

ANNUAL REPORT
to the
GOVERNMENTS
of
THE UNITED STATES and CANADA

COLUMBIA RIVER TREATY
PERMANENT ENGINEERING BOARD
Washington, D.C. Ottawa, Ontario
30 SEPTEMBER 1965



COLUMBIA RIVER TREATY PERMANENT ENGINEERING BOARD

C A N A D A . U N I T E D S T A T E S

CANADIAN SECTION

G. M. MacNABB, Chairman
A. F. PAGET, Member

UNITED STATES SECTION

W. E. JOHNSON, Chairman
M. D. DUBROW, Member

31 December 1965

The Honourable Dean Rusk
The Secretary of State
Washington, D. C.

The Honourable Arthur Laing
Minister for Northern Affairs and
National Resources
Ottawa, Ontario

Gentlemen:

Reference is made to the Treaty between the United States of America and Canada, relating to co-operative development of the water resources of the Columbia River basin, signed at Washington, D. C. on 17 January 1961.

In accordance with the provisions of Article XV paragraph 2(e), there is submitted herewith the first Annual Report, dated 30 September 1965, of the Permanent Engineering Board.

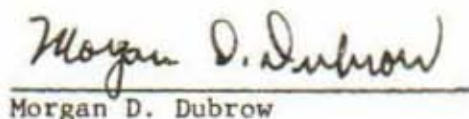
The report sets forth results achieved under the Treaty for the period from the establishment of the Board on 16 September 1964 to 30 September 1965.

Future Annual Reports of the Board will cover the period from 1 October to 30 September.

Respectfully submitted:

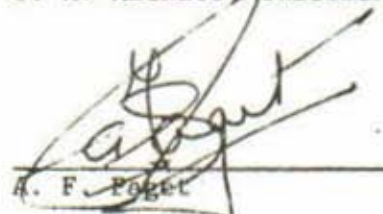
For the United States

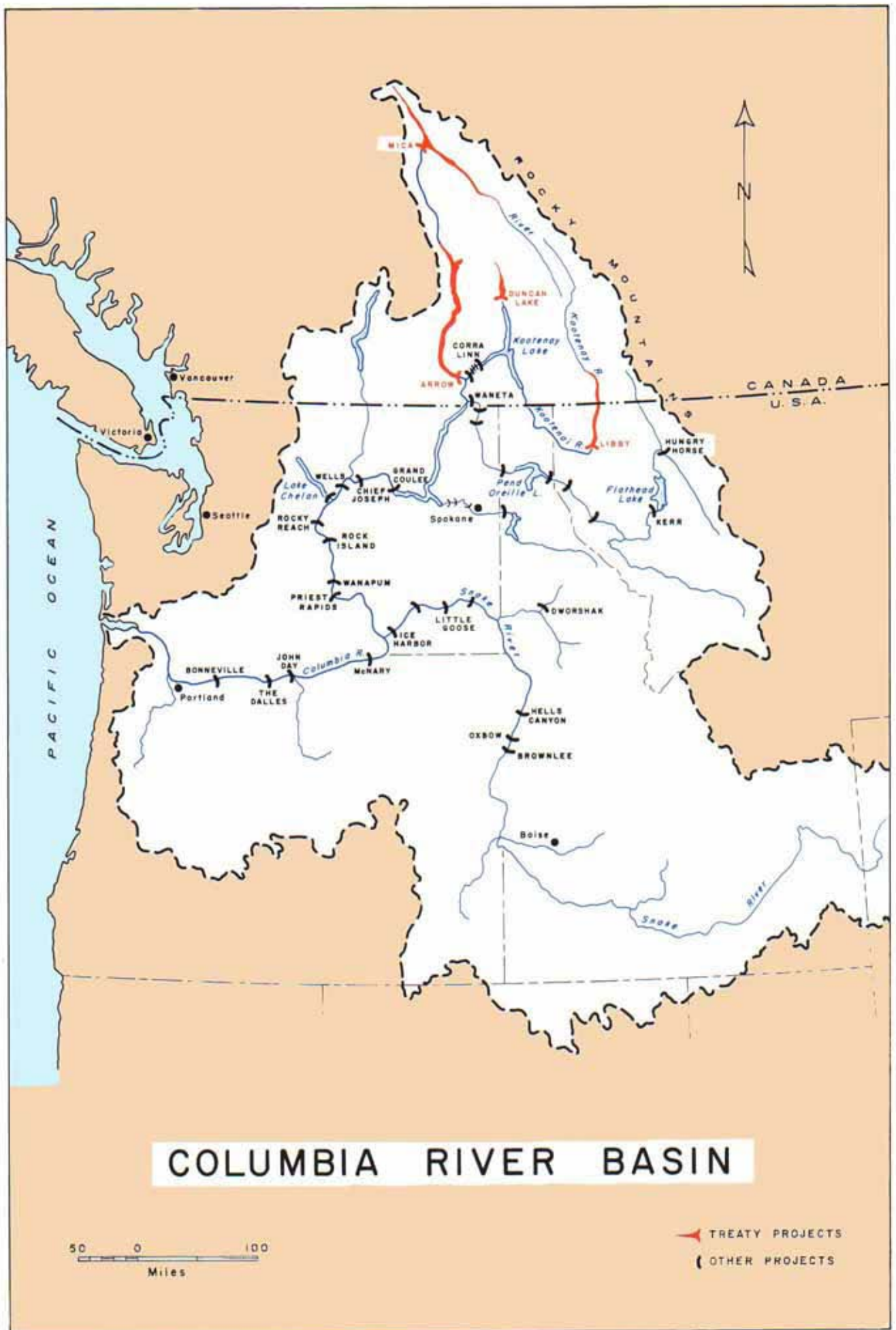

Wendell E. Johnson, Chairman


Morgan D. Dubrow

For Canada


G. M. MacNabb, Chairman


A. F. Paget



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to the
GOVERNMENTS
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**COLUMBIA RIVER TREATY
PERMANENT ENGINEERING BOARD**

Washington, D. C.

Ottawa, Ontario

30 September 1965

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SUMMARY

The Permanent Engineering Board's Annual Report is submitted to the Governments of the United States and Canada in compliance with Article XV of the Columbia River Treaty of January 1961. Progress of project construction and office studies pertaining to the Treaty are described.

The Board held three meetings during the reporting period and made an inspection of the Treaty projects and related works.

Construction of the Duncan Lake storage project is somewhat ahead of the planned schedule with work on the earth dam well advanced. Construction of diversion tunnels and excavation for the spillway are proceeding satisfactorily. The Arrow project is on schedule. Relocations at the site are complete and construction of the cofferdam is underway. The Mica project is in the initial stages of development with site clearing, construction of access roads, driving diversion tunnels, and provision of housing facilities at the townsite in progress. Design and planning for the Libby project is well advanced and it is expected that the United States will in the near future exercise its option under the Treaty to proceed with construction.

Studies concerning the hydrometeorological network, project discharge works, power and flood control operation and reservoir filling are being undertaken by the Entities to ensure operation of the projects in accordance with the terms of the Treaty.

On the basis of current progress, the Board concludes that the objectives of the Treaty are being met.

INTRODUCTION

The Columbia River Treaty, which provides for co-operative development of the water resources of the Columbia River basin, was signed at Washington, D.C. on 17 January 1961 by representatives of the United States and Canada. The Treaty will provide each country with substantially greater benefits than if separate plans of improvement had been undertaken independently by either nation.

Article XV of the Treaty established a Permanent Engineering Board and specified that one of its duties would be to "make reports to Canada and the United States of America at least once a year of the results being achieved under the Treaty...".

This initial annual report of the Board covers the period from the establishment of the Board on 16 September 1964 to 30 September 1965. Events leading up to ratification of the Treaty and the responsibilities of the Board and of the Entities are reviewed. The report also indicates results achieved by both countries under the terms of the Treaty and whether, in the opinion of the Board, the objectives of the Treaty are being met.

Future annual reports of the Board will cover the period from 1 October to 30 September.

THE COLUMBIA RIVER TREATY

Resume of the Treaty and Related Documents

The Columbia River Treaty is the culmination of efforts which date back to 1944. At that time the Governments of the United States and Canada requested the International Joint Commission to determine whether further development of the water resources of the Columbia River basin would be practicable and in the public interest of the two governments. The Commission, a body established by the Boundary Waters Treaty of 1909, established the International Columbia River Engineering Board to undertake the Columbia River investigation. In March 1959 this Board submitted its report "Water Resources of the Columbia River Basin" which indicated alternative plans of development that were considered practicable and advantageous to both countries.

Early in 1959 the two governments requested the Commission to report on principles for the calculation and apportionment of the benefits which would result from co-operative development of the water resources of the Columbia Basin. The Commission submitted its recommendations in December 1959. Negotiations leading to the Treaty commenced in February 1960 and the Treaty was signed on 17 January 1961.

In the United States the Treaty was ratified by the Senate in March 1961. In Canada ratification was delayed and in the spring of 1963 formal negotiations were resumed between the two countries. These negotiations resulted in agreement being reached on a Protocol to the Treaty and on general conditions which

would govern the sale in the United States of the Canadian power entitlement. On 22 January 1964 the Protocol and Attachment Relating to Terms of Sale were agreed upon by an exchange of notes. In June 1964 the Canadian Parliament approved the Treaty and related documents.

The Canadian Entitlement Purchase Agreement was signed on 13 August 1964. Under the terms of this agreement Canada's share of downstream power benefits resulting from the first thirty years of scheduled operation of each of the storage projects was to be sold to a group of electric utilities in the United States known as the Columbia Storage Power Exchange.

On 16 September 1964 the Treaty and Protocol were formally ratified by an exchange of notes between the two governments. A check for \$253.9 million (U.S. funds) was delivered to the Canadian representatives as payment in advance for the Canadian entitlement to downstream power benefits. On the same date at a ceremony at the Peace Arch on the International Boundary at Blaine, Washington, the Treaty and its Protocol were proclaimed by President Johnson, Prime Minister Pearson, and Premier Bennett of British Columbia.

Features of the Treaty and Related Documents

The essential features of the Treaty are as follows:

- (a) Canada will provide 15.5 million acre-feet of usable storage by constructing dams near Mica Creek, the outlet of Arrow Lakes, and Duncan Lake, in British Columbia.

- (b) The United States will maintain and operate hydroelectric power facilities included in the base system and any new main-stem projects to make the most effective use of improved stream flow resulting from operation of the Canadian storage. Canada will operate the storage in accordance with procedures and operating plans specified in the Treaty.
- (c) The United States and Canada will share equally the additional power generated in the United States as a result of river regulation by upstream storage in Canada.
- (d) On commencement of the respective storage operations the United States will make payments to Canada totalling \$64.4 million (U.S. funds) for flood control provided by Canada.
- (e) The United States has the option of constructing a dam on the Kootenai River near Libby, Montana. The Libby reservoir would extend some 42 miles into Canada and Canada would make the necessary Canadian land available for flooding.
- (f) Canada has the option of making specific diversions of the Kootenay River.
- (g) Differences arising under the Treaty which cannot be resolved by the two countries may be referred by either to the International Joint Commission or to arbitration by an appropriate tribunal as specified by the Treaty.

- (h) The Treaty shall remain in force for at least 60 years from its date of ratification, 16 September 1964.

The Protocol of January 1964 amplified and clarified certain terms of the Columbia River Treaty. The Attachment Relating to Terms of Sale signed on the same date established agreement that under certain terms Canada would sell in the United States its entitlement to downstream power benefits for a 30-year period. The Canadian Entitlement Purchase Agreement of 13 August 1964 provided that the Treaty storages would be operative for power purposes on the following dates:

Duncan Lake storage	1 April 1968
Arrow storage	1 April 1969
Mica storage	1 April 1973

PERMANENT ENGINEERING BOARD

General

Article XV of the Columbia River Treaty established a Permanent Engineering Board consisting of two members to be appointed by Canada and two members by the United States. Appointments to the Board were to be made within three months of the date of ratification. The duties and responsibilities of the Board were also stipulated in the Treaty and related documents.

Establishment of the Board

Pursuant to Executive Order No. 11177 dated 16 September 1964 the Secretary of the Army and the Secretary of the Interior on 7 December 1964 appointed two members and two alternate members to form the United States Section of the Permanent Engineering Board. The members of the Canadian Section of the Board were appointed by Order in Council P.C. 1964-1971 dated 29 October 1964. Each member was authorized to appoint an alternate member.

On 11 December 1964 the two governments announced the composition of the Board. The names of the Board members, alternate members and secretaries are shown in Appendix A.

Duties and Responsibilities of the Board

The general duties and responsibilities of the Board to the governments, as set forth in the Treaty and related documents, include:

- (a) assembling records of the flows of the Columbia River and the Kootenay River at the Canada-United States of America boundary;
- (b) reporting to Canada and the United States of America whenever there is substantial deviation from the hydroelectric and flood control operating plans and if appropriate including in the report recommendations for remedial action and compensatory adjustments;
- (c) assisting in reconciling differences concerning technical or operational matters that may arise between the entities;

- (d) making periodic inspections and requiring reports as necessary from the entities with a view to ensuring that the objectives of the Treaty are being met;
- (e) making reports to Canada and the United States of America at least once a year of the results being achieved under the Treaty and making special reports concerning any matter which it considers should be brought to their attention;
- (f) investigating and reporting 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;
- (g) consulting with the entities in the establishment and operation of a hydrometeorological system as required by Annex A of the Treaty.

In addition to these duties Article XV(4) of the Treaty states that the Board shall comply with directions, relating to its administration and procedures, agreed upon by the two governments as evidenced by an exchange of notes. Accordingly a document entitled "Administration and Procedures" was prepared by the Board as subsequently described in the section entitled "Activities of the Board".

ENTITIES

General

Article XIV(1) of the Treaty provides for the designation by Canada and the United States of entities which are empowered and charged with the duty of formulating and executing the operating arrangements necessary to implement the Treaty. Provision is made for either government to designate one or more entities. The powers and duties of the entities are specified in the Treaty and related documents.

Establishment of the Entities

Executive Order No. 11177, previously referred to, designated the Administrator of the Bonneville Power Administration, Department of the Interior, and the Division Engineer, North Pacific Division, Corps of Engineers, Department of the Army, as the United States Entity with the Administrator to serve as Chairman. Order in Council P.C. 1964-1407 dated 4 September 1964 designated the British Columbia Hydro and Power Authority as the Canadian Entity for the purposes of the Treaty. Names of the members of the two entities are shown in Appendix B.

Powers and Duties of the Entities

In addition to the powers and duties specified elsewhere in the Treaty and related documents the Treaty requires that the entities be responsible for:

- (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 co-operating 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 down-

stream 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.

Article XIV (4) of the Treaty provides that the two governments may by an exchange of notes empower or charge the entities with any other matter coming within the scope of the Treaty.

RELATIONSHIP AND LIAISON BETWEEN THE BOARD AND THE ENTITIES

The Entities have the responsibility of formulating and executing the operating instructions necessary to implement the Treaty. In the case of the Canadian Entity this responsibility has been extended to include construction of the Canadian Treaty projects.

One of the main functions of the Board is to report to the governments regarding results being achieved under the Treaty and as to whether the objectives of the Treaty are being met. In order to fulfill its responsibilities the Board was authorized by the terms of the Treaty to obtain reports as necessary from the Entities.

ACTIVITIES OF THE BOARD

Meetings

The initial meeting of the Board was held in Vancouver, British Columbia, on 14-15 January 1965 with subsequent meetings in the months of May and August held in Portland, Oregon and in Trail, B.C. respectively.

At its first meeting the Board reached agreement on a draft of its terms of reference in a document entitled "Administration and Procedures". This document was approved by the two governments by a formal exchange of notes on 4 October 1965. These Notes together with the Annex relating to the Board's administration and procedures are attached as Appendix C to this report.

The Board considered its responsibility for the safety of structures authorized for construction by the Treaty. The Board concluded that neither the duties specified in the Treaty nor its consideration of design data received from the Entities for the purpose of keeping fully informed regarding the projects gives the Board either a direct or implied responsibility for the safety of the structures or for the adequacy of their structural design. However, it was agreed that any apparent defects noted by the Board would be promptly called to the attention of the Entities.

The Board considered its requirements for reports from the Entities and requested reports on construction progress and Entity studies in the fields of the hydrometeorological network, reservoir filling plans, project discharge capacity, power operating plans and flood control operating plans.

Field Inspections

In August the Board visited the major hydroelectric projects in the Columbia Basin to assess construction progress of the Treaty projects and to obtain a general impression of over-all development. Construction progress at the Duncan Lake and Arrow projects was observed during on-site visits and the Mica project and reservoir area were viewed from the air. Other major projects under construction and existing developments were visited.

Reports Received

Since April 1965 monthly reports indicating construction progress of the Canadian Treaty projects have been received by the Board from the Canadian Entity.

In May 1965 the Entities reached agreement on the discharge capacity required for the Duncan Lake project and provided the Board with the report "Duncan Project Discharge Capacity" prepared by the Canadian Entity.

The first report on progress in establishing the hydrometeorological network was received from the Entities in June 1965. This report, "Recommendation No. 1 of the Task Force on Hydrometeorological Network", outlined the first assessment of additional hydrometric stations required by the Entities.

The Entities provided a summary report covering their general progress toward implementing the Treaty through 30 September 1965. In addition to outlining their separate responsibilities the Entities' report summarized progress on each of the studies for which the Board had requested information.

RESULTS ACHIEVED

General

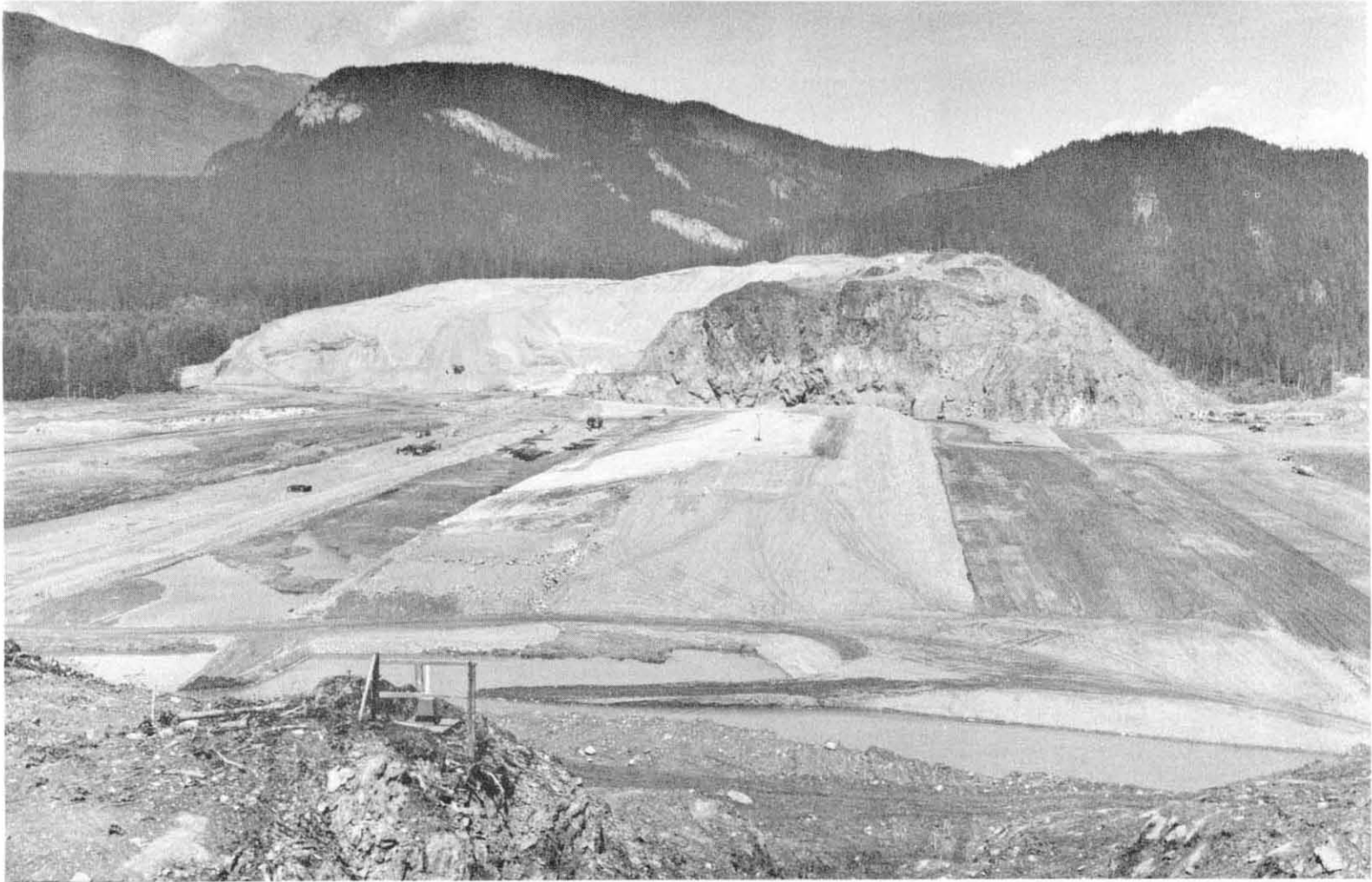
The results achieved under the terms of the Treaty include construction progress on the Treaty projects and progress on studies regarding development of the hydrometeorological network, reservoir-filling plans, power and flood control operating plans, and project discharge works. The locations of the Treaty projects are shown on Plate 1.

Construction Progress of the Treaty Projects

Duncan Lake Project

The Duncan Lake dam, which is scheduled to be operative for stream-flow regulation by 1 April 1968 will be the first of the Treaty projects to be completed.

The general arrangement of structures as shown on Plate 2, will include a zoned earthfill dam built across the flat floor of the Duncan River valley between the steep valley walls. Diversion of the river during construction will be effected by means of two tunnels through rock in the right abutment. These tunnels, controlled by radial gates at the downstream end, will subsequently be used to provide controlled discharges from the reservoir. Spillway facilities will be located on the left abutment and will discharge through a concrete-lined spillway channel.



DUNCAN LAKE PROJECT

Duncan River, British Columbia

The earthfill dam and the right abutment viewed from the spillway area on 7 August 1965.

Plate 3 illustrates graphically the amount of material which has been placed on the right bank of the present river channel in the zoned earthfill dam and impervious blanket. Placing fill in this structure was planned in three annual stages to allow time for foundation settlement to occur and for dissipation of the high pore pressures which were expected to build up in the foundation. Because neither the anticipated rate of settlement nor the high pore pressures have occurred, the construction schedule has been advanced. Revisions have also been made to the planned method of river diversion which allow the main cofferdam to be eliminated and a further advance to be made in the construction schedule.

Progress in construction of the discharge works is illustrated on Plate 3. Excavation of the outlet channel for the discharge works, Plate 2, is virtually complete and rock excavation has been started for the spillway structure and upper end of the spillway chute.

In the reservoir area acquisition of property is well advanced and clearing has been finished at the site.

Arrow Project

The Arrow dam, scheduled for completion by 1 April 1969, will be the second Treaty project to become operative for streamflow regulation.

As shown on Plate 4, the Arrow project will consist of two main components. The first comprises a zoned earthfill embankment with an impervious upstream blanket across the present river channel. The second is the concrete portion which includes the spillway, low-level outlets, and a navigation lock.



ARROW PROJECT

Columbia River, British Columbia

Drills working on cofferdam cut-off wall and suction dredge removing silt. Viewed from the north bank on 7 September 1965.

The project is proceeding according to schedule. On the north bank relocation of the highway and construction of a haul road to the major borrow area have been finished. On the south bank construction of a water supply system and temporary log-haul road for the Celgar mill have been completed and several miles of the Canadian Pacific Railway tracks have been relocated.

Two large suction dredges have been in use on the north side of the river to remove silt from the river-bed for the cofferdam foundation and for the approach and discharge channel areas. Excavation with land-based equipment is continuing for the approach channel and within the cofferdam area. Bottom-dump barges are being used to fill depressions in the river-bed in the area where the impervious blanket will be placed.

Progress in construction of the cofferdam fill, and of the concrete cut-off wall and trench filled with impervious glacial till, is shown on Plate 5. The concrete wall and filled trench will form an impervious barrier to bedrock and allow the area within the cofferdam to be dewatered for building the concrete structures.

To prepare the reservoir area for flooding, acquisition of land and relocation of certain communities are being undertaken. A start has been made on clearing the reservoir area.

Mica Project

Mica dam, the largest of the Treaty projects, is scheduled for completion on 1 April 1973.



MICA PROJECT

Columbia River, British Columbia

The general arrangement of structures and a key plan indicating the reservoir area and access route to the damsite are shown on Plate 6. The embankment will have a nearly vertical impervious core supported between zones of coarser material. During construction the site of the main fill will be dewatered by diverting the river through two 45-foot diameter tunnels located in the left abutment. Spillway facilities and control works to provide regulated discharges from storage will also be located in the left abutment. Present plans propose that power facilities, when required, will be located in the right abutment as indicated on Plate 6.

An extensive program of relocation or improvement of approximately 100 miles of highway has been undertaken to provide access for this project. Contracts have been awarded for most of this work including replacement of bridges. Extensive sections of the new highway are currently being cleared or are under construction.

A townsite is being built to house workers during the construction period. Building has proceeded rapidly and most of the facilities will be available before winter.

The left abutment of the damsite has been cleared and a contract has been awarded for the excavation of two 45-foot diameter diversion tunnels. Excavation of an access adit to these tunnels has been started and work on both tunnels will continue through the winter. Roads to bypass both the tunnel inlet and outlet areas are under construction.

Libby Project

As previously noted, the Treaty gives the United States an option of constructing Libby Dam on the Kootenai River in Montana. The United States has not yet exercised this option. Planning by the U.S. Army Corps of Engineers continued on the project in anticipation of the appropriation of construction funds and the initiation of construction before the end of the fiscal year ending 30 June 1966.

Hydrometeorological Network

One of the responsibilities which the Treaty assigned to the Entities is the establishment and operation, in consultation with the Permanent Engineering Board, of a hydrometeorological system to obtain data for detailed programming of flood control and power operation. This system would include snow courses, precipitation stations and streamflow gauges.

Studies which will be carried out by the Entities for the hydrometeorological network include field reconnaissance of areas to be covered and instrumentation and communication requirements for collection of basic data. Relative reliability of forecasting from existing data, project operating requirements and network efficiency will also be studied.

Consideration was given by the Entities to establishing streamflow gauges at an early date so that there will be an adequate overlap of records between new gauges and those that will be flooded or abandoned. The Entities, with the concurrence of the Permanent Engineering Board, adopted the first requirements for



LIBBY DAM SITE
Kootenai River, Montana

additional reservoir and streamflow gauges as an initial step in the formation of the hydrometeorological network. The Canadian Entity has made arrangements to have the necessary improvements and new installations started at an early date. Studies of forecasting procedures in both countries have been undertaken and an aerial reconnaissance of the Canadian portion of the basin has been carried out primarily for the purpose of locating snow courses.

Since the adequacy of a hydrometeorological system cannot be precisely defined, its development is a continuous process and no completion schedule can be established. It is contemplated, however, that a basic network and communications system will be established prior to project operation to provide as far as possible the hydrometeorological information required for both countries.

Reservoir Filling

The Entities are currently studying reservoir operation to establish the necessary criteria and procedures so that the initial filling program for each of the Canadian storage reservoirs will comply with the terms of the Treaty and related documents. This work will include computation of the water supply available under various assumptions of inflow and downstream generation requirements, and studies of loads and resources at site and downstream in each country to determine energy surpluses which may be utilized to meet Treaty objectives for filling Canadian reservoirs.

Since some aspects of the design of the Mica project are dependent upon the reservoir-filling program, reservoir-filling studies for this project were

assigned first priority. Initial studies for the Mica reservoir show that the probability of reaching the objectives of seven million acre-feet by 1 September 1973 and of fifteen million acre-feet by 1 September 1975 is somewhat lower than may have been thought when the objectives were originally selected.

Work on filling programs for the Duncan Lake and Arrow reservoirs is expected to commence in the near future. The Entities do not consider that it is possible to prepare a schedule for completion of reservoir-filling programs at this time but it is anticipated that these programs will be completed in time to be included in the operating plans.

Power Operation

The Treaty requires that before the first Canadian storage becomes operative the Entities must agree on operating plans and downstream power benefits for each year until all three Canadian reservoirs become operative. The Entities also must determine five years in advance of each operating year both an assured plan of operation and the resulting downstream power benefits.

Development of power operating plans for Canadian storage reservoirs has not been allocated a high degree of priority since the results would not affect any studies currently in progress. It is considered more important to reach agreement on outlet works and on initial filling of Mica reservoir first, since these factors may affect design and construction as well as power operating plans. Before proceeding with studies of power operation it is also considered that some assessment of flood control operating plans should be obtained.

The initial power operating plan must be agreed to by the two Entities before the first storage becomes operative on 1 April 1968. Operating plans and resulting downstream power benefits for each year until 1 April 1974 must be agreed to by the same date.

Flood Control Operation

The terms of the Treaty provide that Canadian storage reservoirs will be operated by the Canadian Entity for flood control purposes in accordance with flood control operating plans submitted by the United States Entity.

Studies by the Entities for determination of flood control operating plans will include evaluation of local water levels, flood-routing studies for the storage projects as part of the entire flood control system, and derivation of operating rule curves for storage projects. Exchanges of flood control storage as well as the operation of any additional storage will be evaluated for the Canadian projects. Flood control operating plans will be reviewed on a continuing basis and consideration will be given to establishing communication procedures to assist in implementing emergency flood control operations.

Additional basic data have been provided by both countries and computer studies of flood routing for the entire system have been undertaken. Preliminary investigations have been made regarding operating rule curves for the Duncan Lake and Mica projects.

Operating rules for the Arrow Lakes and downstream storages and the coordination of flood control operating plans with requirements for power generation and other project uses are scheduled to be finished prior to completion of the first Canadian storage on 1 April 1968. Preliminary rule curves for flood control operation of Canadian storage will be formulated early in 1966.

Project Discharge Works

Paragraph 3 of Annex A of the Treaty specifies that sufficient discharge capacity will be provided at each of the Treaty dams to afford the desired regulation for power and flood control as mutually agreed by the Entities. Studies by the Entities on project discharge capacity will include determination of discharges available at various reservoir operating levels, routing studies to determine the time required for evacuation and refill of reservoirs under varying conditions of natural inflow, and examination of project performance under critical historic conditions and assumed operating plans.

Detailed discharge capacity reports have been prepared by the Canadian Entity for the Duncan Lake and Arrow projects. The Entities have reached agreement on the report for the Duncan Lake project and copies of this report and of the signed agreement have been received by the Permanent Engineering Board. The Entities agree that the recorded discharge capacity is adequate to provide the desired regulation for flood control and power operation.

Discussion between the Entities regarding design and operation of spillway and outlet capacities for the Mica project are continuing.

Flow Records

Article XV(2)(a) of the Treaty specifies that the Permanent Engineering Board shall assemble records of flows of the Columbia and Kootenay Rivers at the Canada-United States of America boundary.

The Governments of Canada and the United States jointly operate a number of international gauging stations to determine the flow of rivers which cross the international boundary. Streamflow records are obtained for the two countries by representatives of the United States Geological Survey and the Canadian Department of Northern Affairs and National Resources. Identical records of these flows are published by the two agencies in their regular water supply publications.

Streamflow for the Columbia River where it enters the United States south of Trail, British Columbia, is measured at the international boundary. Data for this station are supplemented by flow records, obtained in British Columbia near Trail, which represent the combined discharges of the Columbia and Kootenay Rivers. International gauging stations are also operated at Newgate, British Columbia, where the Kootenay River enters the United States, and near Porthill, Idaho, where the river returns to Canada.

Since flows at these points are currently obtained as part of a co-operative arrangement between the United States and Canadian Governments, the Board concluded that collection of additional data is not required. However, once the storage operating program commences the Board plans to record the flows as regulated by the Treaty projects and to determine the flows which would have been experienced at the international boundary under pre-project conditions.

CONCLUSION

On the basis of the progress being made by the Entities on planning and construction of the Treaty projects and on the related engineering studies the Permanent Engineering Board concludes that the objectives of the Treaty are being met.

APPENDIX A

COLUMBIA RIVER TREATY PERMANENT ENGINEERING BOARD

<u>United States</u>	<u>Members</u>	<u>Canada</u>
Mr. Wendell E. Johnson, Chairman Chief, Engineering Division, Civil Works Directorate, Office, Chief of Engineers, U.S. Army, Washington, D.C.		Mr. G.M. MacNabb, Chairman Senior Hydraulic Engineer, Water Resources Branch, Department of Northern Affairs and National Resources, Ottawa, Ontario
Mr. Morgan D. Dubrow Assistant and Chief Engineering Research Advisor, Office of the Assistant Secretary for Water and Power Development, Department of the Interior, Washington, D.C.		Mr. A.F. Paget Deputy Minister of Water Resources, Department of Lands, Forests, and Water Resources, Victoria, B.C.
	<u>Alternates</u>	
Mr. Fred L. Thrall Engineer, Planning Division, Civil Works Directorate, Office, Chief of Engineers, U.S. Army, Washington, D.C.		Mr. E.M. Clark Engineer, Water Resources Branch, Department of Northern Affairs and National Resources, Vancouver, B.C.
Mr. J. Emerson Harper Engineering Assistant, Office of the Assistant Secretary for Water and Power Development, Department of the Interior, Washington, D.C.		Mr. J.T. Rothwell Chief, Power and Major Licences Division, Water Rights Branch, Water Resources Service, Department of Lands, Forests, and Water Resources, Victoria, B.C.
	<u>Secretaries(1)</u>	
Mr. John W. Roche Engineer, Planning Division, Civil Works Directorate, Office, Chief of Engineers, U.S. Army, Washington, D.C.		Mr. E.M. Clark Engineer, Water Resources Branch, Department of Northern Affairs and National Resources, Vancouver, B.C.

(1) Appointed by the Board at its initial meeting held in Vancouver, B.C.,
14-15 January 1965.

ENTITIES
COLUMBIA RIVER TREATY

United States

Mr. Charles F. Luce, Chairman
Administrator, Bonneville Power
Administration,
Department of the Interior,
Portland, Oregon

Brigadier General Peter C. Hyzer
Division Engineer, North Pacific
Division,
Corps of Engineers, U.S. Army,
Portland, Oregon

Canada

Dr. H.L. Keenleyside, Chairman
Chairman, British Columbia
Hydro and Power Authority,
Vancouver, B.C.

EXCHANGE OF NOTES

and

ANNEX RELATING TO ADMINISTRATION AND PROCEDURES

Canadian Embassy
Washington, D.C.

October 4, 1965.

Sir,

I have the honour to refer to discussions which have been held between representatives of the Government of Canada and the Government of the United States of America regarding Section (4) of Article XV of the Treaty between Canada and the United States of America relating to Co-operative Development of the Water Resources of the Columbia River Basin signed at Washington on January 17, 1961 which was brought into force through an exchange of instruments of ratification on September 16, 1964.

Section (4) of that Article provides that the Permanent Engineering Board, established under the terms of Section (1) of the same Article, 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. On the basis of the foregoing discussions the Government of Canada understands that the two Governments have agreed that the Permanent Engineering Board shall be guided by the directions relating to its administration and procedures set out in the annex to this note.

I should like to propose that, if agreeable to your Government this note, together with its annex and your reply, shall constitute an agreement between our two Governments relating to the carrying out of the provisions of the Treaty with effect from the date of your reply.

Accept, Sir, the renewed assurances of my highest consideration.

Ambassador

The Honourable
Dean Rusk,
Secretary of State of the
United States of America,
Washington, D.C.

COLUMBIA RIVER TREATY
PERMANENT ENGINEERING BOARD

Administration and Procedures

1. Authority. The four-man Permanent Engineering Board was created, and its general duties outlined, by the "Treaty Between Canada and the United States of America Relating to Co-operative Development of the Water Resources of the Columbia River Basin" signed at Washington, D.C. on January 17, 1961, and the Annex to an Exchange of Notes dated January 22, 1964. The United States Section of the Board was provided for by Presidential Executive Order No. 11177 dated September 16, 1964. The Canadian Section of the Board was established by Order-in-Council P.C. 1964-1671 dated October 29, 1964 as amended by P.C. 1964-1976 dated December 17, 1964.

2. Composition of the Board. In conformance with Article 6(2) of the Canada-British Columbia Agreement of July 8, 1963 relating to the Treaty, and Order-in-Council 1964-1671, the Canadian Section of the Permanent Engineering Board shall consist of one member to be nominated and appointed by the Government of Canada who shall be Chairman of the Canadian Section, and one member to be nominated by the Province of British Columbia and appointed by the Government of Canada. In accordance with Order-in-Council P.C. 1964-1976 each member shall designate an alternate to serve for and in the member's absence.

In accordance with Presidential Executive Order No. 11177 the United States Section of the Permanent Engineering Board shall consist of one member designated by the Secretary of the Army who shall be Chairman of the United States Section, and one member designated by the Secretary of the Interior. In accordance with that same Order each member shall have a designated alternate to serve for and in the member's absence.

3. Chairman. The Chairman of each Section of the Board shall preside as Chairman of the Board as a whole at all meetings of the Board held in his country. In the event the Chairman of either Section of the Board is absent the chairmanship of that Section and, if appropriate, of the Board itself shall be assumed by the other member of that Section, or if that member is also absent, by the alternate to the Chairman of that Section.

4. General Duties of the Board. As set forth in the Columbia River Treaty and related documents the general duties of the Board include:

- (a) assembling records of the flows of the Columbia River and the Kootenay River at the Canada-United States of America boundary;
- (b) reporting to Canada and the United States of America whenever there is substantial deviation from the hydro-electric and flood control operating plans and if appropriate including in the report recommendations for remedial action and compensatory adjustments;
- (c) assisting in reconciling differences concerning technical or operational matters that may arise between the entities;
- (d) making periodic inspections and requiring reports as necessary from the entities with a view to ensuring that the objectives of the Treaty are being met;
- (e) making reports to Canada and the United States of America at least once a year of the results being achieved under the Treaty and making special reports concerning any matter which it considers should be brought to their attention;

- (f) investigating and reporting 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;
- (g) consulting with the entities in the establishment and operation of a hydrometeorological system as required by Annex A of the Treaty.

5. Meetings. The Board shall meet at such times and places as the Chairmen of the two Sections consider necessary or desirable to properly discharge the responsibilities of the Board. A quorum shall require each member of the Board to be present or represented by an alternate acting on his behalf.

6. Minutes of Board Meetings. The Chairman of each Section shall appoint a Secretary. The Secretary shall be the official recorder of the Board minutes when the Chairman of his Section is presiding. Each Secretary shall exchange and preserve an authentic copy of the minutes approved by the Board. A draft copy of the minutes will, within fifteen days after the meeting, be sent by the recording Secretary to each member of the Board for review and comments, and the comments shall be received by the Secretary within the next thirty days unless otherwise specified and agreed to by the Board. The minutes will be considered for adoption at the next Board meeting. Copies of approved minutes will be supplied to all Board members by the recording Secretary.

7. Engineering Committees. The Board may designate special Engineering Committees to assist in the performance of the Board's functions. Except as otherwise agreed by the Board, these committees will have an equal number of members from each country. The members will be qualified individuals in their respective fields and they need not necessarily be officers or employees of the Governments of the two countries. Members of the committees will be designated by the Chairman of

each Section and will serve for such periods as he may determine.

8. Technical and Administrative Assistance. The respective Sections of the Board shall be provided with the technical and administrative assistance they require through:

- (a) the provision of Board staff,
- (b) the utilization of services available from departments or agencies of their respective Governments, and
- (c) the retention of consulting engineering services.

9. Reports. As required by Article XV of the Treaty the Board will make reports to the Governments of Canada and the United States at least once a year. Reports to the Governments shall be made through the Minister of Northern Affairs and National Resources for Canada and the Secretary of State for the United States. The initial report by the Board will be submitted by December 31, 1965.

10. Expenses. Except as otherwise agreed by the Board each Government shall, in accordance with the usual budgetary practices, bear the expenses authorized by its own Section of the Board and incurred by or on behalf of that Section in carrying out its duties.

11. Communication with the Entities. Communication between the Board and the entities of the two countries will be through the offices of the respective Chairmen.

12. Rules and Regulations. The Board is empowered to make only such supplementary rules and regulations as are consistent with the procedures defined herein in order to carry out its duties and responsibilities as set forth in the Treaty.

DEPARTMENT OF STATE
WASHINGTON

October 4, 1965.

Excellency:

I have the honor to refer to your Note dated October 4, 1965 together with the Annex thereto regarding the Treaty between Canada and the United States of America relating to Co-operative Development of the Water Resources of the Columbia River Basin signed at Washington on January 17, 1961 which came into force through an exchange of instruments of ratification on September 16, 1964. The Note concerns in particular the establishment of directions to be followed by the Permanent Engineering Board established under the provisions of Article XV of the Treaty in relation to its administration and procedures.

I wish to advise you that the Government of the United States of America agrees that your Note with the Annex thereto, together with this reply, shall constitute an agreement between our two Governments relating to the carrying out of the provisions of the Treaty with effect from the date of this reply.

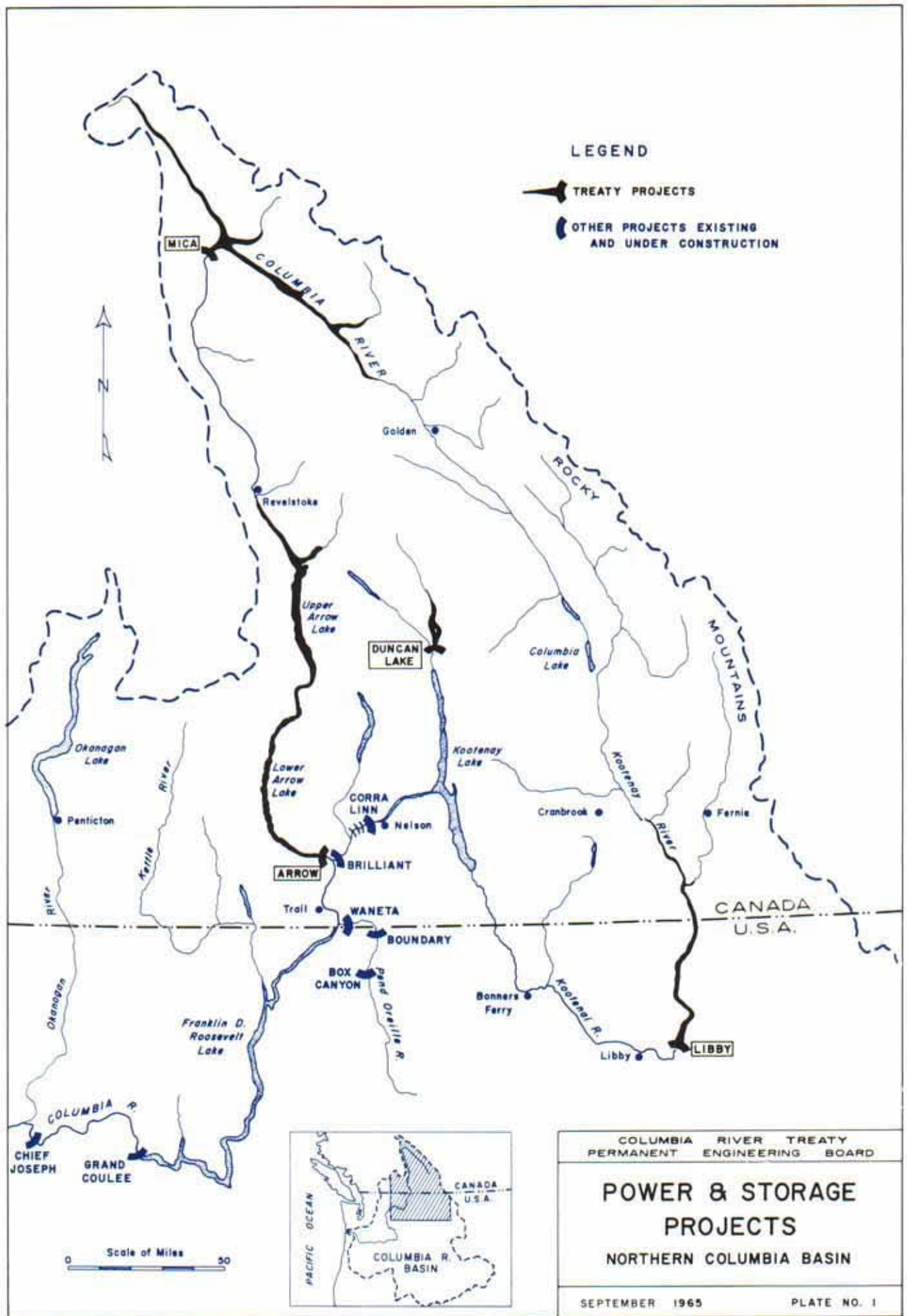
Accept, Excellency, the renewed assurances of my highest consideration.

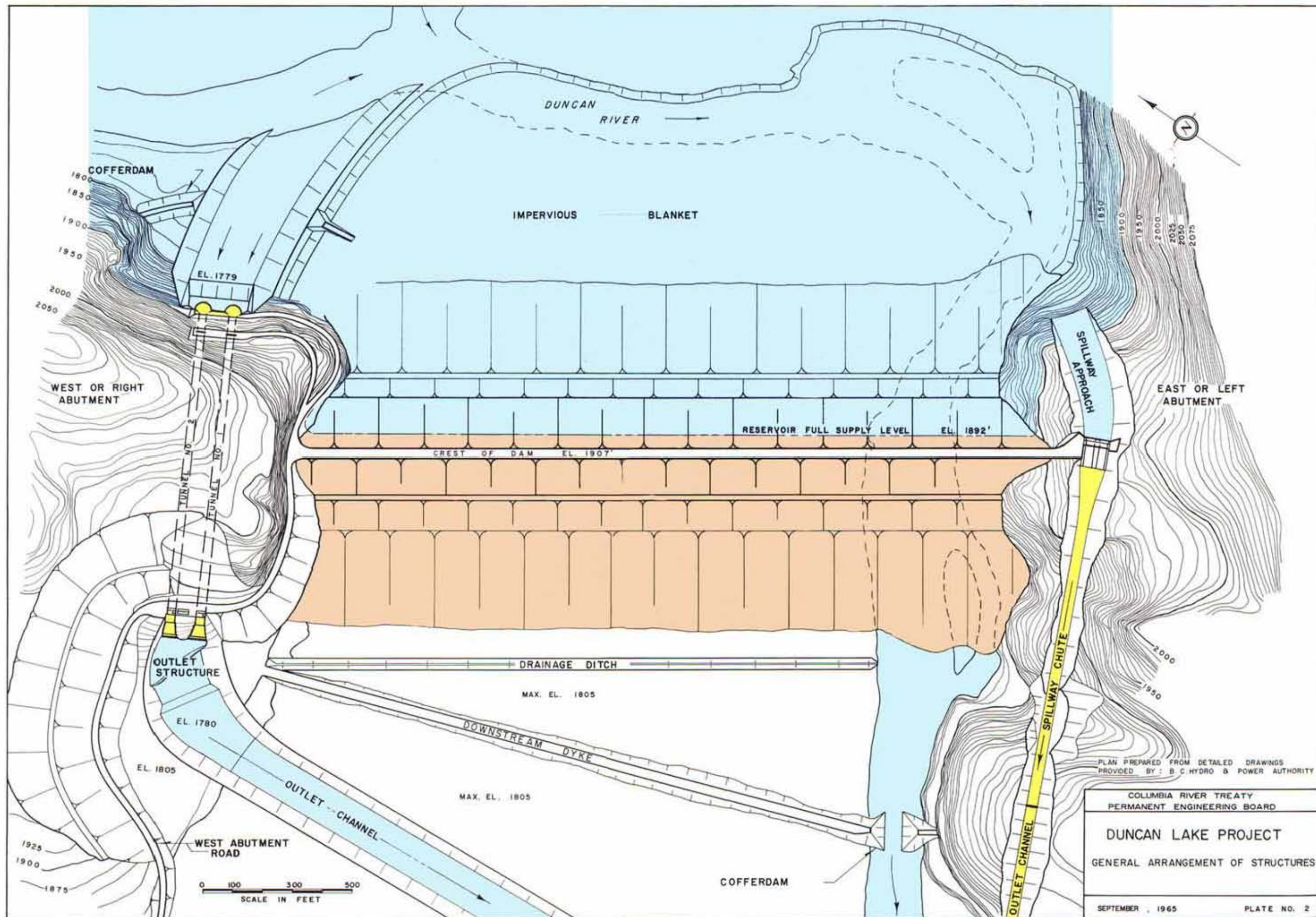
Secretary of State

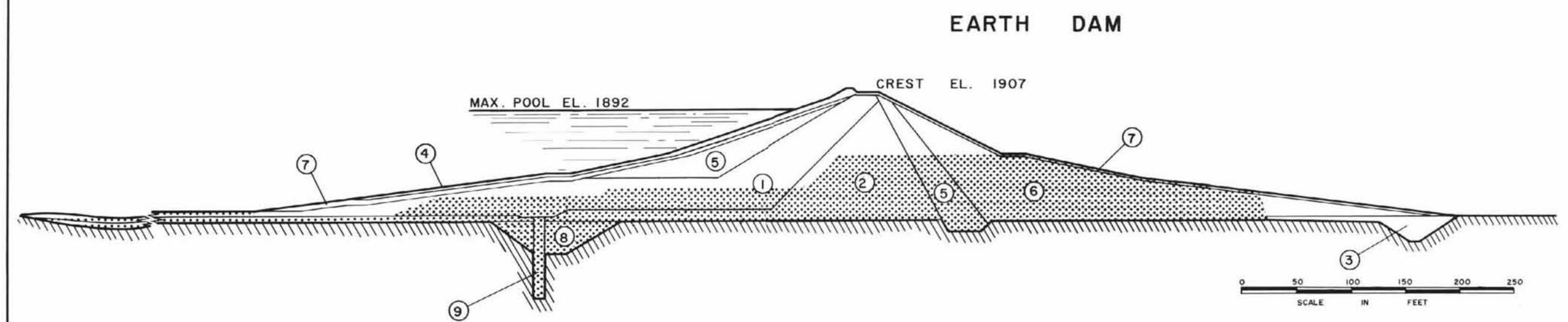
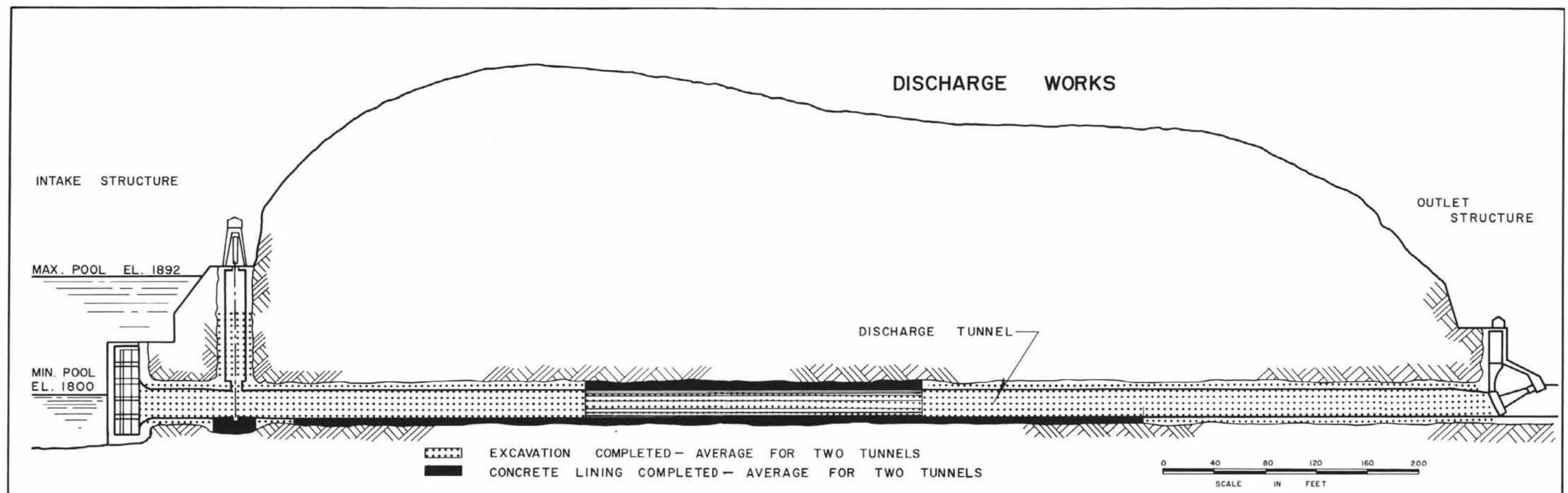
His Excellency
C. S. A. Ritchie,
Ambassador of Canada.

LIST OF PLATES

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Power and Storage Projects, Northern Columbia Basin	1
Duncan Lake Project, General Arrangement of Structures	2
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Libby Project, Reservoir Area	8





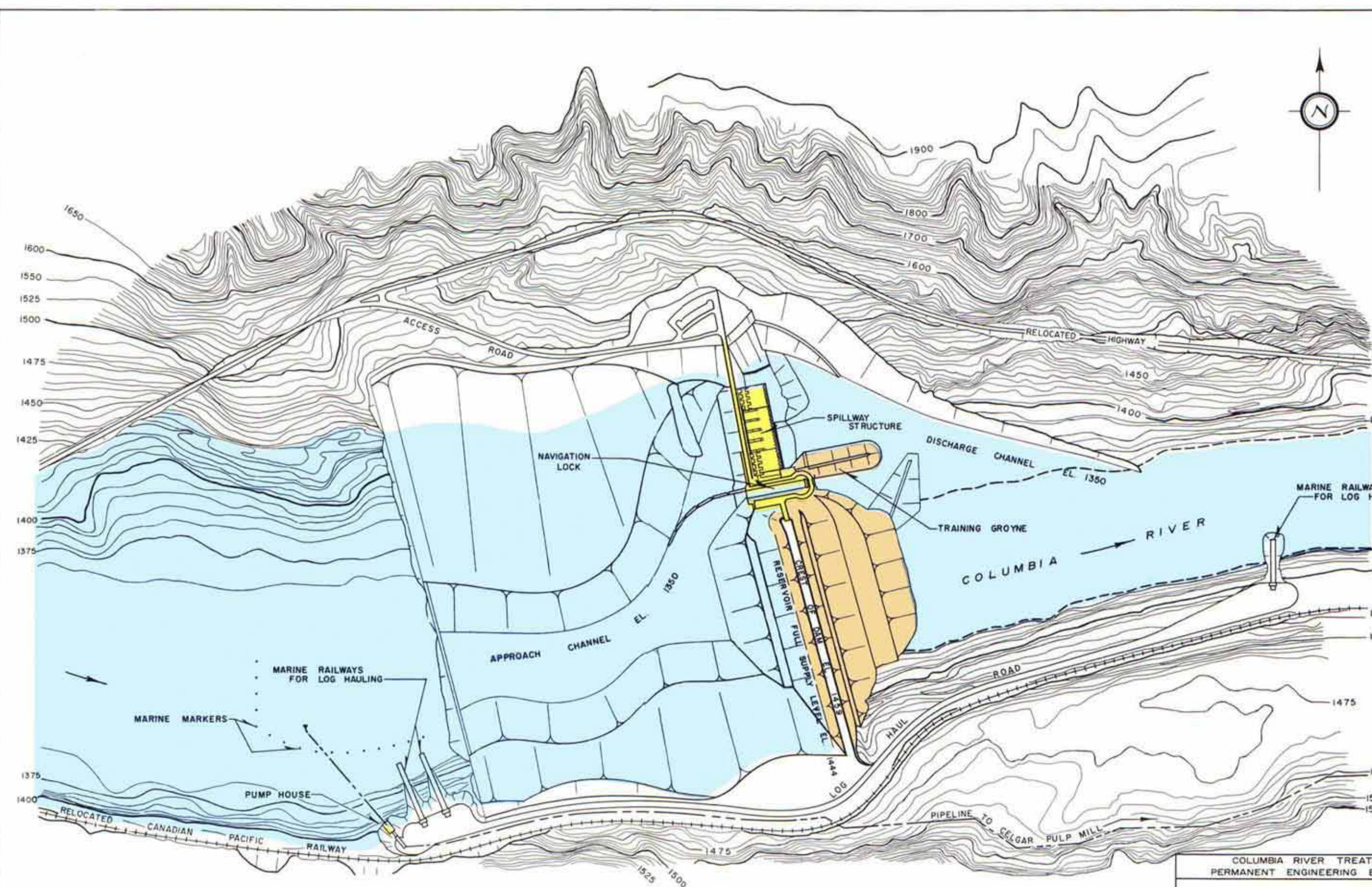


ZONE	MATERIAL
1	IMPERVIOUS FILL
2	SEMI PERVIOUS FILL
3	PROCESSED FILTER
4	RIP RAP
5-8	PERVIOUS FILL VARIOUS GRADINGS
9	IMPERVIOUS CUT-OFF WALL

COLUMBIA RIVER TREATY
PERMANENT ENGINEERING BOARD

DUNCAN LAKE PROJECT
PROGRESS CHARTS
OF
DISCHARGE WORKS & EARTH DAM

SEPTEMBER 1965 PLATE NO. 3



PLAN PREPARED FROM DETAILED DRAWINGS
PROVIDED BY: B.C. HYDRO & POWER AUTHORITY

COLUMBIA RIVER TREATY PERMANENT ENGINEERING BOARD	
ARROW PROJECT	
GENERAL ARRANGEMENT OF STRUCTURES	
SEPTEMBER, 1965	PLATE NO. 4

