

INTERNATIONAL JOINT COMMISSION

Grand Coulee Dam and Reservoir

(Hearing at Spokane, Washington, Sept. 6, 1941)

I N D E X

	<u>Page</u>
Appearances .....	6
<u>Statements and Submissions</u>	
Lorne A. Campbell, President West Kootenay Power and Light Company, Ltd., Trail, B. C. ....	10
W. J. Tindale, Hydraulic Engineer, West Kootenay Power and Light Company, Limited .....	13
Green H. Hackworth, Legal Advisor, Department of State .....	25
Col. Richard Park, Corp of Engineers, U. S. War Department, Portland, Oregon .....	30
F. A. Banks, Supervising Engineer, Grand Coulee Dam, Spokane, Washington .....	33

INTERNATIONAL JOINT COMMISSION

Hearing

to consider the Application of the Government of the United States for approval of the construction and operation of the Grand Coulee Dam and Reservoir, Columbia River, Washington.

Spokane, Washington  
Saturday, Sept. 6, 1941

Pursuant to notice the Commission met in the Davenport Hotel at Spokane, Washington on Saturday, September 6, 1941, at 10:00 o'clock a. m., Mr. A. O. Stanley presiding.

PRESENT:

Mr. A. O. Stanley (presiding); Mr. J. E. Perrault;  
Mr. Charles Stewart and Mr. Roger B. McWhorter.  
Joint Secretaries, Mr. J. B. Ellis and Mr. L. J. Burpee

Mr. Stanley: The Commission will come to order. Mr. Secretary, you had better read the application, I presume.

Mr. Ellis (Reading):

September 30, 1940

The International Joint Commission,

Washington, D. C., United States of America; and  
Ottawa, Ontario, Dominion of Canada.

Sirs:

1. The Government of the United States hereby submits to the International Joint Commission, under the provisions of Article IV of the Treaty of January 11, 1909, between the United States and

Great Britain, this application requesting that the Commission give consideration to such effects, if any, as the construction and operation of the Grand Coulee Dam and Reservoir, Columbia River, Washington, may have on levels or stages of the said Columbia River at and above the international boundary between the United States of America and the Dominion of Canada, and the consequences thereof; and that the Commission enter an appropriate order in the premises, expressly approving the construction and operation of the said Grand Coulee Dam and Reservoir.

2. Conservation, and utilization in the public interest, of the waters of the Columbia River having been under consideration for many years, the Congress of the United States by an Act approved August 30, 1935 (49 Stat. 1028), provided in part:

"That for the purpose of controlling floods, improving navigation, regulating the flow of the streams of the United States, providing for storage and for the delivery of the stored waters thereof, for the reclamation of public lands and Indian reservations, and other beneficial uses, and for the generation of electric energy as a means of financially aiding and assisting such undertakings, the projects known as 'Parker Dam' on the Colorado River and 'Grand Coulee Dam' on the Columbia River, are hereby authorized and adopted, and all contracts and agreements which have been executed in connection therewith are hereby validated and ratified, and the President, acting through such agents as he may designate, is hereby authorized to construct, operate, and maintain dams, structures, canals, and incidental works necessary to such projects, and in connection therewith to make and enter into any and all necessary contracts including contracts amendatory of or supplemental to those hereby validated and ratified."

3. Pursuant to this Congressional authorization, the United States, acting through the Bureau of Reclamation, Department of the Interior, has, since December 1933, been engaged in the construction of the aforesaid Grand Coulee Dam, located in the Columbia River, in the extreme northeastern portion of Township 28 North, Range 30 East, W. M., State of Washington. This dam, now nearing completion, will be a massive, straight-gravity-type structure, rising about 550 feet above the lowest part of the foundation, and raising the water surface of the river approximately 355 feet to elevation 1290 feet above mean sea level, the reservoir thus created being about 151 miles long, and having gross capacity of approximately 10,000,000 acre feet.

4. That part of the Columbia River Basin lying above the Grand Coulee Dam has an area of 74,100 square miles, of which 39,000 square miles are in Canada. Ultimately, the power installation at this dam will be 1,890,000 kilowatts, in 18 generating units of 105,000 kilowatts each. The project will regulate the flow of the Columbia River and make possible the reclamation of 1,200,000 acres of arid land. 1890 mw

5. The Grand Coulee Dam project is not designed to prejudice the existing rights of any interest on either side of the international boundary. Technically, the necessity for securing the approval of the Commission of the construction and operation of the project might reasonably be questioned,

but nevertheless, in view of the possibility that operation of the control dam may at times moderately increase the levels or stages of the Columbia River at and for a short distance above the international boundary, the Government of the United States desires that the Commission give its approval to the project works and to the plan of operation which the Bureau of Reclamation proposes to adopt, in order that the matter may be beyond controversy.

6. Improvements in the channel of the Columbia River at the Little Dallos, 15 miles downstream from the international boundary, as contemplated by the Bureau of Reclamation, will have the effect, it appears, of compensating very substantially for minor stage increases at the international boundary which otherwise might obtain at certain times as a result of the operation of the aforesaid Grand Coulee Dam and Reservoir.

7. Accordingly, the Government of the United States asks that the International Joint Commission approve the Grand Coulee Dam and the proposed method of operation of the reservoir to elevation 1290 feet above mean sea level.

8. This communication will, it is believed, be found by the Commission to contain all essential avorments regarding the facts upon which this application is based and the nature of the order of approval desired, and to be in conformity with the provisions of Paragraph (a) of Rule 6 and with Rule 7 of the Commission's Rules of Procedure.

9. In submitting this application to the Commission, the hope is expressed, on behalf of the United States, that in view of the importance of the matters involved and the exigent need for immediate action, the Commission will expedite its consideration thereof and its action thereon in order that the project works and the plan of operation thereof may receive the approval of the Commission with the least possible delay.

10. Attached to this application and made a part thereof are the following maps and drawings showing the situation and extent of the project works:

1. Columbia Basin Project - Washington, Map No. 39-84, marked "Exhibit A".
2. Map of Columbia River Reservoir, drawing No. 222-D-5880, marked "Exhibit B".
3. Work surface profile, Columbia River and Reservoir, drawing 222-D-6389, marked "Exhibit C".
4. Plan - Grand Coulee Dam power and pumping plants, drawing 222-D-1907, marked "Exhibit D".
5. Elevations and sections, Grand Coulee Dam power and pumping plants, drawing 222-D-1908, marked "Exhibit E".

The required additional copies of the application are being forwarded to you under separate cover.

Very truly yours,

Enclosures:

CORDELL HULL

Maps and drawings,  
as listed above.

Mr. Stanley: Mr. Secretary, call the appearances.

Mr. Ellis: Mr. Chairman, just a moment. Notice or advertisement has been duly published in papers both in the United States and Canada, with a list of parties on both sides who have been notified. We asked for appearances and we have those who were at Trail, and we have checked them on our list, and additional persons who are here have turned in their cards, and the following appearances have been entered:

APPEARANCES

- V. Meek, Controller, Dominion Water and Power Bureau, Department of Mines and Resources, Ottawa, Engineer Advisor to Commission.
- C. E. Webb, Member for Canada, International Kootenay Lake Board of Control, District Chief Engineer, Dominion Water and Power Bureau, Department of Mines and Resources, Vancouver, B. C.
- C. G. Cline, Senior Assistant Engineer, Dominion Water and Power Bureau, Department of Mines and Resources, Niagara Falls, Ontario.
- A. Wells Gray, Minister of Lands of British Columbia, Victoria, B. C.
- E. Davis, Comptroller of Water Rights, Province of British Columbia, Victoria, B. C.
- J. E. Lane, Deputy Comptroller of Water Rights, Province of British Columbia, Victoria, B. C.
- Green H. Hackworth, Department of State, Washington, D. C.
- Col. Richard Park, Corps of Engineers, U. S. Army, Division Engineer, North Pacific Division, Portland, Oregon, Representing Major General Julian Schley, Chief of Engineers.
- Glenn L. Parker, Chief Hydraulic Engineer, U. S. Geological Survey, Washington, D. C. Engineer Advisor to the Commission.

- R. W. Davenport, Chief, Division of Water Utilization, U. S. Geological Survey, Washington, D. C.
- B. E. Stoutmeyer, District Counsel, Reclamation Bureau, Portland, Oregon, representing U. S. Reclamation Bureau.
- D. C. McConaughy, Senior Engineer, Bureau of Reclamation, Denver, Colorado.
- F. A. Banks, Supervising Engineer, U. S. Bureau of Reclamation, Couloee Dam, Washington.
- Major Joseph Jacobs, Consultant, U. S. Bureau of Reclamation, Seattle, Washington.
- Ed Davis, Director of Conservation and Development, State of Washington, Olympia, Washington.
- Henry R. Stevens, Senior Hydraulic Engineer, Portland, Oregon, representing the Bonnoville Power Administration, Portland, Oregon.
- Lorne A. Campbell, President, West Kootenay Power and Light Company, Limited, Trail, B. C.
- A. L. Johannson, West Kootenay Power and Light Company, Limited; the Consolidated Mining and Smelting Company of Canada, Limited, Trail, B. C.
- W. J. Tindalo, Designing and Hydraulic Engineer, West Kootenay Power and Light Company, Limited, Trail, B. C.
- C. C. Morrison, Agricultural Development Department, Great Northern Railway, Seattle, Washington.
- Chas. H. Paul, Consulting Engineer, U. S. Bureau of Reclamation, Dayton, Ohio.
- Thomas R. Nowell, U. S. Geological Survey, Boise, Idaho.
- William Blanc, Water Rights Engineer with Province of British Columbia, Nelson, B. C.
- Ray A. Biggs, Civil Engineer, 414 Mohawk Bldg., Spokane, Wash.
- W. P. Romans, Department Manager, Spokane Chamber of Commerce, Spokane, Washington.
- A. J. Turner, The Washington Water Power Company, Spokane, Wash.

E. H. Collins, Washington Water Power Company, Spokane, Wash.

R. C. Murphy, City Passenger and Ticket Agent, Great Northern Railway, 819 Sprague Avenue, Spokane, Washington.

? Ray Sims, Bonners Ferry, Idaho.

---

Mr. Stanley: Are there any other persons present representing any interests whatever connected with this Grand Coulee project who wish to enter their appearance? If so, they can speak now.

(No response)

Mr. Parker and Mr. Meek made some statements for us at Trail. Now, gentlemen, I believe you said you had further statements to make here.

Mr. Parker: Mr. Chairman, I think the report of the engineer advisors was handed to you and made a part of the record at Trail by Mr. Meek, supplemented by some comments I made for the record. Unless the Commissioners would like additional information, I wonder whether it is necessary to repeat the presentation of the report?

Mr. Stanley: It is all in the record and not necessary to make any repetition, but I thought perhaps you might have some additional statements you cared to make, to supplement in any way the statements you very kindly made to us at Trail.

Mr. Parker: I know of no further information to present to the Commission. The results of our studies were very satisfactory to both Mr. Meek and myself. We are happy that the

outcome was as favorable as it was, and we believe now that all the information we can give you is in your hands.

Mr. Stanley: Mr. Meek?

Mr. Meek: Mr. Chairman, I concur in what Mr. Parker has said. I don't think I have any further statement to make. We are available to answer any questions about the report that might come up.

Mr. Stanley: I believe Mr. Veatch is here today. We would be glad to hear any report you have to make at this time.

Mr. Veatch: I have no report to make, Mr. Chairman, unless you have any questions.

Mr. Stanley: Mr. Webb?

Mr. Webb: Mr. Chairman, I have no further report to make. Mr. Veatch and I submitted our report to you on the basic features at Trail, and there is nothing further that I could add at present.

Mr. Stanley: It is all part of the record. Are there any representatives from the Bureau of Reclamation that have any remarks to make at this time? We would be glad to hear from you, gentlemen.

Mr. Stoutmeyer: We have nothing more to present, except to say if there is anybody here that have any questions to ask we would be glad to answer them.

Mr. Stanley: Is Mr. Lane present, representing the British Columbia Government?

Mr. Lane: Mr. Chairman, the British Columbia Government presented a prepared statement at Trail, which was read by Mr. Davis. We have nothing further to add to that.

Mr. Stanley: Is Mr. Wells Gray present? We would be glad to have you address us.

Mr. Gray: Mr. Chairman, and gentlemen: There is not a thing that we have to put in not already on file with you. We are perfectly satisfied with the whole project.

Mr. Stanley: We have Mr. Campbell here of the Kootenay Light and Power Company. Mr. Campbell has watched the proceedings very closely and we would like to hear anything he has to say about the effects and the behavior of this river behind the Grand Coulee Dam.

Mr. Campbell: Mr. Chairman, and members of the International Joint Commission: At our hearing in Trail Mr. E. Davis, Controller of Water Rights of the Province of British Columbia filed a memorandum which I believe is in the record, calling to the Commission's attention the loss of a potential head of approximately ten feet on the Pend d'Oreille River at extreme low water. Now, that loss of head occurs between the international boundary and the tail-water of Z Canyon, if that development is ever proceeded with. Mr. Davis, the water controller, said that there was approximately ten feet of head on the United States side of the river which is not capable of utilization at the Z Canyon power development. Our surveys show

that the difference in the elevation of the tail-water of the proposed development at Z Canyon and the international boundary line is twenty-nine feet; and I would like that to reflect in the record which I believe was taken down at Trail.

I might further state, Mr. Chairman, that this Pond d'Oroillo development which we have been investigating from the year 1928, is the second large development which we have on our side of the line. We have one other development on the Kootenay River known as the Brilliant development. In the ordinary course of events that development would be next undertaken. After that development is completed we would naturally turn to the Pond d'Oroillo development. The loss of head I will leave Mr. Tindale, our Chief Hydraulic Engineer, to deal with, who will read a memorandum which we have prepared, but I am asking at this time, Mr. Chairman, that your Commission take into consideration the Pond d'Oroillo development and the effects that it will have upon the further development of our side of the line.

I might state, Mr. Chairman, for your information, that we have taken this matter up with the late Col. Cooper, who was then interested in the development of the Z Canyon power. At that time, as you know, we were in the height of a depression, and we found that it was not advisable to continue our investigation at that time. In order that the Commission may be in a position to have the Pond d'Oroillo River before them we propose

filing a part of our plans - E-12 (submitting a map).

Mr. Stanloy: Mr. Campbell, could you conveniently file that in duplicate so that we would have one for each section of the Commission?

Mr. Campbell: I was going to mention that, Mr. Chairman. Unfortunately, we have only got one copy of this plan, but we will be very glad to secure other copies and see that they are mailed without delay. That will be Exhibit No. 1?

Mr. Stanloy: Our Ellis, our Secretary, will mark that as Exhibit No. 1.

Mr. Campbell: E-12 shows our proposed development at Cedar Creek and also we show on this plan how a dam can be constructed at Cedar Creek and water conduits run from the dam site to the Columbia River in order to take in the full head at all times of the flow of the Pend d'Oreille River. I also wish to draw to your attention that this development is ten miles distant from the consolidated works at Trail, which we also have considered on account of the short transmission distance, and it is a very favorable power site, and therefore, we think it should be taken into consideration, as you always have done, that it is developed to the very best advantage and for the best uses of all concerned.

Mr. Stanloy: I have seen that power site. It is a remarkable power site, but I do not recall the exact distance between the proposed location of this power site and the Columbia River. I think it is above the Columbia River.

We have under consideration two developments here. Cedar Creek is approximately one mile from where the Pendd'Oreille River enters into the Columbia River. The second site which Mr. Tindale will deal with, is 1500 feet from the Columbia River.

Mr. Stanley: The fall and difference in these levels between the tail-waters of this dam, at the dam, and the level of the Columbia River is how much?

Mr. Campbell: I would prefer to leave that to our engineers report.

Mr. Stanley: I would like to have that in the record.

Mr. Campbell: I think, Mr. Chairman, that is about all I can say. I will now ask Mr. Tindale to present his memorandum.

STATEMENT OF W. J. TINDALE  
Hydraulic Engineer, West Kootenay Power  
and Light Company Limited

Mr. Tindale: Mr. Chairman and members of the Commission: I have here a memorandum, to which Mr. Campbell has referred; with your permission I will proceed to read it (Reading):

The West Kootenay Power and Light Co. Ltd. in the years 1928-1929-1930 and again in the year 1936, carried out extensive field work and engineering studies in connection with possible development of hydro-electric power on the Pond d'Oreille River.

As a result of investigations of several power sites on the river during the years 1928-1929 and 1930, the Cedar Creek

site, located approximately one mile upstream from the Columbia River, was selected for further study as the one most suitable for development under high head to produce a large amount of power.

In the year 1936 further work was carried out to investigate the power possibilities of a site known as the Waneta site, located 1600 feet upstream from the Columbia River.

Final studies and field investigations of these sites were not completed; however, when considering the possibility of future development of one of these sites, the following data are of interest:

#### The Cedar Creek Site

At this location it is possible that a dam could be constructed to develop all available head from the structure upstream to the tailrace of a possible plant located in the State of Washington at Z Canyon, which is about two miles south of the International Boundary.

The fall from Z Canyon to the International Boundary is approximately twenty-nine feet, and it is probable that a dam could be built at Cedar Creek to utilize a considerable proportion of this fall for power purposes without interference with a possible power development at Z Canyon.

The Cedar Creek dam site crosses a narrow canyon which is very restricted for installation of a large power house, and the possibility of diverting the water for power production

overland to a power house more conveniently located at Columbia River was considered.

In addition to the head created upstream from the Cedar Creek dam, if the power house were located at Columbia River it would use for additional power head the fall of the river, amounting to approximately fifty feet between Cedar Creek and the Columbia River.

#### The Wanota Site

Due to foundation conditions, the crest of a dam built at this location would be considerably lower than the crest of a dam at Cedar Creek, and as a result there would be no backwater across the International Boundary towards Z Canyon. There would, however, be backwater of minor importance across the boundary up Cedar Creek.

The fall of the river between the dam site and the Columbia River is approximately twenty-four feet at low flow stages, and if this twenty-four feet of fall were to be used for power head, it would be necessary to locate the power house at Columbia River near the mouth of the Pond d'Oreille River.

#### Grand Coulee Backwater

According to the Joint Report dated July 15, 1941, by engineer advisors to the International Joint Commission, Victor Meek, Controller of the Dominion Water and Power Bureau, and G. L. Parker, Chief Engineer of the United States Geological Survey, some backwater across the International Boundary will

result from operation of the Grand Coulee dam.

On page 11 of the said report it is stated that the backwater at the boundary will vary from 2.5 feet to one foot for discharges between 20,000 second-foot and 50,000 second-foot, and from one foot to 0 for discharges between 50,000 second-foot and 400,000 second-foot.

On page 12 of the said report it is stated that backwater at the Pond d'Orcille River at its mouth would be essentially the same as at the International Boundary.

It is evident, therefore, that if a power house were constructed at the Columbia River to develop power from either the Cedar Creek or Waneta sites on the Pond d'Orcille River, some loss of head at the power house would result from the operation of Grand Coulee dam.

#### Conclusion

This memorandum is presented, not as an objection to operation of the Grand Coulee dam in the manner proposed, but to put on record conditions which may arise if power is ultimately developed by the West Kootenay Power and Light Co. Ltd. on the Pond d'Orcille River with the power house located at the Columbia River.

When considering information from the power investigations carried out to date, it appears that if the power resources of the stream were to be developed to their fullest extent, the dam would probably be located at Cedar Creek and

water would be diverted to a power house at Columbia River.

The West Kootenay Power and Light Co. Ltd. may eventually proceed with a development of the power resources of the Pend d'Oreille River. The Company may at that time consider it advisable to apply to the International Joint Commission for permission to raise water levels across the International Boundary to compensate for loss of head due to backwater from Grand Coulee dam. The Company may apply further at that time for permission to develop 'on the stream' all power head which can be created without interference with a possible future development at the Z Canyon power site.

Dated at Trail, British Columbia, the 6th day of September, 1941.

W. J. TINDALE

Mr. McWhorter: As I understand your statement, Mr. Tindale, the Cedar Creek and Waneta sites are alternative sites; you do not contemplate the possibility of the construction of dams and power plants at both these sites?

Mr. Tindale: You are quite correct; they were alternative sites. We had not decided which would be the most suitable for development. We were investigating both sites.

Mr. McWhorter: It is your position that whichever of these sites is developed the head will be moderately-- or perhaps slightly is the better word - reduced at certain times by the backwater from the Grand Coulee dam?

Mr. Tindale: Yes, if the power house served by either dam across the Pond d'Orcille River were placed at the Columbia River.

Mr. McWhorter: Did you give any consideration to the fact that at certain other times the head in your turbines would be somewhat increased?

Mr. Tindale: That would be an advantage at high-flow stages.

Mr. McWhorter: When you have the least head?

Mr. Tindale: Yes.

Mr. Stewart: Mr. Tindale, I understood you to say that in the event of building either dam the possibility is that you will locate the power site near the mouth of the Pond d'Orcille?

Mr. Tindale: Yes.

Mr. Stewart: Then the backwater from the Columbia River would have a detrimental effect?

Mr. Tindale: Yes.

Mr. Stewart: In the construction of a dam at either site would your backwater cross the International Boundary?

Mr. Tindale: Only at the Cedar Creek site. The Wanota site was considerably lower in elevation. The foundation conditions would not permit the construction of a high dam at that point, and the backwater from the Wanota site would not reach anywhere near the International Boundary.

Mr. Stanley: If the power house in either case were located immediately adjacent to the dam you would not have the difficulty you mentioned from backwater resulting from the operation of the Grand Coulee dam?

Mr. Tindale: No.

Mr. Stanley: It does not occur to me why it is necessary to place your power house at that distance from the dam.

Mr. Tindale: With regard to the Cedar Creek site the dam is located in a very narrow restricted canyon and the space is very restricted for the installation of power units to develop the power which could be developed there. One other reason: from Cedar Creek to the Columbia river there is a fall of approximately fifty feet. If we were to provide conduits to carry the water from the dam down to the Columbia River we would get the benefit of that fifty feet for additional power head on the plant. Our power-developing units would be placed at the Columbia river.

Mr. Stanley: You would utilize both the fall from the dam and the natural slope of the river?

Mr. Tindale: Yes.

Mr. Stewart: If you constructed the plant at or near the Columbia River you would take advantage of the fifty feet of head that would be created by placing the plant there; therefore, you would be more liable to backwater, wouldn't you? In other words, the Columbia at its normal stage would be what

you would expect to have most of the time; but if the water in the Columbia should be raised two and one-half feet, as suggested in the report of the engineers, there would be two and one-half feet of backwater on your plant?

Mr. Tindale: Yes, there would be two and one-half feet of backwater on the plant and, in consequence, two and one-half feet loss of head as compared with natural conditions.

Mr. Stewart: We are very glad to get that information, because I was under the impression that when you constructed your power plant you would have under ordinary conditions three or four feet of a fall from the power plant itself to the Columbia River. I was under the impression that two and one-half feet would not interfere in any way with your plant.

Mr. Tindale: If we could in the future place the power house on the Columbia River to use the waters from the Pond d'Orcille river we would set the center line of turbines approximately four feet above the lowest water elevation in the river .

Mr. Stewart: Of the Columbia?

Mr. Tindale: Yes; therefore, if any backwater was created we would have to take that into consideration in placing our units.

Mr. Stewart: If you did not take advantage of the fall of fifty feet from the dam to the power plant you would not be troubled so seriously by back-water, but of course you would

have considerable loss of power?

Mr. Tindale: If we were not to take advantage of the fifty feet of fall from Cedar Creek to the Columbia River, that would mean that our power house would be located at the dam site; then we would not be interfered with by backwater from the Grand Coulee.

Mr. McWhorter: What is the fall between the Wanota site and the Columbia River?

Mr. Tindale: The fall is approximately twenty-four feet.

Mr. McWhorter: If you constructed a dam at the Wanota site you would unquestionably put your plant at the Columbia River?

Mr. Tindale: We would if possible.

Mr. Stewart: I take it, Mr. Tindale, that you are apprehensive of the two and one-half feet of backwater that is liable to occur from time to time across the International Boundary - that it would affect the flow and the power at that particular location on the river?

Mr. Tindale: Yes, it would reduce the power head by the amount of backwater.

Mr. McWhorter: Mr. Tindale, taking account of the findings of the engineer advisers, that the head would sometimes be increased and sometimes be decreased as the result of the operation of the Grand Coulee dam, have you made any estimate of the net effect on the power output from your plant as to

both capacity and energy?

Mr. Tindale: You mean taking into consideration the raising at low-flow stages and the lowering at high-flow stages?

Mr. McWhorter: Exactly - it would have an effect upon your capacity and also upon your energy output. Have you estimated that effect?

Mr. Tindale: We have not estimated the effect. The lowering which would come into effect with the flow at about 400,000 cubic feet per second would be of rather small magnitude except in case of very high floods.

Mr. McWhorter: Obviously that is correct, because of the fact that the duration of these high stages is relatively small.

Mr. Tindale: In the year 1928, when there was a relatively large flood, I believe the flow across the International Boundary was something in the vicinity of 460,000 cubic feet per second. The lowering of the flood level at that particular stage due to the Grand Coulee would not be a very large amount.

Mr. McWhorter: Now, you have not stated whether or not you have determined how your capacity and energy output would be affected.

Mr. Tindale: In the case of backwater amounting to two and one-half feet the head loss would be approximately two and one-half feet on the power units, and that would have some slight effect in reducing power output. If on the other hand, the water were lowered during the high flood, the head on the

plant would be increased slightly as compared with natural conditions. That would give a slight increase in the amount of power that would be produced. But figures comparing the different amounts have not been prepared.

Mr. McWhorter: The location of your power house would determine whether or not the operation of the Grand Coulee dam would affect your head at all?

Mr. Tindale: Yes.

Mr. McWhorter: Have you any idea as to when that power plant might be constructed?

Mr. Tindale: I personally have no idea. It is rather some distance in the future, I believe, if it is constructed - probably quite a long time.

Mr. McWhorter: Then it would appear to be a matter which could be dealt with at such time as the plant is constructed?

Mr. Tindale: Yes.

Mr. McWhorter: And when the facts are known as to whether the head will actually be reduced?

Mr. Tindale: Yes, that is what we estimated - that it would be dealt with at the time, when the application would be made for permission to store some water south of the International Boundary.

Mr. McWhorter: Now at that juncture, when you speak of the International Boundary you mean the point at which the Pond d'Oreille river crosses the boundary?

Mr. Tindale: Yes.

Mr. McWhorter: And it is your present thought that when you construct the Cedar Creek or the Waneta power project, whichever it may be, your Company would apply to this Commission for authority to raise the water of the Pond d'Oroille River at the International Boundary by a sufficient amount to compensate for the loss of head by reason of the construction and operation of the Grand Coulee dam?

Mr. Tindale: Yes, that is the idea.

Mr. McWhorter: Chairman Stanley inquires about the extent to which this Waneta project would be bound to raise the water in the Pond d'Oroille River at the boundary; that, of course, would depend upon what the Commission authorized you to do in the way of raising it?

Mr. Tindale: Yes.

Mr. Stanley: You expect when you make your application, of course, to state the dimensions of the dam.

Mr. Tindale: Yes. That would depend on our application if and when it was made. We might apply for permission to store or hold back such head as we could get without affecting the Z Canyon development. Then again, we might have to take other things into consideration and we might not apply for that much. That would have to be determined at the time.

Mr. Stanley: Do you anticipate any other developments on the Pond d'Oroille besides the ones you have mentioned here, as

affected by the construction of the Grand Coulee Dam?

Mr. Tindale: Only the two we were investigating.

Mr. Stanley: And they are alternatives?

Mr. Tindale: Yes.

Mr. McWhorter: That is, you contemplate the construction of one or the other of those two sites?

Mr. Tindale: Yes. We think that the two sites we investigated - the one at Cedar Creek and the one at Waneta - are probably the best sites for development of a large amount of power.

Mr. Stanley: Of course, the height of the dam would depend on which site you selected?

Mr. Tindale: Yes.

Mr. Stanley: And since you are not prepared to state now which one of these sites you will develop, you cannot give us exact figures as to the character of the structure that you propose to build?

Mr. Tindale: No, not at present.

Mr. Stanley: Mr. Hackworth, we have just called for any remarks. You are legal representative of the Government, and if you have any further statements to make we will be glad to hear them.

STATEMENT OF GREEN H. HACKWORTH  
Legal Advisor, Department of State

Mr. Hackworth: Mr. Chairman and gentlemen of the Commission: It seems to me that it is probably unnecessary that I

make any statement. I would like to express very briefly my understanding of the contentions of Mr. Campbell and Mr. Tindale, in order to determine whether or not my understanding is correct. My understanding is this: They are filing here this morning what in effect amounts to a caveat; that is to say, they have put in their reservations. They raise no objections to this Grand Coulee project, but they are putting in a reservation for the consideration of a condition if and when it should be decided to construct a dam on the Pond d'Orcille River at some as yet undetermined site; and if they should decide to construct a dam at a given location, they would like to have the Commission consider the effect of the backwater from the Grand Coulee Dam upon their project and take that into account. I should like to ask Mr. Campbell or Mr. Tindale whether that is the effect of their statements this morning.

Mr. Tindale: I might read again this final paragraph of this memorandum (Reading):

"The West Kootenay Power and Light Co. Ltd. may eventually proceed with a development of the power resources of the Pond d'Orcille River. The Company may at that time consider it advisable to apply to the International Joint Commission for permission to raise water levels across the International Boundary to compensate for loss of head due to backwater from Grand Coulee dam. The Company may apply further at that time

for permission to develop 'on the stream' all power head which can be created without interference with a possible future development at the Z Canyon power site."

Mr. Hackworth: That is in accordance with my understanding of their position. Now, we have in that situation two contingencies. One is whether or not they shall decide at some time to build a dam or dams on the Pend d'Oreille River, and that as yet is a matter of speculation. It has not been decided to do that, as I understand their position. Secondly, we have the further question as to whether the effect of the Grand Coulee dam will be to raise the level of the water at the boundary. Now, we know our engineers have surveyed that situation and have come to the conclusion that there is that possibility, that the water will be raised a little more than two feet during the low-water period, and that envisages keeping the Grand Coulee dam at 1290 elevation; that in turn depends on various other contingencies which we cannot foresee, one of which is the question of rainfall and the natural output of the streams. Another is the question as to whether our people shall find trouble for various reasons in keeping the elevation to 1290, as is now contemplated to do, bearing in mind their reservoir for irrigation purposes and other matters. While these things have been worked out to a more or less mathematical precision, there are always uncertain and unknown quantities to

be taken into account in connection with a long range program of this sort - matters which we cannot foresee, and therefore not certain in their entirety.

If the statement presented this morning is of the character as I have outlined, then it seems to me there is no objection to it. It is quite in keeping with their right to file this caveat and to have it kept in mind, and under the conditions I don't believe the United States, or this side, can well raise objection, because the matter is still in the hands of the Commission to be dealt with when the occasion arises, and we have no doubt it will be dealt with properly and all interests will be taken into account, whether it has to do with backing up the water on the American side of the Pond d'Orcillo River or otherwise. It seems to me there is no fundamental difference in opinion here, if there is any difference at all. That is the way I size up the situation, Mr. Chairman.

Mr. Stanley: We have seen from these so-called protests - they are hardly protests - they are just statements asking us to safeguard their interests and not to make a final order that might preclude their seeking relief for injuries that are not now tangible - it is the desire of a great many that this order authorizing the operation of the dam at 1290 shall be in the nature of an interim order, giving the right to operate the dam and reserving the right on the part of the Commission to reconsider any detrimental things that may develop insofar as Canadian

matters might be concerned; and it strikes me whenever application is made to this Commission for this construction of this structure in Pond d'Oroille, that we will handle the question as we have - well, satisfactorily - and all possible damages to American citizens by the raising of water on the Pond d'Oroille and possible damage to Canadian citizens - those matters can well be considered at any time, provided there is nothing in the order that is now entered that would preclude a final discussion of that question when it arises.

Mr. Hackworth: That is exactly my understanding.

Mr. Stanley: We entirely concur with you.

Mr. Hackworth: Therefore, it would seem to me that we might well give the approval to this project, with the right to reconsider it at a later date, if and when the occasion arises, and then everybody will be satisfied. Our people can go ahead with their project on this side and feel assured they are not going to be interfered with or impeded; and when our good friends on the other side come to the point that they want to develop the Pond d'Oroille, why this can be taken into account and there will be an equitable consideration of the rights of all the parties under all the circumstances.

Mr. Stanley: You perhaps, played a most important part in the preparation of the Lake of the Woods treaty of 1925?

Mr. Hackworth: That is right.

Mr. Stanley: And I presume you are acquainted with the

subsequent proceedings on account of your previous knowledge of the situation?

Mr. Hackworth: That is true.

Mr. Stanley: And with the custom and method of procedure?

Mr. Hackworth: We did that in the Lake of the Woods, and on the Lake Champlain project, and on the St. Lawrence project, and they are right now retaining jurisdiction, as you properly should, so that you could take up those matters in the light of future developments, and I recommend the Commission give serious consideration to the approval of this present application, so that the United States and the Canadian interests can feel that their interests are safeguarded.

Mr. Johannson: Mr. Chairman and gentlemen: The West Kootenay Power and Light Company and Consolidated Mining and Smelting Company have nothing to add to what has been stated by Mr. Campbell and Mr. Tindale. I should like to express the appreciation of myself and my associates for all the courtesies which have been extended to us and for the orderly and judicial attitude adopted by the Commission in these international affairs.

Mr. Stanley: Thank you. Are there any other persons who desire to be heard?

Mr. Park: (Colonel Corp of Engineers, United States War Department, Portland, Oregon) I merely want to take this opportunity to assure you that the chief of engineers is in full accord with all of your conclusions in the reports that were sub-

nitted at Trail the other day. I particularly appreciate the courtesy expressed by Mr. Webb in his reference to the work of the army engineers in connection with the preparation of House Document No. 103, which was prepared about ten years ago. Naturally, inasmuch as the conclusions drawn and the project constructed follow substantially along these lines, the War Department is in complete accord, not only with the project, but with the conclusions with respect to the water levels and the backwater curves and the other hydraulic features. Obviously, the construction and the operation of the Grand Coulee project will have beneficial results - tremendously beneficial results on the production of electric energy at all downstream projects. Its operation even now has a beneficial effect on our Bonneville project, which as you know, has been in operation for some time now. Due to the regulation of the flow it must necessarily have a very beneficial effect on the navigable depth - particularly the low-water depth of the Columbia River, if it is operated with due consideration to that feature, which I am sure it will be. It will also have a beneficial effect in that it will have a tendency to decrease flood damages. Therefore, I want to thank you very much for your courtesy in asking the Chief of Engineers to be represented here.

Mr. McWhorter: Are you division engineer at Portland?

Mr. Park: I am in Portland, Oregon.

Mr. McWhorter: I hope to see you there on the eleventh.

Mr. Park: I shall be there; yes, indeed.

Mr. Stanley: The entire Commission takes this occasion to express our gratification that we met you in handling this matter.

Mr. Park: Thank you, Mr. Chairman.

Mr. Ellis: Mr. Chairman, the Secretary of the Canadian section has a communication.

Mr. Burpee: An application has been filed with the Commission by the Nelson Board of Trade, which reads as follows (Reading):

September 4, 1941

To the International Joint Commission  
on Boundary Waters,  
L. J. Burpee Esq., Secretary,  
Davenport Hotel,  
Spokane, Washington., U.S.A.

Re: Coulee Dam.

Gentlemen:

The undersigned have learned with interest of the presentation made by a member of this Board, Mr. W. J. E. Biker, appearing as a private citizen, at your public meeting in Trail yesterday, regarding the effect the Coulee Dam may have on our migratory fish resources in British Columbia and now wish to present to you for your consideration at your hearing in Spokane on Saturday, September 6th the resolution appended hereto.

We desire to state that we are not fully informed as to the habits and behaviour of our migratory fish and are not aware that the Commission has made any investigation to this end.

The appended resolution, which has been prepared by a special committee appointed for the purpose by regular meeting of our Board held to-day, is also supported by the West Kootenay Association of Rod and Gun Clubs, in which clubs are incorporated members from the whole district affected.

RESOLUTION:

"RESOLVED that we respectfully ask the International Joint Commission on Boundary Waters to have investigations made by competent authorities in order that the Commission may write into its Order of Approval sufficient safeguards to protect the interests of British Columbia in this respect."

Respectfully submitted

Nelson Board of Trade

W. G. C. LANSKAIL  
Secretary

Mr. Stanley: Mr. Banks, you might throw some light on that.

Mr. Banks: I don't believe that there is very much I could add to the statement that I made at Trail, which was to the effect that in addition to the construction of large fish hatcheries on the Wenatchee, Entiat and Methow Rivers to take care of the commercial fisheries, we are also constructing a very large hatchery on Chamokane Creek, a tributary to the Spokane River, for the propagation of game fish, and I assume

that it is possible to divert from the hatchery at Leavenworth certain of the steelhead trout or steelhead salmon, which is in effect sort of a sea-going rainbow trout, to the reservoir. I am advised that fishing is very good in the reservoir and we hope to introduce sufficient species of game fish into the reservoir to make up for any deficiency that may be caused by the constructing of the Grand Coulee dam.

Mr. Stanley: Colonel, in our hearing up on the east coast affecting the hydro-electric developments on the St. Johns River there was a provision, which would not be applicable to the Grand Coulee Dam, for the maintenance of fish ladders at the dam. The experts seemed to think the ladders are all right, but for some reason the fish never got on them, and the result was that a great number of salmon came up the St. Johns before the dam was closed and were caught, and those streams are now full of land-locked salmon. I understand you have a great amount of fingerlings and small fish you are going to produce in these hatcheries to put in the waters of the tributaries of the Columbia River below the Grand Coulee. Now, would it be feasible to put some of those fish into the forebay to propagate along with your rainbow trout? Sometimes fish get along pretty well together and sometimes they don't - like people - the big fish form a habit of eating the little ones. I don't know whether that would be true with salmon and trout or not.

Mr. Banks: I don't think so. There are two possibilities.

One, the introduction of the steelheads and another one, the possible introduction of the blueback salmon. It is the blueback salmon, as I understand it, that under certain conditions will become land-locked, but if they can get out of a lake they will go downstream, and at Coulee Dam there would be opportunities for them to go over the spillways if they were near the surface, or through the turbines.

Mr. Stanley: Would that be destructive?

Mr. Banks: We are afraid that it might. There is a possibility that they would survive the trip over the spillway, but in going through the turbines it is a rather rapid change from high pressure to a low pressure with perhaps a tendency to vacuum. The facilities in the turbines are ample to take care of any fish that might want to go through them.

The development of fish ladders has reached quite a science in more or less recent years. They have become more of a problem in some of our dams. At Bonneville dam fish ladders have been constructed and have been in operation there. The same thing was considered at Coulee Dam but there were two things that were against it. First, that the number of steps that the fish would have to take to get further would be too great for the fish to undertake. We are, as you know, about 600 miles from the ocean, and these migratory fish come up there on their own fat; that is, they don't feed on the way up to any great extent, and they get rather weak when they get there, and the experts in-

dicated that they probably wouldn't go on up over. Furthermore, if they don't go over, then the downstream migrants might be injured by going through the turbines. Further, the fish, in order to get into your fish ladders, are generally trapped by live water, and there is so much fluctuation it was impossible to put in suitable trapping devices to get the fish out.

Mr. Stanley: These ladders<sup>of</sup> which I speak on the St. Johns River and elsewhere are all developments that were put in twenty-five or thirty years ago.

Mr. Banks: That is right. So we have undertaken the problem of changing the homing instinct of the salmon - to re-educate them to up these smaller streams in place of coming up the Columbia River. Our figures indicate that there was only about four percent of the salmon that got by Bonneville that ever got to Coulee, anyhow. But we all recognize the fact that even that four percent should be taken care of, and that is why we built the hatcheries.

Mr. Stanley: Mr. Banks, I believe it is true that fish, especially fish coming from salt water to fresh water to spawn, usually return to the place where they spawned. Now, if a fish spawns in a hatchery and is say, sort of raised on a bottle, you haven't got anywhere he would try to find his future home.

Mr. Banks: Well, the ichthyologists and biologists have been unable to tell us just when the homing instinct develops; whether it exists in the egg, or in the fish after it is hatched

out of the egg. They are quite certain it develops in the fish after it is hatched. Numerous experiments have been performed in the tagging of fish that lead to that conclusion.

Mr. Banks: The difference, I might mention between the two species of fish I mentioned a little while ago - one is the blueback salmon, the migratory blueback salmon, and when it spawns it dies and doesn't return. The steelhead trout does return to salt water again after it spawns and returns to fresh water several times.

Mr. Stanley: Is there anyone else who wishes to be heard?

Mr. H. R. Stevens (Senior Hydraulic Engineer, Bonneville Power Administration): I just wish to express appreciation of being invited to attend this hearing. Of course, the Bonneville Power Administration is the federal body which is given the responsibility of disposing of all the power that is generated on the Columbia river, and therefore that is where our interest lies. I simply wish to express our appreciation of being invited to be here.

Mr. Stanley: We are delighted to have you.

Mr. Stewart: It affords me very much pleasure to offer the following resolution, which will be seconded by Mr. McWhorter of the United States section of the Commission:

RESOLUTION

I should like to move a vote of thanks to the engineer advisors to the Commission, Messrs. Victor Heck and Glenn Parker,

for the excellent engineering report they have submitted on the water levels that will be created by the construction of the Grand Coulee Dam. Their assistants, Messrs. Cline and Davonport, have exercised the greatest care in checking the comprehensive report of the engineers of the Bureau of Reclamation of the United States, and in gathering other data.

I should also like to express appreciation of the assistance rendered by Mr. C. E. Webb, District Chief Engineer of the Dominion Water and Power Bureau, and Mr. F. M. Veatch, District Engineer, U. S. Geological Survey Department of the Interior, Tacoma, Washington.

The complete information contained in the report of the engineers will greatly assist the Commission in arriving at a decision.

Mr. Stanley: The resolution is moved and seconded and unanimously adopted.

The Commission will now take recess until 12:00 o'clock, at which time it will hold an executive session. This concludes the public hearing.

(WHEREUPON, at 11:40 p. m. the Commission adjourned)

---