin in January 1961, as well as the storage at the Libby Dam and the 8,450,000 acre-feet of basic flood control storage provided by Canada. Thus only a flood of major proportions would require the use of additional Canadian storage during this period.

After this initial 60-year period, calls upon Canada for flood control operation can be made only if the flood peak at The Dalles would exceed 600,000 cubic feet per second after the use of all storage facilities which existed in the basin in the United States at the expiration of this 60-year period. Therefore Canada is effectively protected against an undue number of calls.

2. In preparing the flood control operating plans in accordance with paragraph 5 of Annex A of the Treaty, and in making calls to operate for flood control pursuant to Articles IV(2) (b) and IV(3) of the Treaty, every effort will be made to minimize flood damage both in Canada and the United States of America.

Comment

While substantial flood control protection to Canada is automatic when the Treaty projects are in operation, the specific inclusion

of Canadian needs in the determination of flood control plans was not provided for in the Treaty and is an important addition to that document.

3. The exchange of notes provided for in Article VIII(1) of the Treaty shall take place contemporaneously with the exchange of the Instruments of Ratification of the Treaty provided for in Article XX of the Treaty.

Comment

The sale of Canada's entitlement to downstream power benefits for 30 years as now planned, and the absence of immediate markets for the power in Canada, makes it essential that assurance of purchase is made either before, or contemporaneously with, ratification of the Treaty by Canada. The Protocol requires a simultaneous exchange of ratifications and acceptance and conclusion of the initial sale agreement. This advance sale makes it possible to determine ahead of time how the proceeds of sale will relate to estimated cost. Also the difficulties in finding a market for Canada's downstream benefits, for at least 30 years, is no longer a concern of Canada.

4. (1) During the period and to the extent that the sale of Canada's entitlement to downstream power benefits within the United States of America as a result of an exchange of notes pursuant to Article VIII(1) of the Treaty relieves the United States of America of its obligation to provide east-west standby transmission service as called for by Article X(1) of the Treaty, Canada is not required to make payment for the east-west standby transmission service with regard to Canada's entitlement to downstream power benefits sold in the United States of America.

(2) The United States of America is not entitled to any payments of the character set out in subparagraph (1) of this paragraph in respect of that portion of Canada's entitlement to downstream power benefits delivered by the United States of America to Canada at any point on the Canada-United States of America boundary other than at a point near Oliver, British Columbia, and the United States of America is not required to provide the east-west standby transmission service referred to in subparagraph (1) of this paragraph in respect of the portion of Canada's entitlement to downstream power benefits which is so delivered.

Comment

The standby transmission charge payable by Canada under the Treaty could have amounted to as much as \$2,000,000 a year. The Protocol eliminates this charge during the period of sale in the United States of Canada's downstream power benefits.

5. Inasmuch as control of historic streamflows of the Kootenay River by the dam provided for in Article XII(1) of the Treaty would result in more than 200,000 kilowatt years per annum of energy benefit downstream in Canada, as well as important flood control protection to Canada, and the operation of that dam is therefore of concern to Canada, the entities shall, pursuant to Article XIV(2) (a) of the Treaty, cooperate on a continuing basis to coordinate the operation of that dam with the operation of hydroelectric plants on the Kootenay River and elsewhere in Canada in accordance with the provisions of Article XI(5) and Article XII(6) of the Treaty.

Comment

This Item acknowledges that Canada will benefit from the operation of Libby and makes more specific the obligation of the United States to coordinate the operation of that dam with the operation of Kootenay River plants in Canada where that would not be against the interests of the United States.

6. (1) Canada and the United States of America are in agreement that Article XIII(1) of the Treaty provides to each of them a right to divert water for a consumptive use.

(2) Any diversion of water from the Kootenay River when once instituted under the provisions of Article XIII of the Treaty is not subject to any limitation as to time.

Comment

Although it was intended that any diversion from the Kootenay to the Columbia under the Treaty could continue in perpetuity once it was properly instituted, doubt was expressed that the wording of the Treaty made it clear. This Item assures that once a diversion of Kootenay waters is undertaken by Canada it may be continued forever.

Doubt was also expressed whether Article XIII(1) of the Treaty, in a positive enough way, gave Canada the right to make diversions of Columbia waters for consumptive uses such as irrigation, domestic and municipal needs. Argument will be prevented on this point by this Item's re-affirmation of Canada's right to make such diversions.

In connection with the definition of "consumptive use" in the Treaty it should be pointed out that the fact that water being diverted for a consumptive use such as irrigation also produces hydroelectric power en route either as an integral or incidental part of the total operation does not result in that diversion ceasing to be a diversion for a consumptive use.

7. As contemplated by Article IV(1) of the Treaty, Canada shall operate the Canadian storage in accordance with Annex A and hydro-

electric operating plans made thereunder. Also, as contemplated by Annexes A and B of the Treaty and Article XIV(2) (k) of the Treaty, these operating plans before they are agreed to by the entities will be conditioned as follows:

- (1) As the downstream power benefits credited to Canadian storage decrease with time, the storage required to be operated by Canada pursuant to paragraphs 6 and 9 of Annex A of the Treaty, will be that required to produce those benefits.
- (2) The hydroelectric operating plans, which will be based on Step I of the studies referred to in paragraph 7 of Annex B of the Treaty, will provide a reservoir-balance relationship for each month for the whole of the Canadian storage committed rather than a separate relationship for each of the three Canadian storages. Subject to compliance with any detailed operating plan agreed to by the entities as permitted by Article XIV(2) (k) of the Treaty, the manner of operation which will achieve the specific storage or release of storage called for in a hydroelectric operating plan consistent with optimum storage use will be at the discretion of the Canadian entity.
- (3) Optimum power generation at-site in Canada and downstream in Canada and the United States of America referred to in paragraph 7 of Annex A of the Treaty will include power generation at-site and downstream in Canada of the Canadian storages referred to in Article II(2) of the Treaty, power generation in Canada which is coordinated therewith, downstream power benefits from the Canadian storage which are produced in the United States of America and measured under the terms of Annex B of the Treaty, power generation in the Pacific Northwest Area of the United States of America and power generation coordinated therewith.

Comment

There was some concern that the Treaty gave the United States control over the operation of Canadian storage for power production in Canada. It is difficult to see where the Treaty supports this concern, since fundamental to the Treaty are plans of operation which must not only be agreed to jointly, but which will take into account the advantages now possible within Canada. However, in case the Annexes of the Treaty left doubt as to the exact procedure to be followed in formulating and carrying out the operating plans, this Item removes the doubt by placing the following conditions on the plans of operation:

- (a) The plans will only commit the amount of Canadian storage necessary to produce the downstream benefits actually credited to that storage;

- (b) The plans will be based on the same series of studies from which the downstream power benefits are calculated (five years in advance, see Annex B, para. 7);
- (c) Canada is given full discretion to decide from which projects storage releases will be made;
- (d) Canada is given full discretion as to the detailed operation which will give the monthly storage quantities required by the agreed operating plan drawn up five years in advance.

8. The determination of downstream power benefits pursuant to Annex B of the Treaty, in respect of each year until the expiration of thirty years from the commencement of full operation in accordance with Article IV of the Treaty of that portion of the Canadian storage described in Article II of the Treaty which is last placed in full operation, and thereafter until otherwise agreed upon by the entities, shall be based upon stream flows for the thirty-year period beginning July 1928 as contained in the report entitled "Extension of Modified Flows Through 1958 - Columbia River Basin" and dated June 1960, as amended and supplemented to June 29, 1961, by the Water Management Subcommittee of the Columbia Basin Inter-Agency Committee.

Comment

The Treaty stipulates that, unless otherwise agreed, a 20-year period of streamflow record is to be used to calculate the downstream power benefits. Under this Item a 30-year period of record is to be used instead. Use of the longer period of record has the effect of increasing the average flows under study, thereby increasing the need for control by Canadian storage and resulting in an average increase in Canada's downstream energy benefits of approximately 500,000,000 kilowatt hours annually, or an increase of about 18% of the total energy benefit.

9. (1) Each load used in making the determinations required by Steps II and III of paragraph 7 of Annex B of the Treaty shall have the same shape as the load of the Pacific Northwest Area as the Area is defined in that paragraph.

(2) The capacity credit of Canadian storage shall not exceed the difference between the firm load carrying capabilities of the projects and installations included in Step II of paragraph 7 of Annex B of the Treaty and the projects and installations included in Step III of paragraph 7 of Annex B of the Treaty.

Comment

This Item clarifies the procedure to be followed in the calculation of the downstream power benefits.

It requires that the loads used in determining Canada's benefits in Steps II and III (Annex B, Para. 7) will have the same monthly load distribution as loads of the Pacific Northwest Area (defined in Annex B, Para. 7). This clarification simplifies the process of determining the downstream power benefits.

Paragraph 2 of Annex B is clarified by making it clear that the capacity credit of Canadian storage shall not be greater than the difference between the usable capacity in Steps II and III of Annex B (the study of the base system projects with and without Canadian storage). If in time Step III indicates that the United States can make full use of all its installed hydroelectric capacity without the benefit of Canadian storage, Canada's capacity credits will diminish to zero at that time. In this event it should be noted that Item 7 (1) of the Protocol reduces Canada's commitment under the Treaty to an operation which will produce only the continuing average annual energy benefits.

10. In making all determinations required by Annex B of the Treaty the loads used shall include the power required for pumping water for consumptive use into the Banks Equalizing Reservoir of the Columbia Basin Federal Reclamation Project but mention of this particular load is not intended in any way to exclude from those loads any use of power that would normally be part of such loads.

Comment

The Protocol requires that in the calculation of Canada's capacity benefits, the power used to drive the irrigation pumps of the Banks Equalizing Reservoir (at the Grand Coulee project) be considered as part of the general system load rather than a station service load of the Grand Coulee plant, thus increasing Canada's capacity benefit by 5% to 7%.

11. In the event operation of any of the Canadian storages is commenced at a time which would result in the United States of America receiving flood protection for periods longer than those on which the amounts of flood control payments to Canada set forth in Article VI(1) of the Treaty are based, the United States of America and Canada shall consult as to the adjustments, if any, in the flood control payments that may be equitable in the light of all relevant factors. Any adjustment would be calculated over the longer period or periods on the same basis and in the same manner as the calculation of the amounts set forth in Article VI(1) of the Treaty. The consultations shall begin promptly upon the determination of definite dates for the commencement of operation of the Canadian storages.

Comment

Because of the prepayment aspect Article VI(2) of the Treaty provides for reduction in the \$64,400,000 (U.S.) payment to

Canada for flood control if the Canadian projects are late in commencing full operation. However, no provision is made in the Treaty for an increase in the event of Canadian storage being operative earlier than required. This Item allows for the upward adjustment of the payments to Canada in the event of early completion.

12. Canada and the United States of America are in agreement that the Treaty does not establish any general principle or precedent applicable to waters other than those of the Columbia River Basin and does not detract from the application of the Boundary Waters Treaty, 1909, to other waters.

Comment

In the event that there would be an impression that the Treaty established a principle or precedent restricting Canada's freedom to develop other international rivers (e.g. the Yukon) in the manner most advantageous to Canada this Item states clearly that the Columbia arrangement does not establish any such principle or precedent and, moreover, does not affect the application of the Boundary Waters Treaty, 1909 to other international rivers in Canada.

TERMS OF SALE OF CANADA'S ENTITLEMENT TO DOWNSTREAM POWER BENEFITS

Although the actual sale of Canada's entitlement to downstream power benefits, as provided for in Article VIII, was not expected to take place until the Treaty was in force, the Governments of Canada and the United States through an Exchange of Notes have now agreed in advance on general conditions and limits for the initial sale and they have undertaken to authorize a sale that meets these terms and conditions contemporaneously with the exchange of ratifications. British Columbia and Canada in the Supplemental Canada-British Columbia Agreement have each acknowledged that the proposal is satisfactory.

The proposal is for the sale to a single private Purchaser rather than to a government agency of the first thirty years production of downstream power benefits of each Treaty project and complete prepayment therefor in a lump sum upon ratification of the Treaty. There is to be no automatic right of renewal so full recapture, if necessary, is assured. The formal and detailed contract of sale between the Purchaser and the British Columbia Hydro and Power Authority, the Canadian entity for Treaty purposes, will cover a wide range of technical matters acceptable to them. However it must conform to and is subject to the general conditions and limits agreed to by the Governments and set out in the attachment to the Exchange of Notes. The actual contract will be negotiated and signed by the British Columbia Hydro and Power Authority and the Purchaser before the Treaty is ratified. Thus Canada and the United States retain control of the details of the transaction between British Columbia and the Purchaser.

The proposed sale contemplates that

- (a) a new United States organization will be established, consisting of power producers in the Pacific Northwest Area, which will be the Purchaser and which will in turn sell the power to its members.
- (b) The purchase price will be raised by a bond issue of this organization, the income from which will be free of United States income tax and hence its borrowing charges will be relatively low. It will thus be better able to pay the price required.
- (c) Bonneville Power Administration will agree with the Purchaser to fulfil its contracts for delivery of power in return for an assignment of the power purchased by the organization.

The proposal modifies somewhat the construction time schedule for the three Canadian dams. The new schedule is as follows:

Duncan Lake	April 1, 1968
Arrow Lakes	April 1, 1969
Mica Creek	April 1, 1973.

Assuming ratification by October 1, 1964, the new schedule means that Canada will get an additional 1 1/2 years benefits from Duncan Lake and 1/2 year of benefit from Arrow Lakes and Mica.

In order to keep the proposal in proper context it should be borne in mind that there is no export of power involved since no power produced in Canada is being transmitted outside of Canada. Rather, power produced in the United States is being sold in the United States and an amount of money agreed upon in advance is being paid to Canada in return for a service to be rendered, namely, the regulation of the streamflow of the Columbia.

The Purchaser, rather than paying for the power year by year undertakes a complete prepayment. The annual values of the power sold were discounted at 4 1/2% to a lump sum payment as of October 1964. This sum is the amount mentioned in the Terms of Sale (\$254,400,000 U.S.). Converted to Canadian funds at an assumed exchange rate of \$1.00 United States equal \$1.08 Canadian it amounts to \$274,800,000 (Canadian). Because of the possibility of investment in Canada at higher interest rates than that which the bond issuer in the United States could obtain the whole sum will come to Canada for investment here. When to these sums are added the flood control payments of \$64,400,000 (U.S.), converted to Canadian dollars and similarly invested at 5%, the total values become \$501,000,000 by 1973. (For further details see Chapter V.)

Because of the prepayment by the Purchaser the British Columbia Hydro and Power Authority agrees to compensate the private Purchaser if for any reason the Treaty projects are not constructed and operated as required by the Treaty. This compensation is, therefore, a re-payment rather than a penalty. Compensation is limited to replacement costs for the actual power not received by the private Purchaser and may, at the option of British Columbia Hydro and Power Authority, take the form of money or power. Disputes as to the amount of compensation due are to be settled by a special arbitration tribunal. Because of the assignment by the Purchaser to the Bonneville Power Administration of its right to receive the power sold by Canada this paragraph provides that Bonneville Power Administration succeeds to the rights of the Purchaser respecting compensation.

The purchase price is to be applied towards the cost of constructing the Treaty projects and Canada will transfer these funds to British Columbia in accordance with the Canada-British Columbia Agreement.

In order to obtain maximum benefits during the construction phase of the three Canadian dams and particularly in order to provide sufficient head at Mica Creek for purposes of at-site generation, the Terms of Sale require the two operating entities to meet, discuss and agree upon programs for filling the storages provided by the dams. Canada has obtained the commitment of United States to give priority to filling 15,000,000 acre-feet of the storage at Mica Creek within two years of completion of construction. This commitment enables the British Columbia Hydro and Power Authority to take advantage of at-site generation by 1975, which is much earlier than otherwise would have been the case.

Several matters which follow from the fact of the sale and particularly the prepayment aspect constitute the balance of the agreed terms and conditions. The more important ones are as follows:

- (a) If Canada alters the operation of the Treaty storages as is permitted by paragraph 7 of Annex A of the Treaty for generating needs in Canada the resulting reduction in the Canadian entitlement to downstream power benefits sold to the Purchaser and paid for will be made up by the British Columbia Hydro and Power Authority by supplying power, or otherwise as may be agreed upon by the British Columbia Hydro and Power Authority and the Purchaser.
- (b) Since Canada's entitlement to downstream power benefits has been sold it is no longer possible during the period of the sale to compensate the United States for any loss in the United States share of downstream power benefits by a forfeiture of Canada's entitlement. Therefore the compensation required by Article XVIII(5) of the Treaty will be made by the British Columbia Hydro and Power Authority in money or power at its option.
- (c) During the period of the sale Canada has no real responsibility in the internal transactions between the Purchaser and Bonneville Power Administration. Therefore it has been agreed that Bonneville Power Administration may determine for purposes of its relationship with the Purchaser and consumers in the United States the figures which will be assumed to have equalled the actual Canadian entitlement. As pointed out in the comment on Article XIV of the Treaty this provision will have no undesired effect on Canada because the functions of the Canadian entity relating to calculation of benefits and preparation of hydroelectric operating plans and other joint activities under the Treaty have been preserved.

CANADA-BRITISH COLUMBIA AGREEMENTS

The Government of Canada and the Government of British Columbia entered into a Main Agreement dated July 8, 1963, and a Supplemental Agreement dated January 13, 1964, under which the rights and obligations of British Columbia are defined and provision is made for effective implementation of all the arrangements that are contemplated.

The need for the agreements lies in the fact that, while Canada is the contracting party in relation to the United States in the Treaty, the Protocol and the exchange of notes concerning sale of the downstream power benefits, it is British Columbia that is the owner, in Canada, of the water resource involved and which is to do the things required for its development under the Treaty. Therefore it was essential to have very clear agreement as to how British Columbia is going to discharge the obligations that Canada has undertaken in relation to the United States, both immediately and during the entire life of the Treaty. Equally, there must be a clear understanding as to how Canada is going to pass on to British Columbia the payments and other benefits the United States is to provide and how, during the life of the Treaty, Canada will handle the claims, benefits and other questions that will arise.

As the owner of the water resource, British Columbia gets the downstream power benefits or the proceeds of their sale, all compensation payable by the United States in return for flood control, the Kootenay River benefits in Canada resulting from Libby Dam, the water diversion rights in Article XIII of the Treaty, the benefit of the standby transmission services provided by the United States and any future payments to settle claims, to compensate for extra flood control requests or to cover any other arrangements that may be agreed on.

Canada and British Columbia in the Preamble to the Supplemental Agreement each acknowledge to the other that the Protocol to the Treaty signed by Canada and the arrangements for the proposed sale of Canada's share of the downstream power benefits is satisfactory to both Governments.

In view of the fact that the proceeds of the sale of downstream power benefits belong to British Columbia the Supplemental Agreement provides that Canada will as soon as it has received the prepayment from the United States Purchaser, pay to British Columbia the full equivalent in Canadian dollars and that any further obligation of Canada to the United States of America under the Terms of Sale with respect to the application of the purchase price towards the cost of construction of the Treaty projects will be carried out by British Columbia. The payment will be transferred to British Columbia in accordance with the

procedures usually employed in such transfers and within the time required by the normal practice.

In return for these Treaty benefits British Columbia agrees to carry out the construction and operation of the three Treaty dams through its agency, the British Columbia Hydro and Power Authority, without any financial assistance from Canada by way of grant, loan or otherwise. In general British Columbia has agreed to do everything which constitutionally it is capable of doing to carry out the terms of the Treaty. British Columbia has agreed to comply with the construction schedule for the dams established by the Treaty and the Terms of Sale and further has agreed to install generation at the Mica Dam as soon as "economically feasible" (see Section 16).

The agreements recognize and in no way interfere with the freedom of the Federal Government to conduct Canada's external relations. Accordingly, while the Federal Government is naturally expected to consult B. C. even in certain cases involving international relations, its right to act on the basis of its own best judgment in such cases is fully respected. In other cases primarily the concern of the Province the agreements generally provide that Canada will obtain the concurrence of B. C. before dealing with such matters.

The agreements provide for a complete indemnification of Canada by British Columbia in respect of all liability to the United States not due directly to some fault of Canada itself. In particular, British Columbia will reimburse Canada for any costs or expenses Canada incurs in doing anything that British Columbia should have done.

The agreements provide that all construction and operation in Canada required to carry out the obligations imposed by the Treaty will be done in accordance with all laws in force from time to time in Canada, whether such laws are provincial or federal. The normal licensing procedures under the various applicable statutory schemes of both the Legislature of British Columbia and the Parliament of Canada are to be followed, but each Government agrees not to withhold any license, the absence of which would frustrate the carrying out of any Treaty obligations. This simple and effective way of fitting the new activities required by the Treaty into the existing domestic legal situation has the distinct advantage of not raising any constitutional or jurisdictional questions.

The agreements also provide for a number of minor matters, such as:

- (a) the nomination by British Columbia of one of the two Canadian members of the Permanent Engineering Board,
- (b) the maintenance and disclosure of appropriate records by British Columbia,
- (c) recognition of the federal government policy on Canadian

labour and materials and non-discrimination,

- (d) continuing consultation between Canada and British Columbia including establishment of a liaison committee, and
- (e) submission of disputes to the Exchequer Court of Canada and provision of means for enforcing an award of that court.

[illegible][illegible]

NORTHERN PORTION

OF

COLUMBIA RIVER BASIN

Time (min)	Rate of change
0	0
5	15
10	38
15	25
20	10
25	10
30	10
35	10
40	10

LEGEND

*****KJLAB 2650

TREATY PROJECT.....

1987

