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69TH CONGRESS, 1st Session } SENATE { REPORT No. 1145

RIVER AND HARBOR BILL

JUNE 23, 1926.—Ordered to be printed

Mr. JONES of Washington, from the Committee on Commerce, submitted the following

REPORT

[To accompany H. R. 11616]

The Committee on Commerce, to whom was referred the bill (H. R. 11616) authorizing the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes, having considered the same, report favorably thereon with the recommendation that the bill do pass with amendments.

The bill as it passed the House carried authorizations for projects aggregating $33,558,000, and also the project for the improvement of the Missouri River above Kansas City to Sioux City, estimated to cost $50,000,000, or in the aggregate $83,558,000.

The Senate has added the following projects:

Hackensack River, N. J	$1, 655, 000
Intracoastal waterway from Beaufort Inlet, N. C., to the Cape Fear River	5, 000, 000
Galveston Channel, Tex	621, 000
Little Caillou Bayou, La	85, 000

The survey with reference to the power, flood control, and irrigation has been increased by an authorization amounting to $6,500,000.

The total additions to the bill amount approximately to $13,861,000.

The Missouri item has been fixed definitely at $12,000,000, or an estimated reduction of $38,000,000 from the House bill.

This leaves the authorizations carried in the bill, as reported to the Senate, at $59,419,000, instead of $83,558,000 (estimated), as passed the House.

The following are items added to the bill by your committee, the detailed information relating to each being from the reports of the Chief of Engineers on the projects:

HACKENSACK RIVER, N. J.

From its source in southern New York, the Hackensack River flows about 45 miles into Newark Bay. The lower 20 miles are tidal and navigable. The river is under improvement by the United States for the provision of a channel 30 feet deep and 400 feet wide from the upper end of Newark Bay channel to the Central Railroad of New Jersey bridge; thence 20 feet deep and 200 feet wide for about $1\frac{6}{10}$ miles, to a point about 4,800 feet above the Lincoln Highway bridge; thence 12 feet deep and 200 feet wide for $11\frac{2}{10}$ miles to Little Ferry; thence 12 feet deep and 150 feet wide for $2\frac{1}{2}$ miles to the New York, Susquehanna & Western Railroad bridge, Hackensack; a total distance of $16\frac{1}{2}$ miles. The section now under consideration is about $2\frac{3}{4}$ miles long. Mean range of tide is about 5 feet. Local interests desire a channel 30 feet deep and of suitable width.

In 1924 the water-borne commerce amounted to 2,344,000 tons. Of this, 1,500,000 were coal and coke; the balance was principally sand, gravel, and crushed stone, chemicals and fertilizer, petroleum products, and lumber.

The district engineer, who is also the division engineer, reports that a number of large industries are located at Kearny and at Marion, adjacent to the section where a deeper channel is desired. Most of these are public utilities which supply gas and electricity for light and power to the metropolitan district of New Jersey. In addition to the receipt of large quantities of coal, they ship a considerable tonnage of coke. A shipbuilding company, which builds tankers and handles repairs to ocean-going vessels, has plans for making further use of its terminals by shipping boilers, engines, machinery, and miscellaneous steel products which are produced by allied companies. The other industries are also expected to expand. Interested parties estimate that a 30-foot channel would result in an annual saving, on coal alone, of $392,000.

The district engineer believes that increased channel capacity is justified by the general character of the business. Manufacturing industries in northern New Jersey, which are supplied with power by the companies that would benefit from the improvement, ship their varied products to all parts of the United States and abroad, and the benefits from greater depth would be large and general. The estimated costs of channels 300 feet wide, and 25 and 30 feet deep, are $560,000 and $1,655,000, respectively. The estimated cost of maintenance is $15,000 annually in either case. The district engineer recommends that a 30-foot channel be provided, since the most economical carriers engaged in trade in this locality draw about 28 feet when loaded. Local interests should furnish suitable areas for the disposal of dredged material.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district engineer.

After due considerationt of he above-mentioned reports, I concur in the views of the district engineer and the Board of Engineers for Rivers and Harbors. The existing and the immediately prospective commerce pertaining to the section of the Hackensack River under consideration, are sufficient in magnitude and character to justify the provision of additional facilities at the expense of the United States.

Adjacent to the proposed improvement are large unoccupied areas, which are available for industrial and terminal expansion. The Hackensack River has possibilities for the development of a considerable transshipment business from rail to water. Five trunk-line railroads are located in the immediate vicinity, and two others have switching connections; direct transfer of freight would therefore be possible at a considerable saving as compared with the method of transfer by means of lighters in general use elsewhere in New York Harbor. A 30-foot channel is necessary for the economical movement of the present commerce, and to encourage the further development of this section of the port. I therefore report that modification of the existing project for the improvement of Newark Bay, Hackensack and Passaic Rivers, N. J., is deemed advisable, so as to provide for a channel in Hackensack River 30 feet deep at mean low water, and 300 feet wide, from the Central Railroad Hackensack River bridge to a point about 2,000 feet north of the Delaware, Lackawanna & Western Railroad bridge, at an estimated cost of $1,655,000, with $15,000 annually for maintenance; provided local interests furnish satisfactory areas for the disposal of material excavated in the carrying out of the project and its subsequent maintenance. Funds should be made available at the rate of $500,000 for each of the first two years, and $655,000 for the third year.

INTRACOASTAL WATERWAY FROM BEAUFORT, N. C., TO CAPE FEAR RIVER, N. C.

The city of Beaufort, on the east coast of North Carolina, is the southern terminus of the intracoastal waterway extending south from Norfolk, with a project depth of 12 feet. A shallow-draft waterway extends from Beaufort to Jacksonville, N. C., or about one-half the distance to the Cape Fear River. The next series of intracoastal waterways to the South begins at Winyah Bay, S. C., and continues south to Jacksonville. Request is now made for an extension of a deeper-draft waterway from Beaufort to the Cape Fear.

There is an available route for such a waterway through the tidal marshes behind the sea islands which fringe this section of the coast; and several inland routes, utilizing as far as possible the small streams of the coastal section which in general drain into the Neuse and Cape Fear Rivers. The inland routes present difficulties on account of their tortuous character, the necessity of several locks, the probability of strong currents at some season in the fresh-water streams which would be followed, and, in certain cases, the difficulty of obtaining an adequate water supply. Based on his own and previous investigations, the district engineer favors the coastal route as more direct and economical and more likely to furnish a stable channel. The division engineer and the Board of Engineers for Rivers and Harbors concur with him in considering this route preferable.

The existing waterway from Norfolk to Beaufort handled in 1925 a commerce of 522,000 tons, exclusive of log rafts, which was moved at a large saving. Part of this is local and short haul, but a great deal pertains to Norfolk and other distributing points. Before the World War there was a considerable movement from Norfolk to Beaufort by the inland route and thence, without transshipment, to more southern points by the open sea. In 1917 the company engaged in this movement handled 92,000 tons of freight. The traffic was interrupted by the war, when the Government commandeered the company's fleet. The district engineer, after a careful economic study, is of the opinion that the extension of an adequate waterway to the Cape Fear River would result in the development of a large traffic, part of it entirely on the waterway, and part, consisting of a joint waterway and ocean movement similar to that described above entering the ocean at the month of the Cape Fear. He estimates in his report of preliminary examination an annual commerce, of the latter class, of 300,000 tons, with savings of $600,000, and an annual commerce pertaining exclusively to the inland route of 618,000 tons additional, with annual savings of $1,342,000. In his report of survey he submits even larger estimates of savings.

Cost estimates for the work are as follows:

Channel dimensions	First cost	Maintenance	Total annual charge
12 by 90 feet	$5,800,000	$150,000	$382,000
10 by 80 feet	4,500,000	125,000	305,000
8 by 60 feet	3,200,000	100,000	228,000

These include in each case the cost of beacons, of a bridge where the waterway intersects an important highway at the Cape Fear end, and of a tidal lock in the connection between Myrtle Sound and the Cape Fear River. The latter is made necessary by the difference in the water levels at the two ends of a 2-mile cut, which amounts at certain stages of normal tide to between 2 and 3 feet and during storms to as much as 7 feet. Without a lock such conditions would produce destructive velocities through the stretch in question. The district engineer considers that even if the 10-foot or the 8-foot channel should be selected the lock should be built initially to provide for a depth of 12 feet, thus avoiding possible future reconstruction.

The district engineer favors the project, and recommends a 12-foot depth throughout. He believes that the waterway should be considered as an extension of, and commercially integral with, the existing section from Norfolk to Beaufort. He points out that the most important part of the commerce on that waterway is carried by large barges, of which a typical one draws 9½ feet loaded; and that a large proportion of the potential traffic and savings which, he estimates, would involve for their development a channel adequate for this type

of barge. Allowing for the necessary clearance under the keels, this means a depth of 12 feet. He recommends such a channel, at the cost given above, subject to the provision by local interests of an adequate right of way. The division engineer concurs as to the worthiness of the project, but believes that dimensions of 10 by 80 feet would be adequate for the present.

This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board concurs with the district and division engineers that the provision of the waterway is justified, but gives its reasons for feeling that an 8-foot depth is ample.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. A waterway from Beaufort to the Cape Fear River would give a safe passage along a dangerous section of the coast and behind Frying Pan Shoals to the large and increasing number of yachts, fishing vessels, motor boats, and other small craft which now make use of the existing intracoastal waterways to the north and the south. It would reduce by about 50 per cent the gap on the southeast coast between the north and south ends of the intracoastal system, thus greatly facilitating the through movement of small craft, which would have both a shorter and a safer run in the open ocean. The avoidance of danger and delay to such vessels, the operation of which in the aggregate involves thousands of lives and an investment of millions of dollars, represents an important national benefit. In addition to this there is a likelihood of the development of a large freight traffic, partly in lumber from the stands and mills between Beaufort and the Cape Fear, and partly in oil, fertilizer, and general merchandise distributed to, from, and between such points as Wilmington, Newbern, Beaufort, and Morehead City. The probable savings in freight and the benefits involved in facilitating and rendering more safe the movement of small craft of all sorts are sufficient to outweigh the cost of providing an adequate channel. The project would, moreover, be a step toward the linking up of the northern and southern sections of the intracoastal system, should this later be found desirable and justifiable.

There is, however, no sufficient evidence that a 12-foot depth is necessary at the present time to realize these benefits. While large barges requiring this depth operate on the waterway from Norfolk to Beaufort, their operations are principally confined to the northern section of that waterway. The traffic which continues south as far as Beaufort is much more limited and is handled in general by smaller craft. The intracoastal waterways to the south of Winyah Bay carry an important and paying commerce on project depths of from 4 to 7 feet. The major waterways of the Mississippi system have a project depth of not greater than 9 feet, and the same depth has been approved by Congress for the proposed intracoastal waterway from the Mississippi River along the Louisiana and Texas coasts, where there is a much larger potential commerce than on the channel now under consideration. I see no reason to doubt that the provision of a channel 8 feet deep would be adequate for all present needs of this section. The saving made by adopting this channel instead of one 12 feet deep is $2,600,000, a large sum of money, which could more profitably be expended on urgent waterway improvements in other sections of the country. The provision of an 8-foot channel will permit of commercial development which will demonstrate clearly whether additional depth is later desirable. If it be shown to be desirable, it can at any time be authorized by Congress, and there is no reason to believe in this case that subsequent deepening would involve a materially greater expense than if the 12-foot depth were provided initially.

I therefore report that it is deemed advisable to provide a waterway 8 feet deep and 60 feet wide extending along the coast from Beaufort, N. C., to the Cape Fear River, cited in general as proposed by the district engineer, with such modifications in routing as the Chief of Engineers may find desirable and economical, and including the provision of a tidal lock near the Cape Fear end and a highway bridge in its vicinity, at an estimated cost of $3,200,000, with $100,000 annually for maintenance, provided that local interests furnish, without cost to the United States, a right of way 1,000 feet wide, and give assurances satisfactory to the Secretary of War and the Chief of Engineers that they will take over the highway bridge on its completion, and maintain and operate it in perpetuity. Funds should be made available as follows: $950,000 the first year, $900,000 the second year, $500,000 the third year, $500,000 the fourth year, and $350,000 the fifth year.

GALVESTON CHANNEL, TEX.

Galveston Channel is the approach to the water front of Galveston from the inner end of the jettied channel that forms the entrance to Galveston Harbor. The United States has provided a maintenance, which is the important item at Galveston, it is likely that there will be no material increase over present costs in providing a 32-foot channel, whereas an increase to 35 feet would add greatly to maintenance expense. Such work as is needed on the inner and outer bars can be handled under the existing project. I therefore report that modification of the existing project for Galveston Channel, Tex., is deemed desirable, so as to provide for a depth of 32 feet, at an estimated cost of $621,000, with $200,000 annually for maintenance. The full amount of the estimated cost of the work should be made available in the initial appropriation.

LITTLE CAILLOU BAYOU, LA.

Little Caillou Bayou is a tidal stream in southeastern Louisiana, having its source in Bayou Terrebonne, about 4½ miles below Houma, La., and emptying in Terrebonne Bay. It is not under improvement by the United States, but a project was recommended in 1922 for a channel 5 feet deep and 40 feet wide from the head of the bayou to Robinson Canal, a distance of about 20 miles, at an estimated cost of $85,000, subject to certain conditions of local cooperation, including a cash contribution of one-half the first cost of the work. Congress has taken no action on this recommendation, which was printed in the House document referred to in the above resolution. Local interests desire that the conditions of local cooperation be modified.

The district engineer reports that this bayou is the main transportation facility for one of the richest and most thickly populated farming regions of the State. The present governing depth of about 2 feet, which has been obtained by private dredging, is not adequate for the needs of navigation, particularly since the mean range of tide in the section under consideration is but 3 to 6 inches. Even with this limited depth, however, a commerce of 79,000 tons was moved over the waterway in 1925, the principal items being sugar cane, sugar, oysters, shrimp, and miscellaneous merchandise. Much of the cane comes from waterways to the west, through the St. Louis Canal, which has a limiting depth of 5 feet. Most of the sea food comes up Little Caillou Bayou from the shallow bays near its mouth. The parish of Terrebonne, through which the bayou flows, has purchased and donated to the United States about 10 linear miles of rights of way for the intracoastal canal recently recommended by the department in this section. In addition it has cooperated extensively with the United States in the removal of water hyacinths, and now spends about $7,000 annually on such work. In view of this liberal attitude of the parish, the district engineer recommends that the cash cooperation called for in Document No. 200 be reduced from 50 to 10 per cent. The division engineer concurs.

The Board of Engineers for Rivers and Harbors points out that the recommendation for 50 per cent cooperation in Document No. 200 was based primarily on the closeness of Bayou Little Caillou to Bayou Terrebonne, which is under Federal improvement. Since the date of that recommendation the situation has changed by the increasing relative importance of Bayou Little Caillou, which in 1925, in spite of the limited depth available, handled considerably more commerce than did Bayou Terrebonne in 1924, the latest year for which detailed statistics for the latter are available. This is largely because Little Caillou serves not only the area along its banks but also an extensive area to the west. Moreover, the adoption of the department's recommendation for a 9-foot waterway through this section of Louisiana, now under consideration by Congress, would greatly augment the national interest in the natural channels tributary thereto. The board does not feel that the financial condition of the locality should be a determining factor, believing that cooperation should be demanded not on the basis of what local interests can afford but on the basis of how much general interest there is in the proposed work. By a similar line of reasoning, it does not feel that the United States should accept the proposed 10 per cent cooperation merely because it has been offered. It feels that recent changes in conditions justify the United States in meeting the entire cost of the work, and that it should therefore do so. It accordingly modifies its recommendation contained in House Document No. 200, Sixty-seventh Congress, second session, and recommends the improvement of

Little Caillou Bayou, La., by the provision of a channel 40 feet wide and 5 feet deep at mean low Gulf, from its head to Robinson Canal, at an estimated cost of $85,000, with $3,000 annually for maintenance, subject to the provisions that local interests will furnish, without cost to the United States, all lands and spoil disposal areas required for the work, will make any necessary changes in bridges, and will keep the waterway free of water hyacinths.

After due consideration of the above-mentioned report, I concur in the views of the board.

ILLINOIS RIVER, ILL.

The following additional report from the Chief of Engineers upon a resolution of the committee relating to the improvement of the Illinois River is made a part of this report:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, June 16, 1926.

Hon. W. L. JONES,
Chairman Committee on Commerce,
United States Senate.

MY DEAR SENATOR: 1. Referring to letter of the chairman of the Committee on Commerce of the United States Senate, dated June 14, 1926, inclosing a copy of a resolution of the committee dated June 14, 1926, requesting the Board of Engineers for Rivers and Harbors to review its report, published in Rivers and Harbors Committee Document No. 4, Sixty-ninth Congress, first session, with a view to clarifying its recommendations, I inclose herewith the report of the board, dated June 15, 1926, in response thereto.

2. The board states that it was not its intention to commit the Government in any way regarding the legality or permanency of the existing diversion. It calls attention to the specific statement in paragraph 22 of its report printed in House Document No. 4, "that it would be premature definitely to fix the diversion at this time."

3. The board state that if it is felt that the former recommendation of the board might be interpreted as fixing any permanent diversion, a solution may be found in changing the recommendation so as to propose that a project for a channel 9 feet by 200 feet be adopted, and that the department be definitely authorized, not only to provide it for existing conditions of low water flow, but also, and without further reference to Congress, to continue to provide it, by suitable changes in the works of improvement, if the low-water flow be reduced within the limits contemplated by the table on page 3 of House Committee Document No. 4, Sixty-ninth Congress, first session. The estimates in that table assume that the works corresponding to a given estimate are undertaken ab initio. On that basis a limiting authorization figure would be $2,666,000, the estimated cost of providing the channel by canalization with the least flow contemplated in the table. If, however, the low-water flow should be reduced by successive steps, and at each step certain works had to be provided appropriate to the then existing flow, the necessity might arise for modifying some part of the work in a manner which would somewhat increase the ultimate cost. The amount of such increase can not be accurately estimated, since it is unknown at what rate and by what steps the flow may hereafter be reduced; but it is estimated that the cost under such conditions might reach $3,000,000 or $3,500,000.

4. The following recommendation, embodying the above proposal, is accordingly submitted:

The board recommends modification of the existing project for the Illinois River so as to provide a channel with least dimensions of 9 feet in depth at low water and 200 feet in width, from the mouth to Utica. Under present conditions of low-water flow, the provision of such a channel, by dredging and by the partial removal of the two State dams and the retention and minor alteration of the two Federal locks and dams, is estimated to cost $1,350,000, with $126,000 annually for maintenance. Future reduction in the flow would involve additional expenditures. It is understood that Congress, if it approves this recommendation, will thereby have authorized the department to undertake any works covered by the estimates in the table on page 3 of House Document No. 4, Sixty-ninth Congress, first session, which may be necessary in the future to provide a channel of the

dimensions specified, and will have authorized the necessary expenditures therefor, up to a limiting total for new work of about $3,500,000. The above recommendation is subject to the following conditions: That the State of Illinois transfers to the United States, without cost, all rights and titles in the two State-owned dams on the Illinois River; that local interests furnish the United States without cost all necessary areas for the economical disposal of material dredged in creating and maintaining the channel: *Provided further*, That no work on the Illinois River shall be carried out according to the project herein outlined, with the existing or any subsequent diversions, until the Secretary of War and the Chief of Engineers shall have received satisfactory assurances that local interests will at the same time provide an equal depth for through navigation in the Illinois waterway.

5. After due consideration of the above-mentioned report, I concur with the board.

H. TAYLOR,
Major General, Chief of Engineers.

WAR DEPARTMENT,
THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., June 15, 1926.

Subject: Illinois River.
To: The Chief of Engineers, United States Army.

1. This report is submitted in response to the following resolution, adopted June 14, 1926:

"*Resolved by the Committee on Commerce of the United States Senate*, That the Board of Engineers for Rivers and Harbors be, and hereby is, authorized and requested to review its report, published in Rivers and Harbors Committee Document No. 4, Sixty-ninth Congress, first session, with a view to clarifying its recommendation."

2. The letter of the chairman of the Committee on Commerce, transmitting the above resolution, contained the following paragraph:

"It is the understanding of this committee that in submitting its report, the Board of Engineers for Rivers and Harbors did not intend to make any recommendations which would have any bearing upon the question of diversion and if such be the case, it would be well if the board could so revise its report as, to make this matter clear beyond question."

3. It was not the intent of the board, in its recommendation contained in its previous report, to commit the Government in any way regarding the legality or permanency of the existing diversion. It recommended certain work in the Illinois River, estimated at $1,350,000, to obtain a channel 9 feet by 200 feet from Grafton to Utica, and pointed out that, if existing conditions were changed corresponding changes in the cost of providing the channel would result. The board submitted a series of preliminary estimates based upon various assumed diversions, from 1,000 cubic feet per second to 10,000 cubic feet per second (annual average measured at Lockport). It compared these estimates, with the resultant national benefits which it appeared would arise from a through 9-foot channel from Chicago to Grafton, and found that the cost of the navigation project was reasonable on any of the bases investigated.

4. The board also referred to the various interests affected by diversion of water from Lake Michigan. It found that these were important, and in some cases conflicting, and that all the data were not at hand accurately to evaluate them. It therefore gave its view (par. 22) "that it would be premature definitely to fix the diversion at this time."

5. If it is felt that the former recommendation of the board might be interpreted as fixing any permanent diversion, a solution may be found in changing the recommendation so as to propose that a project for a channel 9 feet by 200 feet be adopted, and that the department be definitely authorized, not only to provide it for existing conditions of low-water flow, but also, and without further reference to Congress, to continue to provide it, by suitable changes in the works of improvement, if the low-water flow be reduced within the limits contemplated by the table on page 3 of House Committee Document 4, Sixty-ninth Congress, first session. The estimates in that table assume that the works corresponding to a given estimate are undertaken ab initio. On that basis a limiting authorization figure would be $2,666,000, the estimated cost of providing the channel by canalization with the least flow contemplated in the table. If, however, the

low-water flow should be reduced by successive steps, and at each step certain works had to be provided appropriate to the then existing flow, the necessity might arise for modifying some part of the work in a manner which would somewhat increase the ultimate cost. The amount of such increase can not be accurately estimated, since it is unknown at what rate and by what steps the flow may hereafter be reduced; but it is estimated that the cost under such conditions might reach $3,000,000 or $3,500,000.

6. The following recommendation, embodying the above proposal, is accordingly submitted:

The board recommends modification of the existing project for the Illinois River so as to provide a channel with least dimensions of 9 feet in depth at low water and 200 feet in width, from the mouth to Utica. Under present conditions of low-water flow, the provision of such a channel, by dredging and by the partial removal of the two State dams and the retention and minor alteration of the two Federal locks and dams, is estimated to cost $1,350,000, with $126,000 annually for maintenance. Future reduction in the flow would involve additional expenditures. It is understood that Congress, if it approves this recommendation will thereby have authorized the department to undertake any works covered by the estimates in the table on page 3 of House Document 4, Sixty-ninth Congress, first session, which may be necessary in the future to provide a channel of the dimensions specified, and will have authorized the necessary expenditures therefor, up to a limiting total for new work of about $3,500,000. The above recommendation is subject to the following conditions: That the State of Illinois transfers to the United States, without cost, all rights and titles in the two State-owned dams on the Illinois River; that local interests furnish the United States without cost all necessary areas for the economical disposal of material dredged in creating and maintaining the channel; provided further, that no work on the Illinois River shall be carried out according to the project herein outlined, with the existing or any subsequent diversions, until the Secretary of War and the Chief of Engineers shall have received satisfactory assurances that local interests will at the same time provide an equal depth for through navigation in the Illinois waterway.

For the board:

EDGAR JADWIN,
Brigadier General, Corps of Engineers,
Senior Member of the Board

FLOOD CONTROL AND WATER POWER SURVEYS

In view of the change recommended by the committee in regard to flood control and power surveys, it is deemed proper to include in this report the report of the engineers relating to this important matter.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 7, 1926.

Subject: Estimate of cost of examinations, etc., of streams where power development appears feasible.

To: The Secretary of War.

1. The following report is submitted in accordance with the requirements of section 3 of the river and harbor act of March 3, 1925, which reads as follows:

"The Secretary of War, through the Corps of Engineers of the United States Army, and the Federal Power Commission are jointly hereby authorized and directed to prepare and submit to Congress an estimate of the cost of making such examinations, surveys, or other investigations as, in their opinion, may be required of those navigable streams of the United States, and their tributaries, whereon power development appears feasible and practicable, with a view to the formulation of general plans for the most effective improvement of such streams for the purposes of navigation and the prosecution of such improvement in combination with the most efficient development of the potential water power the control of floods, and the needs of irrigation: *Provided*, That no consideration of the Colorado River and its problems shall be included in the consideration or estimate provided herein."

2. The streams which have been considered under this provision include all navigable streams upon which power developments appear to be feasible and tributaries upon which power developments planned to make full development of the resources would be subject to Federal jurisdiction as provided in the Federal water power act. For the purpose of this consideration these streams were divided into three classes:

(*a*) Those streams the improvement of which by power developments, alone or in connection with navigation structures, would benefit navigation sufficiently to justify the Federal Government in sharing in the cost of the improvements.

(*b*) Those streams the improvement of which by power development would be of considerable benefit to navigation but not sufficient in the light of present information to warrant large expenditures by the Federal Government on that account.

(*c*) Those streams upon which the apparent benefits to navigation that could be derived from power developments would be insignificant.

3. In accordance with this classification, three types of investigations corresponding to the three classifications of streams are considered to be desirable.

For (*a*) accurate general and detailed surveys, foundation investigations, and studies sufficient to determine:

The discharge of the streams.
The locations and capacities of reservoir sites.
The location and practicability of dam sites.
The capacities of power sites.
The present and prospective power markets available.
The best plan of improvement for all purposes.
Preliminary estimates of the costs of improvement.
The feasibility of the best plan of improvement.

For (*b*) Fairly accurate general surveys, detailed surveys of important areas, and studies sufficient to determine:

The discharge of the streams.
The profiles of the streams.
The location and capacities of reservoir sites.
The location of apparently practicable dam sites.
The approximate capacities of probable power sites.
The benefits to navigation and other interests probably obtainable through power development.
The probable power markets.
Rough approximations of costs and value of power development.
The principal features of the best plan of development.

For (*c*) fairly accurate general surveys and studies sufficient to determine—
The discharge of the streams.
The profiles of the streams.
The approximate location of possible power sites.
The approximate capacities of probable power developments.
The general scheme best adapted to a comprehensive utilization of the water resources.

4. In the preparation of the estimates allowance was made for the utilization of information obtainable from other sources. The estimates were made with a very limited expenditure of funds and should be considered as preliminary estimates only, subject to modification when more complete information is available as well as under changing conditions in the future. The estimates for the determination of stream flow include the establishment of the necessary stream gauging stations and their operation during the period of the survey. In most cases, the subsequent operation of these gauging stations should be provided for, but it was not included in the estimates. Upon the completion of the surveys, the operation of the important gauging stations should becontinued by the United States Geological Survey, whose annual appropriations should be increased by the additional amounts required for the purpose.

5. The results of the estimates are as follows:

Streams draining to Atlantic Ocean north of Cape Cod as follows: St. Croix, Machias, Union, Penobscot, Kennebec, Androscoggin, Presumpscot, Saco, Kennebunk, Salmon Falls, and Merrimack	$147,000
Streams draining to Atlantic Ocean between Cape Cod and New York Harbor as follows: Taunton, Pawtucket, Pawcatuck, Thames, Connecticut, Housatonic	34,200

Hudson River and tributaries as follows: Mohawk, Hoosic, Batten Kill, Wappinger Creek, Walkill, Kinderhook Creek	$106, 500
Streams draining to Lake Champlain and Richelieu Rivers as follows: Poultney, Otter Creek, Boquet, Ausable, Saranac, Big Chazy, Winooski, Hamoille, and Missisquoi	54, 000
Raritan River	19, 400
Delaware River and tributaries as follows: Shohola Creek, Mongaup River, Neversink, Lehigh, Tohickon Creek, Neshaminy Creek, Perkiomen Creek	158, 000
Rivers draining into Chesapeake Bay as follows: Susquehanna, Pamunkey, Rappahannock, Occoquan Creek, Patuxent, Potomac, and James	531, 200
Streams draining to Atlantic Ocean south of Chesapeake Bay as follows: Roanoke, Meherrin, Neuse, Tar, Cape Fear, Yadkin, Peedee, Santee, Savannah, Altamaha, Satille, and St. Marys	826, 600
Streams, except the Mississippi River, draining to Gulf of Mexico as follows: Suwannee, Withlacoochee, Apalachicola and tributaries, Mobile River system including the Coosa, Black Warrior, and Tombigbee Rivers; Guadalupe, Calcasieu, Amite, Tickfaw, Tangipahoa, Chefuncte, Bayou Nezpique, Bayou Teche	909, 000
Mississippi River and minor tributaries as follows: Ouachita, St. Francis, Meramec, Illinois, Des Moines, Iowa, Wisconsin, Chippewa, and St. Croix	467, 000
Arkansas River and tributaries: White, Grand, Illinois, Petit Jean, Fourchee La Favre, and Poteau	87, 100
Ohio River and minor tributaries as follows: Tradewater, Wabash, Green and Barren, Salt, Kentucky, Miami, Licking, Guyandot, Big Sandy, Muskingum, Little Kanawha, Beaver, Monongahela, Allegheny	393, 100
Tennessee River	300, 000
Cumberland River	250, 000
Kanawha River	225, 000
Missouri River and tributaries as follows: Madison, Jefferson, Galatin, Marias, Musselshell, Milk, Yellowstone, Little Missouri, Cannon Ball, Grand, Moreau, Cheyenne, Bad, White, Niobrara, James, Big Sioux, Little Sioux, Platte and Kansas, Osage and Gasconade	425, 000
Streams draining into Lake of the Woods and Hudson Bay drainage basin, as follows: Rainy, Big Fork, Little Fork, Vermilion, Kaweshiwi	250, 400
Streams draining into Lake Superior as follows: Pigeon, Brule, Devil Track, Cascade, Poplar, Temperance, Manitou, Baptism, Beaver Bay, Gooseberry, St. Louis, Amnicon, Bad, Montreal, Sturgeon, and Carp	82, 600
Streams draining into Lake Michigan as follows: Wolf, Oconto, Peshtigo, Menominee, Manistique, Manistee, Muskegon, Grand, Kalamazoo, and St. Joseph	512, 100
Streams emptying into Pacific Ocean south of Columbia River as follows: Eel, Mad, Klamath, Sacramento, San Joaquin, Kern	420, 000
Columbia River and minor tributaries as follows: Cowlitz, Lewis, Willamette, John Day	734, 100
Snake River and tributaries	215, 000
Streams draining into Pacific Ocean north of Columbia River as follows: Skagit, Snohomish, Stilaguamish, Puyallup, Chehalis	104, 100
Rivers in Hawaiian Islands	71, 000
Grand total	7, 322, 400

6. It is not believed necessary or desirable to provide at once for a comprehensive program of surveys or investigations covering all or even a large part of the streams included in this estimate, but the importance of this work is so great and the length of time required to complete it is such that it should be inaugurated as soon as practicable. There are evidently two principal purposes for which investigations of this nature would be useful, either for the preparation of plans for improvement to be undertaken by the Federal Government alone or in connection with private enterprise, or to secure adequate data to insure that waterway developments by private enterprise would fit into a general plan for the full utilization of the water resources of a stream. This depart-

ment is now charged with examinations and surveys for navigation and flood-control improvements and with the construction of such projects as are authorized by Congress. In both classes of investigations the department must, by law, give consideration to the development of potential water power.

In investigations for flood control it must also consider other possible utilization of water resources. Irrigation projects constructed by the Federal Government have not heretofore affected to any considerable extent the navigable capacities of any waterways which the Government has undertaken to improve for navigation, nor does it appear probable that they will do so to any considerable extent in the future. Inasmuch as consideration must be given to irrigation requirements in flood-control investigations, it would seem that Congress has made adequate provision for the proper coordination of all interests in those projects for the utilization of waterways with which this department is interested. Navigation and irrigation are in some cases intimately related, but this close relationship has heretofore existed only in cases where the irrigation developments are being made by private interests. In such cases the laws for the protection and preservation of navigable waterways are sufficiently broad to permit an equitable adjustment of conflicting interests and the investigations necessary to arrive at a decision can now be made by the department without congressional authorization.

7. The principal developments that are now being made by private enterprises are in the development of water power but to a much lesser extent in irrigation. The latter class of developments can, as stated above, be adequately regulated to adjust conflicting interests under existing laws for the provision of navigable waterways. Improvements for the development of water power are, of course, under the Federal Power Commission and can be controlled by the Government only when they affect navigation directly or indirectly. In such cases the Federal Power Commission must determine whether or not the proposed projects are adapted to a comprehensive development of the stream affected. In many instances data required to be obtained under the provisions of preliminary permits can be made to serve this purpose, but to permit the commission to reach correct decisions in some cases special investigations are necessary.

It is believed that these investigations could properly be provided for by the enactment of the legislation necessary to permit the application to such surveys and investigations of the portion of the charges arising from licenses under the Federal water power act and reserved and appropriated, under the provisions of section 17 thereof, as a special fund in the Treasury to be expended under the direction of the Secretary of War in the maintenance and operation of dams and other navigation structures owned by the United States, or in the construction, maintenance, or operation of headwater or other improvements of navigable waterways of the United States. At the present time the Geological Survey is preparing contoured maps of the entire United States and is engaged in the collection of stream-flow data, so far as the funds at their disposal will permit. A continuation of these activities of the Geological Survey is desirable, and if they are carried on at a reasonable rate with due regard to the needs of the immediate future, when supplemented by special investigations under the legislation suggested above, they will supply the specific data needed to permit accurate determination of the advisability of development on waterways by private interests, and expensive general surveys are, therefore, not considered necessary for this purpose.

8. Investigations of the type for which estimates are submitted should therefore, it is believed, be first given to streams on which it appears there is a possibility of the Federal Government's undertaking either alone or in connection with private interests, construction work for the improvement of the stream. These surveys should evidently be made by the agencies which are to be intrusted with the construction work; in the case of navigation and flood control the War Department, and in the case of irrigation projects the Department of the Interior. Judging from past experience of this department, it may be that where a combined power and navigation project appears feasible, there is a very fair possibility that the investigations of the power values and possibilities may in many cases be obtained without cost on the part of the United States by private interests interested in securing the power.

H. TAYLOR,
Major General, Chief of Engineers.
O. C. MERRILL,
Executive Secretary, Federal Power Commission.

[House Report No. 993, Sixty-ninth Congress, first session]

RIVER AND HARBOR BILL

APRIL 26, 1926.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed

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MR. DEMPSEY, from the Committee on Rivers and Harbors, submitted the following

REPORT

[To accompany H. R. 11616]

The Committee on Rivers and Harbors respectfully submits the following report in explanation of the accompanying bill authorizing the construction, repair, and preservation of certain public works on rivers and harbors and recommends that the bill do pass.

The bill adopts 30 new projects and authorizes the modification of four others. The new work adopted will when completed add very largely to the facilities of the country for water transportation, and the estimated cost is very small compared to the benefits which will be derived, as will be made apparent by the table, printed in the report herewith, showing the cost of the projects separately and in the aggregate.

The improvements recommended are important to the transportation system of the country in providing shorter and safer routes; in completing waterway projects already adopted, and having them terminate at important exchange, distribution, and transfer points; in furnishing new and additional facilities in great waterway systems, the need of which has developed through their use; in supplying water routes to large and productive stretches of country where that is the only means of transportation available. The committee has had constantly in mind that the water transportation system of the country should be considered as a whole, and that the effort should be made to supply the missing links and to standardize depths, so that uniform types of vessels and barges may be adopted and used over long distances and in as diversified fields of traffic as possible.

The construction of the projects adopted a year ago and those included in this bill will go far toward securing the end the committee has in view, but it must be borne in mind that this country is growing so rapidly and transportation units change so often, that added im-

provements will be needed from time to time to meet congestion and varying transportation conditions.

The letters of the Chief of Engineers accompanying the reports on the projects herein adopted and containing his recommendations are herewith set forth for the benefit of the Members:

THAMES RIVER, CONN.

The Thames River is formed by the junction of the Yantic and Shetucket Rivers near Norwich, Conn. Thence it flows south about 15 miles past New London into Long Island Sound. The Federal Government has provided a channel 33 feet deep and 600 feet wide up to New London, with a subsidiary channel along the water front of that city, a channel 20 feet deep and 200 feet wide for 6 miles from New London to Allyns Point, and a channel 14 feet deep and 200 feet wide thence to Norwich. Request is made that a channel 16 to 20 feet deep be provided up to Norwich.

The water-borne commerce above New London in 1923 amounted to 487,000 tons. The most important item is coal from the Port of New York and from the Hampton Roads ports. The barges used for this traffic have been steadily increasing in size; it is becoming progressively more difficult and more uneconomical to utilize those which can operate in a 14-foot channel. This is particularly true in the case of barges from Hampton Roads. Another important item of commerce is the inbound movement of lumber. It is almost impossible to obtain schooners from the southern lumber ports which can operate on a 14-foot channel. The movement, therefore, is likely to involve lightering part of the cargo at Allyns Point, which is said to have resulted not only in increased cost but in a considerable curtailment of the lumber traffic. There is also, on this stretch of the river, a considerable commerce in general merchandise, carried by a regular steamer line operating between New York and Norwich. For the type of steamer now generally used on Long Island Sound the existing depths are not economical.

The district engineer estimates that an adequate channel would result in a saving of 50 to 75 cents per ton on southern coal, and of a total of $20,000 a year on lumber and pulp wood. He also estimates an increase in the annual package freight traffic of at least 20,000. tons, with a minimum saving of $1.20 to $1.40 per ton. He submits estimates for three alternative projects, 16, 18, and 20 feet deep at mean low water, each with a general width of 200 feet. The figures for first cost are, respectively, $159,000, $263,000, and $420,000. The figures for maintenance are respectively, $15,000, $20,000, and $25,000. He believes that the best balance between cost and benefits would be obtained by the 18-foot channel, which he recommends.

The division engineer is doubtful of the cost estimates submitted by the district engineer, and in a supplementary communication recommends an increase in unit figures which would raise the first cost of the 18-foot channel to $350,000. He does not believe that the benefits resulting either from the more economical movement of bulk commodities or from the possibilities of further package freight service would be sufficient to justify the necessary Federal expenditure, and recommends against the improvement.

This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, concurring with the district engineer as to the advisability of the improvement and the type of channel, and with the division engineer as to the estimated cost.

After due consideration of the above-mentioned reports, I concur in the views of the board. The present project from Allyns Point to Norwich was adopted many years ago, at a time when the size and type of carriers was quite different from that now prevailing. Under present conditions its depth is insufficient for the economical movement of such bulk commodities as coal and lumber, or for the operation of modern sound steamers. In spite of the handicap of insufficient depth, the locality has built up a very considerable commerce, which, while it decreased during the war and the succeeding years, reached in 1923 a tonnage equal to that of 1914, and a value larger than ever before reported. The city of Norwich is an important industrial and business center and distributing point. In view of this fact, of the successful commerce that has been maintained in the face of the increasing inadequacy of the channel, and of the large prospective savings, the United States is justified in revising the project to accord with present-day conditions. I therefore report that modification of the existing project for Thames River, Conn., is deemed advisable so as to provide for a channel 200 feet wide, with increased width at bends, and 18 feet deep at mean low water, at an estimated cost of $350,000, with $20,000 annually for maintenance.

WATERWAY CONNECTING GRAVESEND BAY WITH JAMAICA BAY, N. Y.

The route of the proposed waterway from Gravesend Bay to Jamaica Bay is via Coney Island Creek and Sheepshead Bay to Rockaway Inlet. It is not now available for through navigation, as the upper part of Coney Island Creek passes through a culvert. There are a number of bridges crossing the creek, which at times carry very heavy passenger traffic. The waterway is desired principally to provide a sheltered route for light-draft vessels from New York Harbor to Jamaica Bay, thus avoiding the exposed stretch south and west of Coney Island.

Under recent legislative authority Jamaica Bay will be provided with a 30-foot channel by the United States, the work to be carried on progressively in conjunction with terminal development by the City of New York. Neither Gravesend Bay nor Coney Island Creek is under improvement; between Sheepshead Bay and Rockaway Inlet a 6-foot channel has been provided by the United States.

The district engineer submits a plan for a waterway 15 feet deep at mean low tide, following the general course of Coney Island Creek through Sheepshead Bay, and entering the Jamaica Bay entrance channel about 7,000 feet westerly from Flatbush Avenue extension, a total length of 29,500 feet. He proposes a bottom width of 250 feet between Gravesend and Sheepshead Bays where the right of way will be provided by local interests, and elsewhere a bottom width of 400 feet. Alternative routes have been considered, including that apparently favored by local authorities, lying north of Plumb Island to and across Dead Horse Inlet, and through Dead

Horse Bay, entering Jamaica Bay just west of Flatbush Avenue extension. The district engineer prefers the route recommended by him because it is less expensive, and does not pass through territory where additional bridges would be necessary.

The State of New York was represented at conferences with the Federal authorities by a board created by legislative enactment. This board was in agreement with the district engineer as to the depth and width of the channel proposed, and in its report to the legislature recommended local cooperation to the extent of—

(*a*) Providing a right of way 400 feet wide.
(*b*) Providing convenient areas of deposit for material dredged by hydraulic plant.
(*c*) Alteration of existing bridges to provide openings with a horizontal clearance of not less than 100 feet and a vertical clearance when closed of not less than 24 feet at high tide.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board considers that the devlopment of Jamaica Bay, made possible by recent legislation, is largely dependent upon facilities for uninterrupted barge traffic between that point and the main water front of the harbor. It therefore recommends the adoption of the plan proposed by the district engineer. subject to such modification of the precise location of the eastern section of the channel and the amount of breakwater construction as may be later found advisable and possible of accomplishment without additional cost, and subject to the provision that local interests furnish a 400-foot right of way and suitable areas for disposal of dredged material and arrange for the necessary alteration of bridges under plans to be approved by the Secretary of War.

After due consideration of the above-mentioned reports, I concur in the views of the district engineer and of the Board of Engineers for Rivers and Harbors, and therefore report that the construction by the United States of a waterway connecting Gravesend Bay with Jamaica Bay, N. Y., is deemed advisable to the extent of providing a depth of 15 feet at mean low tide and a width of 250 feet where a right of way has to be acquired and 400 feet elsewhere, at an estimated cost of $2,000,000 with $30,000 annually for maintenance, provided that the location of that section of the channel east of Sheepshead Bay, and the extent of breakwater construction, shall be subject to such modification as may later be found advisable and economical, and subject to the conditions of local cooperation recommended by the district engineer. The initial appropriation should be $800,000.

GREAT KILLS, STATEN ISLAND, N. Y.

Great Kills is a small natural harbor on the southeast shore of Staten Island. It has not been improved by the United States. It was formerly protected from wind and waves by a sand spit, but this was breached some years ago, as a result of which the harbor has shoaled extensively and the natural protection is greatly reduced. Mean range of tide is 4.7 feet. Request is made for an entrance channel 12 feet deep from Lower Bay and an anchorage basin of the same depth, the dredged material to be used for land reclamation.

From the most recent information available to the district engineer, who is also the division engineer, it appears that there is a population of about 30,000 within a radius of 5 miles from the Kills, and a traffic pertaining to this area of about 217,000 tons a year. Considerable development has occurred since these estimates were made. The request for an improved harbor is based partly on the need of a harbor of refuge for small boats and partly in the interests of economical transportation of freight. The district engineer believes that a considerable portion of the freight consumed locally, especially that which originates in Greater New York, might use an improved harbor at Great Kills, and that a saving of 25 cents a ton thereon might reasonably be expected. He can find little definite information bearing on the need for a harbor of refuge. He submits estimates for entrance and interior channels from 10 to 12 feet deep and of varying widths, with, in each case, an anchorage basin within the harbor 12 feet deep having an area of 63 acres. The costs vary from $450,000 to $685,000, with annual maintenance of $10,000 in each case.

The city of New York has offered to provide terminal facilities to cost approximately $40,000. The district engineer considers that, for this sum, terminals could be built adequate for the reasonably prospective traffic. Local interests have offered to bulkhead the southerly side of the harbor, to provide spoil disposal areas and a land company offered, at the time the survey was made, to pay $500 an acre for land filled by dredged material to a height of 10 feet above low water. The district engineer believes that more extensive bulkheads should be provided, and that, in view of the large local benefits and the high value of the reclaimed land (estimated at $14,000 an acre) more liberal cash cooperation should be afforded. He recommends the least expensive of the improvements on which he has made an estimate, at a cost of $450,000, provided that local interests, in addition to furnishing suitable terminals and bulkheads, contribute in cash $350,000. In a supplementary report he states that in recent months, subsequent to the submission of the report of survey, the city of New York has decided to create a marine park between the harbor and lower bay, with an area when completed of nearly 400 acres. The material to fill this area to 8 feet above mean low water, if obtained from the harbor, would involve dredging the latter to an average depth of 13 feet.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board concurs in general with the district engineer as to the advisability of some Federal improvement at this point, and as to the relative local and general benefits to result. It believes, however, that the United States should confine its work to providing an entrance channel 10 feet deep and 150 feet wide, at an estimated cost of $62,000, with $5,000 annually for maintenance, provided local interests agree to furnish bulkheads and terminals, and to undertake, at their own expense, work in the inner harbor of the same general character as that proposed by the division engineer.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. Great Kills is the most appropriate site on the eastern shore of Staten Island for a harbor of refuge for light-draft barges and small vessels.

It can not be said from available data that the need for such a harbor is extremely urgent, but it would undoubtedly be desirable and convenient. A satisfactory barge channel with adequate terminals would probably result in the movement to the Kills of a considerable quantity of freight destined for use or consumption in the neighborhood. The benefits thereof would be principally local, but as the communities affected appear to have a population of 30,000 or more, the United States may be said to have some concern in the matter. In my opinion, the extent of Federal interest on both scores is adequately expressed by the work and the expenditures proposed by the board. Local interests may properly be asked to cooperate by providing suitable interior channels and an anchorage basin. It appears that any development of the partially submerged land between the harbor and Lower Bay, whether done by a private company or by the city for park purposes, would involve in any case an amount of dredging in the harbor at least sufficient to provide the necessary channels and basin. Moreover, the value of the filled land would in all likelihood be several times greater than the cost of the dredging.

I therefore report that the improvement of Great Kills, Staten Island, N. Y., is deemed advisable to the extent of providing a channel from deep water in lower New York Bay to the entrance of the harbor in the vicinity of the present westerly end of Crooks Island, 10 feet deep at mean low water and 150 feet wide, in general as sited by the district engineer, at an estimated cost of $62,000, with $5,000 annually for maintenance; provided, that before work is commenced, local interests furnish satisfactory assurances, first, that they will construct bulkheads in the neighborhood of Crooks Island, as proposed by the district engineer, for the protection of the Federal channel and the disposal of material dredged therefrom; second, that they will furnish suitable terminals, in accordance with plans to be approved by the Secretary of War and the Chief of Engineers, and an approach channel to these terminals in the inner harbor with dimensions at least equal to those of the entrance channel; and third, that they will dredge, to a depth of 12 feet at mean low water, an anchorage basin in the inner harbor with an area of at least 50 acres, the location thereof to be approved by the Chief of Engineers and the Secretary of War; the inner channel and anchorage basin to be maintained thereafter by and at the expense of local interests.

PASSAIC RIVER, N. J.

The Passaic River flows through northern New Jersey for a distance of about 80 miles, entering Newark Bay at Newark, N. J. The United States has provided a channel 20 feet deep and 300 feet wide from the mouth for about 7 miles; thence 16 feet deep and 200 feet wide to the Montclair & Greenwood Lake Railroad bridge, about 1.1 miles; thence 7½ feet deep and 150 feet wide through Belleville Bar, about 1,500 feet; and thence 6 feet deep and 50 to 100 feet wide to the Gregory Avenue highway bridge at Passaic, 5.8 miles, a total distance of 14.1 miles. Mean range of tide is about 5 feet at the Montclair & Greenwood Lake Railroad bridge and 4 6 feet at the Gregory Avenue Bridge. A channel 12 feet deep and 150 feet wide is now desired, extending from the Montclair & Greenwood Lake Railroad bridge to the Garfield Bridge in Passaic.

The commerce in 1922 pertaining to the section of river under consideration amounted to 125,000 tons, mostly oil, petroleum products, and lumber; in 1923 it was slightly less. The present controlling depths above the Montclair & Greenwood Lake Railroad bridge are 6 feet to Gregory Avenue and thence 3 feet to the Garfield Bridge. Boats carrying coal, lumber, sand, brick, and crushed stone draw, when fully loaded, up to 11 feet. The channel conditions necessitate underloading so that the draft will not exceed 7 or 8 feet. It is also claimed that a very material saving in transportation costs would result from the movement of oil in vessels having a standard draft of 10.6 feet, over the results possible with movement in smaller barges.

An economic study made by the Passaic River Improvement Association leads local interests to believe that the deeper channel requested would result in an increased commerce of some 500,000 tons. The advocates of this improvement state that a large part of the tonnage pertaining to the Passaic district is now brought in or taken out of New York Harbor by water. The direct exchange of this tonnage between water carriers would eliminate trucking and extra handling around New York, and delays at ferries, bridges, and in congested streets. It would also provide a quicker service for many commodities.

The district engineer, who is also the division engineer, states that the partial loading of boats made necessary by the limited channel depth and the delays due to unfavorable tidal conditions greatly increase the cost of transportation. Under the conditions existing, no regular package freight line has developed. Such a service is promised by an established line operating between Newark and New York, provided channel depths are made adequate. The district engineer considers that, if the United States is to continue the improvement, a channel should be furnished deep enough to accommodate safely the type of barges commonly used in New York Harbor and in the New York State Barge Canal. He submits the following estimates for improving the river up to the Garfield Bridge or to the Eighth Street Bridge:

10 feet by 125 feet up to Garfield Bridge	$752,000
12 feet by 125 feet up to Garfield Bridge	1,196,000
10 feet by 125 feet up to Eighth Street Bridge	649,000
12 feet by 125 feet up to Eighth Street Bridge	1,058,000
10 feet by 150 feet up to Eighth Street Bridge	858,000
12 feet by 150 feet up to Eighth Street Bridge	1,379,500

It is safe to assume, in his opinion, that a 10-foot channel would result in freight savings of about $135,000, and a 12-foot channel in savings of about $200,000. As it is now tentatively decided to build the proposed municipal wharf below the Eighth Street Bridge, instead of above it as was previously contemplated, the district engineer believes it unnecessary to extend the improvement beyond that bridge. He gives reasons for considering that a 10-foot depth would be sufficient and a width of 150 feet desirable, and therefore recommends a channel of these dimensions extending up to the Eighth Street Bridge, at an estimated cost of $858,000, with $18,000 annually for maintenance, subject to the conditions that local interests shall furnish disposal areas and shall provide a public terminal satisfactory to the Chief of Engineers. These reports have been referred, as

required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district engineer.

After due consideration of the above-mentioned reports, I concur in the views of the district engineer and the Board of Engineers for Rivers and Harbors. The area which would be served by a deeper channel in the Passaic River lies within the metropolitan district of New York. Much of its business is dependent upon tonnage passing through the port of New York. Rail and truck movements in this district are subject to considerable delay and expense. Provision for the movement of traffic by water between the city of Passaic and the harbor of New York would result in a saving in freight rates and would tend to decrease the congestion attending land transportation. A few years ago the department recommended unfavorably on the improvement; since then, however, new industries have developed in the Passaic district, the movement of commerce by water has considerably increased, and there are definite indications that increased channel facilities would produce pronounced savings and benefits. I therefore report that modification of the existing project for Passaic River, N. J., is deemed advisable so as to provide for a channel 10 feet deep at mean low water and 150 feet wide from the Montclair & Greenwood Lake Railroad bridge to the Eighth Street Bridge in Passaic, at an estimated cost of $858,000, with $18,000 annually for maintenance; provided that local interests shall furnish, without cost to the United States, suitable areas for the disposal of material dredged in the creation and subsequent maintenance of the channel, and shall give satisfactory assurances that they will provide a public terminal in accordance with plans to be approved by the Chief of Engineers and the Secretary of War, fulfillment of these conditions to precede the initiation of work by the United States. Funds should be made available in three approximately equal annual installments.

BALTIMORE HARBOR, MD.

The Secretary of War and the Chief of Engineers are authorized to modify the existing project with reference to the anchorage area at the intersection of the Fort McHenry Channel with the Ferry Bar Channel by the selection of a new location at such point as may be found, after full consideration, to be most advantageous to shipping interests. (See statement of the Chief of Engineers in the hearings on the river and harbor bill.)

APPOMATTOX RIVER, VA.

The Appamottox River is a tributary of the James River, which it enters about 32 miles below Richmond. The city of Petersburg is 11 miles above the mouth. The United States has provided a channel 80 feet wide and 12 feet deep at ordinary high water from a point about 3½ miles from the James River to Petersburg, and has diverted the main river to prevent deposit of its burden of silt in Petersburg Harbor. Mean range of tide is 2.9 feet. A channel is now desired 12 feet deep at mean low water and 100 feet wide between Petersburg and the James River.

The commerce for 1923 was 252,000 tons, and for 1924 was 209,000 tons. The decrease in traffic in the latter year was caused largely by a reduction in shipments of sand and gravel, which constitute the

major part of the annual business. Materials other than sand and gravel consist of 18,000 to 20,000 tons, mostly package freight, and 6,000 tons of fertilizer materials and lumber. Petersburg, with a population of about 35,000, is an industrial city of considerable importance. It has more than 70 manufacturing establishments, the principal ones producing cigarettes and plug and smoking tobacco. It is also a consuming and distributing point for agricultural products, notably peanuts, cotton, and tobacco.

From a survey made by local interests of the 1923 rail traffic, it is possible to segregate the origin and destination of 131,000 tons thereof, as follows:

Origin or destination	Tonnage
Points on the James and Rappahannock Rivers	39, 500
Baltimore	14, 000
Philadelphia, New York City, or Boston	66, 500
New England points	11, 000
Total	131, 000

Based upon this information and upon existing rail and water rates, the district engineer estimates that upward of 100,000 tons of this traffic could be moved by water at an annual saving approaching $180,000. The existing river commerce would also benefit by a deeper channel, through a reduction of delays now experienced while waiting for favorable tides, etc.

The existing project provides for a mean low-water depth of only 8½ feet, which is sometimes reduced by as much as 2 feet by westerly winds. The maximum loaded draft of the steamboats now operating on the river is 9 feet and of barges 10¼ feet. The district engineer points out that the present depth is manifestly too limited for handling commerce in vessels of this draft with economy, and that the introduction of additional carriers and the growth of business could not be expected under such conditions. From information presented by local interests, it appears that greater depth of channel would result in a saving of 20 to 30 per cent in the cost of moving bulk commodities in barges. The steamboat rate is already 12½ per cent under rail rates and might be made still lower. The present barge movement of sand and gravel is, in the opinion of the district engineer, likely to decrease.

The cost of providing channels 10 feet deep at mean low water and 80 feet wide, and 12 feet deep and 100 feet wide, is estimated at $91,000 and $287,000, respectively, with annual maintenance of $6,500 and $7,500. The district engineer believes that a 12-foot channel is necessary for full development of the possible commerce. He computes the annual carrying charges, including maintenance and interest on the first cost, at $19,000, which is a small percentage of the estimated savings. If only about 10 per cent of the estimated traffic were diverted from rail to water, the resultant savings would equal the annual charges. The district engineer therefore recommends adoption of a 12-foot project. He believes that local interests should be required to take measures to prevent material from Lieutenant Run and Poes Creek entering Appomattox River, or alternatively should be required to maintain the channel in that vicinity.

The division engineer concurs with the district engineer, except that he believes that the United States should assume all channel maintenance. He recommends that the locality provide necessary spoil-disposal areas adjacent to the channel.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board concurs with the district and division engineers in the opinion that further improvement is justified, but believes that a channel 10 feet deep at mean low water would provide adequately for the present needs.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. The channel provided by the existing project has resulted in a commerce of considerable magnitude. It is manifest that there exists an active demand for water transportation. With deeper water it is probable that there would be a marked increase in the movement of high and medium grade material. The total tonnage might not increase greatly, as the sand and gravel movement appears to be decreasing, but the greater unit value would result in correspondingly greater savings in transportation costs. Most of the carriers now used could, under ordinary conditions, operate at any stage of the tide were a channel depth of 10 feet at mean low water provided. The comparatively few deeper draft carriers might have to "work the tides," but the delay involved would be inconsiderable, and the additional cost of a 12-foot channel is out of proportion to the resulting limited benefits to these larger carriers. I therefore report that modification of the existing project for the improvement of Appomattox River, Va., up to Petersburg is deemed advisable to the extent of providing for a channel 10 feet deep at mean low water and 80 feet wide, with a turning basin at the upper end, along the general lines proposed by the district engineer at an estimated cost of $91,000, with $6,500 annually for maintenance, subject to the provision that local interests shall furnish, without cost to the United States, suitable spoil disposal areas. The entire amount of the estimated first cost should be made available in the initial appropriation.

CHANNEL TO NEWPORT NEWS, VA.

The existing project, which provides for a channel 600 feet wide and 35 feet deep at mean low water, connecting deep water in James River with Hampton Roads, has been completed. Local interests now desire a channel 40 feet deep and from 600 to 1,000 feet wide.

The district engineer presents a plan for a channel 40 feet deep at mean low water and 400 feet wide across the shoal with widening at the entrances, to be dredged within the limits and along the axis of the existing 600-foot channel, at an estimated cost of $500,000 for new work and $20,000 annually for maintenance. The division engineer concurs in part in this recommendation, but considers that some local cooperation should be required and that the work could be deferred for the present.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated November 21, 1922. It states that Newport News has a large water-borne commerce, the total tonnage for 1920

amounting to about 6,860,000 tons. This consists largely of bituminous coal, arriving by rail and shipped abroad or coastwise by water. In such coal shipments Newport News ranks second among the ports of the United States. It is desirable that channel dimensions be provided adequate for any ships engaged in such commerce.

The Newport News Shipbuilding & Dry Dock Co. operates one of the largest shipyards in the United States, with modern facilities for construction and repair of vessels of all classes. The value of this plant to the United States is indicated by the great number of naval and merchant vessels which have been built there, and by the saving which is being made at present in the reconditioning of the steamship *Leviathan*. The utility of this plant as a national asset in peace and war is limited by the depth of channel available. To remove the difficulties and risk attendant upon the passage of the larger class of vessels now entering the harbor, and to make the shipyard facilities available for such craft, a channel depth of 40 feet is needed. The provision of such a channel would also open to deep-draft ships a large anchorage in the James River, where protection from storms would be afforded, as well as ready access to repairs and supplies.

The present channel can not at all times be navigated with ressonable safety by large ships on account of its limited dimensions, hard bottom, and cross tidal currents. In attempting passage, several vessels have become unmanageable and have grounded, due to these conditions. After a careful study of the situation, the board considers that to obtain satisfactory results the channel should have a width of not less than 600 feet, increased to 1,000 feet at the ends, the increased cost of which is believed to be justified by the resulting advantages. It therefore recommends that the existing project be modified to provide a depth of 40 feet for a width of 600 feet, widened at the ends to 1,000 feet, at an estimated cost of $714,000 for new work and $20,000 annually for maintenance.

After due consideration of the above-mentioned reports, I concur in general in the views of the Board of Engineers for Rivers and Harbors, and therefore report that the further improvement of the channel from Old Point to Newport News, Va., is deemed advisable to the extent of providing a channel 40 feet deep and 600 feet wide, increased to 1,000 feet at the ends, at an estimated cost of $714,000 for new work and $20,000 annually for maintenance. The total amount of the estimated cost should be made available in one appropriation.

SHALLOTTE RIVER, N. C.

Shallotte River is a small stream entering the Atlantic 20 miles west of the mouth of Cape Fear. The United States has provided a channel 4 feet deep at mean low tide and 36 feet wide for a distance of about 8 miles from the mouth to Whites Landing, which is about a mile downstream from the town of Shallotte. Mean range of tide is 5 feet at the mouth and 3½ feet at Shallotte. Request is made that the improvement be continued to the town.

The present commerce is about 8,000 tons of a varied character, most of which moves to or from Wilmington by the open sea, and practically all of which moves over the unimproved stretch between Whites Landing and Shallotte. The district engineer states that extension of the channel to the town would probably not cause a

material increase in commerce, but that it would greatly facilitate the operation of existing water carriers. He recommends that the channel be so extended with the present project dimensions, at an estimated cost of $7,000, with $200 annually for maintenance. The division engineer concurs. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the above-mentioned reports I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. Shallotte River has been improved at quite small expense. Its commerce is comparatively limited but is of sufficient magnitude and general importance to have justified the United States in the work thus far undertaken. This is particularly true in view of the fact that Brunswick County, in which the river is situated, is the largest county in North Carolina, with valuable agricultural land, and that due to poor railroad facilities, it is to a considerable degree dependent on water transportation. The full value of the improved river can not, however, be obtained because practically all vessels must pass over the section above Whites Landing, where depths are less than in the improved section below, in order to reach the terminals at Shallotte. This condition could be avoided by transshipping at Whites Landing. It appears, however, that construction of a terminal at this point would be quite expensive on account of a bluff bank, in addition to which certain legal complications are involved. I consider that Shallotte is the logical point to select for the upper terminus of the improvement. I therefore report that modification of the existing project for the improvement of Shallotte River, N. C., is deemed advisable so as to provide for a channel 4 feet deep at mean low water and 36 feet wide from the mouth to the town of Shallotte, at an estimated cost of $7,000 with $200 annually for maintenance.

NEUSE AND TRENT RIVERS, N. C.

New Bern is one of the southern termini of the system of inland waterways, nominally terminating at Beaufort Inlet, over which a large traffic is carried on with Norfolk, Va., and points farther north. The existing project for improvement of the Neuse River provides for a channel 300 feet wide and 8 feet deep at dead low water below New Bern and 200 feet wide and 8 feet deep at New Bern, and for lesser depths above. The existing project for the Trent River provides for a channel 8 feet deep at dead low water at New Bern with lesser depths above. It appears to be the desire of local interests to secure a 12-foot depth of water at and below New Bern to correspond with the project depth of the inland waterway. Referring to the plane of mean low water, which is the plane of reference for the inland waterway between Norfolk and Beaufort Inlet, there is now an available depth of 10½ feet up to New Bern.

The district engineer estimates the cost of dredging a channel 12 feet deep at mean low water and 300 feet wide through the three obstructing shoals up to New Bern at $50,000 for new work and $2,000 annually for maintenance. He recommends the adoption of this project subject to the condition that before the improvement is

undertaken by the Federal Government, local interests be required to complete the construction of the rail connection with the wharves on the Trent River portion of the harbor. He believes that further improvement than is contemplated by the existing project for the Trent River above New Bern is not warranted at this time, and local interests, though advised of these unfavorable views, presented no appeal therefrom. The division engineer concurs in the views and recommendations of the district engineer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith concurring in the recommendations of the district and division engineers.

After due consideration of the above-mentioned reports I concur in the views of the district engineer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the further improvement of Neuse and Trent Rivers up to and in front of New Bern is deemed advisable to the extent of providing a channel 12 feet deep at mean low water and 300 feet wide, at an estimated cost of $50,000 for new work and $2,000 annually for maintenance, subject to the condition that no work shall be done toward the deepening of the channel until rail connection satisfactory to the Chief of Engineers has been completed to the wharves. The full amount of the appropriation should be made available in a single appropriation.

I also concur with the district engineer, the division engineer, and the Board of Engineers for Rivers and Harbors in the opinion that no additional improvement above New Bern is required in the Trent River at the present time.

CHARLESTON HARBOR, S. C.

Charleston Harbor is the principal port of South Carolina. It is under improvement by the United States under a project providing for jetties at the mouth and for a 40-foot channel 1,000 feet wide between the jetties and up the Cooper River, which forms the principal part of the harbor, to the United States navy yard, located 7½ miles from the southern end of the city. This project was adopted in 1918 as a national-defense measure. Such work as was done on it did not advance to the point of increasing the governing channel depths. The project which existed previous to this provided for a 30-foot channel from the sea to the harbor. The jetties at the entrance have been completed and the 30-foot channel has been dredged and generally maintained. As adequate depths already exist in the lower Cooper River, this work has resulted in providing a 30-foot approach to the water front along that river. During the war emergency, dredging was done by the Navy Department and the Army Quartermaster Corps, which resulted in an extension of the 30-foot depths up the Cooper River to the navy yard and thence for 3 miles to the Army supply base. The latter is below the mouth of Sanders Creek referred to in the present item of law. In Cooper River, off the main water front of the city, is a marshy island known as Drum Island, the channel between which and the city is called Town Creek. It has depths in excess of 30 feet except at the lower entrance, where the controlling depth is 27 feet, and over shoals in

the upper entrance. No work of improvement has been done by the United States in Town Creek, but some dredging has been done by private interests. Mean range of tide is 5.2 feet. Interested parties request the completion of the 40-foot project to the navy yard and the provision of a 30-foot channel through Town Creek.

The district engineer submits a study of vessel drafts, from which he concludes that there are very few commercial vessels likely to call at Charleston which could not be accommodated on a 30-foot channel. He thinks that a 30-foot channel in the Cooper River would adequately serve the commercial needs of the port, although between the jetties the depth should be increased to 32 feet. The 30-foot depth should extend up to the Army supply base, which has recently been leased by the port utilities commission of Charleston and is an important element in the terminal facilities of the port. No need is apparent for improving the river between the Army supply base and Sanders Creek. A 30-foot depth should also be provided through Town Creek, which handles about one-third of the entire commerce of the harbor in addition to serving as an alternative route for through traffic pertaining to the terminals on the upper stretch of the Cooper River. In the opinion of the district engineer, the 40-foot project is not needed commercially. It is understood to have been suspended on account of cessation of work on a large new dry dock at the navy yard, and he believes that it should remain in suspension until the need for it develops. He would, however, modify the project widths to conform to the wishes of the Navy Department. He recommends a channel 32 feet deep and 1,000 feet wide from the sea to the inner end of the jetties; thence 30 feet deep and 600 feet wide to the navy yard, thence 30 feet deep and 400 feet wide to Goose Creek, just above the Army supply base with a turning basin at the base; and a channel 30 feet deep and 500 feet wide through Town Creek; subject to the provision that local interests will furnish dumping grounds. His estimate for first cost is $479,000, with $100,000 for maintenance.

The division engineer concurs with the district engineer, except that he considers that for the commercial project the depth from the sea to the inner end of the jetties need only be 30 feet. With this modification the estimated first cost would be $314,000, with $95,000 annually for maintenance. He also recommends that work on the 40-foot project be undertaken only as requested by the Secretary of the Navy for purposes of national defense.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the recommendations of the division engineer.

After due consideration of the above-mentioned reports, I concur in the views of the division engineer and the Board of Engineers for Rivers and Harbors. The project for Charleston Harbor which existed until 1918 covered only the jetties and the channel to their inner end. On account of the good natural channels within the harbor, and of the concentration of the principal terminal facilities at the southern end of the peninsula on which the city is located, this project proved adequate up to that time. With the growth of the port additional terminals have been constructed on Town Creek and on Cooper River at points above the city, the most remote of these latter

being the Army supply base, now locally known as the "port terminals," which, though designed primarily for war needs, has come to perform an important commercial function in peace time. The 30 feet provided at the entrance under the former project is considered adequate for the business of the port, but channels of a similar depth and of appropriate widths should be authorized up the Cooper River as far as the Army supply base, and also through Town Creek. In so far as concerns the stretch of the Cooper River up to the navy yard such a depth would, of course, be included in and provided by the 40-foot project, should that be completed and maintained. This project, however, on the one hand provides a depth much in excess of that needed by commercial vessels, and on the other hand does not provide the channels through Town Creek and above the navy yard which are of commercial importance. Moreover, work on the 40-foot project has been suspended, and since its resumption apparently turns on questions distinct from commerce and commercial navigation, another project should be in existence more closely adapted to the economic needs of the harbor. I therefore report that modification of the existing project for Charleston Harbor, S. C., is deemed advisable to the extent of providing for commercial purposes a channel 30 feet deep, 1,000 feet wide from the sea to the inner end of the jetties, thence 600 feet wide to the navy yard, and thence 400 feet wide to Goose Creek, with a turning basin 700 feet wide at the port terminals, together with a channel 30 feet deep at mean low water and 500 feet wide through Town Creek, following substantially the lines proposed by the district engineer, at a total estimated cost of $314,000, with $95,000 annually for maintenance, subject to the provision of local cooperation recommended by the Board of Engineers for Rivers and Harbors. The entire amount of the estimated first cost should be made available in a single appropriation.

I further report that modification of the existing 40-foot project is deemed advisable, in accordance with the request of the Secretary of the Navy, so as to provide for widths of 1,000 feet from the lightship to the inner ends of the jetties, thence 600 feet to the south pier at the navy yard, and thence 1,000 feet to the commandant's wharf, the effect of which modification is to reduce the estimated first cost to $3,603,000 and the estimated annual maintenance ot $250,000, both figures being additional to the estimates for the commercial project given above; and that it be considered as a national defense rather than a commercial measure, and be prosecuted only as found necessary in the interest of national defense.

SAVANNAH RIVER, GA.

Savannah Harbor is under improvement by the United States under a project which provides depths of 30 feet at the entrance, 26 feet up to the Seaboard Air Line bridge at the city, and 21 feet thence to Kings Island, which lies 27½ miles from the ocean. The Coastal Highway Bridge is 4.2 miles upstream from the foot of Kings Island. This stretch is part of the section of the river between Savannah and Augusta for which there is a Federal project looking to the provision of a 5-foot depth; below the highway bridge it has been unnecessary to do any work under this project. Mean range of tide is 6.1 feet at Kings Island and 5.4 feet at the highway bridge.

Request is made for a channel up to the bridge 21 feet deep and 200 feet wide.

Six industrial plants are located on the west bank of the river between Kings Island and the bridge. The Savannah Warehouse & Compress Co., the Savannah Sugar Refining Corporation, the Savannah Creosoting Co., the Savannah River Lumber Co., the Atlantic Paper & Pulp Corporation, and the Savannah Steel Corporation. The commerce of this stretch in 1924, exclusive of traffic pertaining to the shallow-draft river channel and to the operation of sand dredges, was 233,000 tons, the largest amount on record in the past five years. The principal items were sugar, cotton, and creosote oil. These pertain, respectively, to the Savannah Sugar Refining Corporation, the Savannah Warehouse & Compress Co., and the Savannah Creosoting Co., all of which are located within the lower 2 miles of the section of river under consideration. The most important concern affected is the sugar company, whose commercial success is dependent to a considerable extent on its ability to receive raw sugar in ocean-going vessels. It has dredged the main channel at its own expense to a depth of 17 feet at mean low water, which work has also benefited the creosoting company.

4. The district engineer points out that the extension of industrial development upstream from Kings Island represents a natural and normal growth of the port of Savannah, and that industries have been installed here whose products enter into our national commerce. The sugar company now pays some $6,000,000 annually to the United States as customs duties, and its payments have represented in recent years over 97 per cent of all the duties collected at the port of Savannah. In the opinion of the district engineer, the magnitude of the interests and their commerce is such as to justify some improvement. He believes that the least channel dimensions which would be satisfactory are a depth of 21 feet and a width of 200 feet. The cost of providing these from the upper end of the present 21-foot project to the Savannah Creosoting Co., a distance of 11,000 feet, is $190,000, with $16,000 annually for maintenance. A further extension of 9,000 feet would reach all the existing industries below the Coastal Highway Bridge at an additional cost of $165,000. The district engineer believes that the first of these improvements is justified, but that the cost of the second is excessive, in view of the limited benefits which would probably be derived from it under present or immediately prospective conditions. He recommends the adoption of a project for a channel of the dimensions proposed up to the Savannah Creosoting Co. The division engineer concurs. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the above-mentioned reports, I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. Savannah is an important and growing port, and its industrial expansion in recent years has naturally led to the development of industries on the river above the limits of the present deep-draft project. Three of these industries have developed an annual water-borne commerce of over 200,000 tons, despite the difficulties arising from limited depth of water,

which difficulties have been overcome to some extent by dredging at local expense. It is believed that the volume and importance of the commerce justify Federal assistance. The most effective and economical means of providing this is by the channel proposed by the district engineer. Such a channel will serve the Savannah Creosoting Co. and the two concerns which are situated below it, including the sugar company, which is the largest contributor to the existing traffic; and will also make available additional sites for industrial development along a stretch of more than 2 miles of river. Further extension upstream is not believed at present advisable, in view of the expense involved and of the more limited industrial developments. I therefore report that modification of the existing project for Savannah Harbor, Ga., is deemed advisable to the extent of providing a channel 21 feet deep at mean low water and 200 feet wide from the upper end of the existing 21-foot project at Kings Island to the vicinity of the terminal of the Savannah Creosoting Co., by dredging and suitable regulating works, along the general lines proposed by the district engineer, at an estimated cost of $190,000, with $16,000 annually for maintenance, subject to the conditions of local cooperation proposed by the Board of Engineers for Rivers and Harbors. The entire amount of the estimated first cost should be made available in the initial appropriation.

SAVANNAH HARBOR, GA., FROM KINGS ISLAND TO THE SEA

Savannah Harbor includes the lower section of the Savannah River and the estuary at its mouth, with a total length of improved channel of about 27½ miles. The existing project provides for channels 30 feet deep from the sea to quarantine, thence 26 feet deep to the Seaboard Air Line Railroad bridge, and thence 21 feet deep to the foot of Kings Island, with varying widths, together with certain supplementary features, to be attained by jetties, dredging and regulating works and the closure of certain side channels. Mean range of tide is 7 feet at the entrance, and about 6 feet at the foot of Kings Island. Request is made for such maintenance of the existing project that full depths will be available at all times, and for consideration of further needs of the harbor.

The general plan for improving the harbor has involved contraction of channels to produce additional scouring of the bottom. Regulating works constructed with this end in view have materially assisted in maintaining the channels, but have not been adequate to remove the heavy burden of silt brought down by the Savannah River. Extensive dredging is therefore necessary. Under present conditions, and with the high unit prices prevailing since the war, it is estimated that the average annual cost of maintaining the harbor is $510,000.

The district engineer submits a careful study looking to a reduction in this cost. Contraction of the bar channel beyond the jetties would involve the construction of breakwaters at a cost of $17,000,000 or $18,000,000, far too much to be justified by the resulting savings in maintenance. In the upper section of the harbor, between Kings Island and the head of North Channel, the necessary maintenance dredging is not large. The report is therefore primarily concerned with the intermediate section from

the sea end of the jetties to the head of North Channel. The district engineer proposes additional contraction works, training walls and other structures, with a view to increasing the scouring effect of the current in this section. The total estimated cost is $3,900,000 or $4,606,000, depending on the extent to which the alignment of North Channel is modified. He considers that a project along these lines should be adopted, but believes that it may be necessary to carry out only certain specified portions of it, the estimated cost of which is $2,380,000. The division engineer concurs in general, but suggests that it may be found desirable, after contracting North Channel, to provide for increasing the ebb flow by means of a dam with regulating gates in South Channel, immediately below St. Augustine Creek, permitting free entrance of flood tide, but concentrating the flow of the ebb in North Channel.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board points out that more efficient regulation in North Channel can be accomplished either by contracting that channel or by increasing the flow therein. It obtained from the district engineer a supplementary report looking to the development of a plan based more largely on the latter idea. This plan as presented by the board, contemplates a dam with one-way gates in South Channel, upstream from the head of St. Augustine Creek; a by-pass channel around this dam for the intracoastal waterway running south from Savannah Harbor; the raising of Long Island training wall, the removal of Oyster Bed Island, and certain additional work in the upper river. The estimated cost is $1,420,000, with $400,000 annually for maintenance. The board recommends a modification of the existing project along these lines, subject to certain local cooperation.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. The maintenance of a channel adequate for the important general waterborne commerce of the port of Savannah has proved to be a very difficult and expensive problem. The major item in the expense is the continuous dredging necessary to remove the silt deposits brought down by the river. This expense can not be eliminated, but it can be materially reduced by works so designed as to increase the scouring effect of the river current and the ebb tide. The section where the greatest necessity exists for such work is from the jetties to the head of North Channel. It has been recognized that conditions would be much improved here if the flow in North Channel could be increased. The present project authorizes the construction of a rock dam in South Channel with this end in view. This has never been built. It would be preferable to provide a regulating dam with one-way gates, so that the water entering by South Channel and Habersham Creek at flood tide could pass freely to the upper harbor, and be concentrated in North Channel on the ebb. The location of this work upstream from the mouth of St. Augustine Creek involves the provision of a by-pass channel for the intracoastal waterway; such a channel would of course carry a portion of the ebb tide; but its volume would be comparatively small. In addition to these works designed to increase the ebb flow in North Channel it is desirable to provide for a freer entrance of the flood tide by widening

the channel at Oyster Bed Island, Kings Island and Drakies Cut. It is also desirable to raise Long Island training wall, which in its present condition is so low that a portion of the ebb tide in North Channel flows out across it, whereby the scouring effect in the main channel is reduced. The net cost in round figures is $1,420,000, and it is expected that there will result a reduction of over $100,000 in maintenance. Moreover, it is likely that some of the work, such as the raising of Long Island training wall, can be undertaken wholly or partly in connection with necessary maintenance dredging, at little additional expense, thus reducing still further the net amount properly chargeable to new work. I consider that under these conditions, the saving in maintenance and the greater probable assurance of a satisfactory channel justify the capital expenditure proposed.

I therefore report that modification of the existing project for Savannah Harbor, Ga., is deemed advisable, so as to provide for a channel 30 feet deep with a general width of 500 feet from the 30-foot contour in the ocean to the quarantine station, 10.2 miles; thence, 26 feet deep with a general width of 400 feet to the Seaboard Air Line Railway bridge, 16 miles; and thence 21 feet deep and 300 feet wide to the foot of Kings Island, 1.3 miles; a total length of 27.5 miles; for widening the channel to 600 feet at West Broad and Barnard Streets; for an anchorage basin opposite Fort Oglethorpe by widening the 26-foot channel to 900 feet and installing mooring dolphins; for closing South Channel by a regulating dam, and dredging a channel 7 feet deep and 100 feet wide between the main river and Wilmington River, as a substitute for this portion of the inland waterway; for dredging Drakies Cut to a depth of 13 feet and a width of 350 feet; for increasing the width of the channel at Kings Island to 525 feet; for the raising, extension, and repair of training walls, jetties, and other works; and for bank protection; at an estimated cost of $1,420,000 with $400,000 annually for maintenance, subject to the conditions that local interests shall deed to the United States the necessary land on South Channel for the regulating dam, and shall furnish, without cost to the United States, a right of way for the intracoastal waterway extending from the main river near Fort Jackson to Wilmington River, and suitable disposal areas for material dredged in the improvement and future maintenance of the harbor. Appropriations should be made at the rate of $500,000 annually for the first three years and $377,000 the fourth year.

The above item of law calls for a consideration of widening, straightening, and deepening the existing channels and consolidating all projects relating to Savannah Harbor. While the governing depth up to Savannah is 26 feet at mean low water, as distinguished from 30 feet at certain neighboring ports, I do not consider that this involves a sufficient interference with commerce and navigation to justify at the present time the increase in project dimensions of the channel, in view both of the considerable range of tide, and of the great cost of maintaining even the present channel. The first step should be works such as now proposed, looking to a reduction in this maintenance cost and a more complete stabilization of the regimen of the harbor. All items of improvement of Savannah Harbor are now consolidated in a single project.

APALACHICOLA BAY, FLA.

Apalachicola Bay and St. George Sound form between them a body of water about 45 miles long and 8 miles wide on the south coast of Florida, separated from the Gulf by low narrow islands. There are three natural entrances—West Pass, East Pass, and St. Vincent Sound. The Apalachicola River enters the bay from the north, and the town of Apalachicola is situated at its main mouth. The United States has improved the locality under a project calling for a channel 18 feet deep and 150 feet wide through West Pass and Link Channel, the latter being a channel through certain shoals just inside the bay; for a channel 10 feet deep at mean low water and not less than 100 feet wide thence to the town of Apalachicola; and for a channel 9 feet deep at mean low water and 100 feet wide through Bulkhead Shoals. The latter is a short section to the east of the town tending to facilitate the movement of commerce between Apalachicola and St. George Sound. In House Document No. 860, Sixty-fourth Congress, first session, the Chief of Engineers recommended the abandonment of the West Pass and Link Channel improvements. Congress has taken no action on this recommendation. Mean range of tide is 2 feet.

Apalachicola and adjacent communities have a total population of about 5,000 and form the center of a considerable fishing, oyster, and shrimp industry, employing some 200 boats of light or moderate draft. Several sawmills are also located at the town. Water-borne commerce for 1924 was 26,700 tons coastwise, principally sea food and lumber products. The Apalachicola River, which in its lower section has a project depth of 6 feet, carries, together with certain tributaries, a considerable light-draft commerce.

In his report of preliminary examination the district engineer discussed the initial request of local interests, which was for a channel 20 or 22 feet deep from the Gulf to the town. He made an approximate estimate of 134,000 tons of new commerce which might result from this improvement, together with a saving of $50,000 a year on existing commerce. The Board of Engineers for Rivers and Harbors, after studying the case and holding a hearing, considered that the benefits from such a channel would be too uncertain to justify its great cost. Consideration was accordingly limited to channels of 12 feet or less, on which basis a survey was made.

The district engineer presents estimates for three alternative 12-foot channels of 100-foot bottom width as indicated on the attached map, as follows:

Route 1	$124,000
Route 2	173,000
Route 3	35,000

Route 2 was the one most favored by local interests, but the district engineer, after detailed investigations, which are discussed in his report of survey and in a supplementary report, arrives at the conclusion that maintenance thereof would be extremely expensive on account of the large annual movement of silt out of certain supplementary mouths of the river. He believes that route No. 1 would be the most suitable for a 12-foot depth. He does not, however, consider that there is adequate justification for this depth. The

fishing vessels, and a light-draft side-wheel steamer which operates to Carrabelle, are in general adequately served by existing depths. The only other general commerce of importance is carried in a single small steamer known as the *Tarpon*, which has a loaded draft of 8 feet. This vessel makes regular trips between Apalachicola and points to the east and west. It is sometimes forced to underload on account of shoaling in the bay, but the cost and delay incident thereto are not, in the opinion of the district engineer, sufficient to justify the considerable expense of an increase in existing depths. He questions the claim of local interests that a deeper-draft steamer might be put on if further improvement were made, and points out, moreover, that if this occurred it would probably involve the removal of the *Tarpon*, since there does not appear to be sufficient potential commerce for two such carriers. He states, however, that the governing depth in the section of the present channel between the southern section of the bar at the mouth of the river and the inner or eastern section of Link Channel is less than the 10 feet now being provided by maintenance across the bar at the mouth of the river, and that this condition should be corrected. He also believes desirable a 10-foot channel by route No. 1 from the town to East Pass. His estimate for this work is $55,000, with maintenance at $24,000 on the second year after completion and $14,000 thereafter; the latter figure being additional to the present maintenance estimate of $15,000.

The division engineer does not believe that the proposed work would serve any more useful purpose than somewhat to facilitate the operations of the steamer *Tarpon*, and recommends against any modification of the existing project.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board discusses the serious maintenance problem in Apalachicola Bay resulting from the enormous deposits of silt from the Apalachicola River, estimated at 15,000,000 cubic yards annually. It points out that, as a result of this, the expense involved in maintaining a channel adequate for general ocean shipping would be far in excess of any probable benefits. It concurs with the division engineer that the benefits of a 10-foot channel to East Pass would not be sufficient to justify the cost involved. It believes that the economic situation at the locality does not justify anything beyond the provision of an adequate 10-foot approach to Apalachicola from the Gulf by the cheapest route, together with maintenance of the 9-foot channel through Bulkhead Shoals, which at almost no cost considerably facilitates navigation to the eastward. It prefers, however, to withdraw its previous recommendation for abandonment of the 18-foot channel through West Pass and Link Channel, substituting therefor a provision for a 10-foot channel over the same sections to correspond to the depth provided within the bay. Present natural depths in West Pass and Link Channel are in excess of 10 feet, so that this latter recommendation involves no new work and may never involve maintenance operation, but the board believes that the Chief of Engineers should have authority to undertake it if it should become necessary.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. Apalachicola Bay is naturally a shallow body of water with a bot-

tom composed largely of soft silt brought down by the Apalachiola River. Large quantities of this deposit are added annually. The communities involved are small, and in view of the resources of the neighboring country, the railway net and rate structure, and the existence of neighboring deep-water ports, it is unlikely that a channel for ocean vessels would result in any material commercial or economic benefits of national scope, even were the Government prepared to undertake the very large annual expense involved in maintaining it. The present project provides for an 18-foot channel into the bay, a 10-foot channel thence to the town, and a 9-foot channel over the worst shoal to the east of the town. The 10-foot and 9-foot channels are justified by the existing coastwise commerce and sea-food industry. The depth of 18 feet in the western approach channel is inappropriate to the 10-foot depth within, but instead of abandoning an improvement of this section the project should be modified to provide for the same depth of 10 feet, thus permitting the department to guarantee such a channel all the way from the Gulf in the event that future shoaling in West Pass renders it necessary. I therefore report that modification of the existing project for Apalachicola Bay, Fla., is deemed advisable to the extent of providing for a channel 10 feet deep at mean low water, 150 feet wide from the Gulf through West Pass and Link Channel, and 100 feet wide thence to the town of Apalachicola, and for a channel 9 feet deep and 100 feet wide through Bulkhead Shoals. No specific appropriation is necessary for the work, which is limited to maintenance.

GULFPORT HARBOR AND SHIP ISLAND PASS, MISSISSIPPI

Authority is given to modify the existing project by relocating the channel across Ship Island Bar at such point as the Chief of Engineers, United States Army, may deem most desirable in the interest of navigation and economy.

(See statement of the Chief of Engineers in the hearings on the river and harbor bill.)

AMITE RIVER AND BAYOU MANCHAC, LA.

The Amite River drains an area of about 1,800 square miles in southwestern Mississippi and eastern Louisiana and flows into Lake Maurepas, which lies to the west of and is connected with Lake Pontchartrain. Bayou Manchac, formerly an outlet of the Mississippi, enters the Amite from the west about 36 miles above the mouth of the latter. The Federal project for the improvement of these streams provides for the removal of obstructions in the Amite from its mouth to a point 73½ miles above its junction with Bayou Manchac, for the closure of island chutes, and for snagging and dredging of Bayou Manchac to a point 11¼ miles above its mouth, together with the dredging of a turning basin in the bayou in the vicinity of Wards Creek. Local interests desire further improvement, though no specific channel dimensions are requested.

The district engineer reports that the commerce pertaining to these streams amounted to 38,000 tons in 1923, largely forest products. In earlier years it averaged 50,000 tons and in 1916 was 109,000 tons, declining to 19,500 tons in 1920. The products of the

region, which is not well served by railroad, moved principally by water to New Orleans. The existing channel from Lake Pontchartrain to the mouth of Bayou Manchac has a depth of about 7 feet, although in places that depth is available in a narrow channel only. Between the mouth of the bayou, which is obstructed by a sandy bar having a governing depth of about 5 feet, and the fixed railroad trestle 8½ miles above there are depths in excess of 6 feet.

The district engineer considers that the existing depths are ample for the present and immediately prospective commerce, and that improvement is no longer required on the Amite River above the mouth of Bayou Manchac. He finds, however, that greater width is needed in the lower river and recommends that the project be amended so as to provide for a channel 7 feet deep and 60 feet wide between Lake Maurepas and Port Vincent, about 4 miles below the mouth of Bayou Manchac, and for the removal of obstructions between that point and the Louisiana Railway & Navigation Co.'s bridge on the bayou, at an estimated cost of $5,000, with $1,200 annually for maintenance. The division engineer concurs.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the information presented, I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. The existing project is of an indefinite order, which fails to provide adequately for the maintenance of a practicable channel. The present and prospective commerce justifies the provision by the United States of a channel of definite cross section in the lower part of the Amite River. The upper reaches of the river are apparently used to so limited an extent as not to warrant further expenditure of Federal funds, but the business pertaining to Bayou Manchac is believed to be sufficient to justify the continued removal of obstructions. I therefore report that the improvement of Amite River and Bayou Manchac, La., is deemed advisable to the extent of providing, in lieu of the existing project, for a channel 60 feet wide and 7 feet deep at mean low water, from that depth in Lake Maurepas to Port Vincent, and for the removal of obstructions between that point and the bridge of the Louisiana Railway & Navigation Co. across Bayou Manchac, at a total estimated cost of $5,000, with $1,200 annually for maintenance.

Attention is invited to the statement of the Board of Engineers for Rivers and Harbors concerning Pass Manchac. As all the Amite River through commerce must move through Pass Manchac, it appears advisable that an examination of that waterway be made to ascertain the desirability of providing specified channel dimensions consistent with those in the Amite.

BAYOU BONFOUCA, LA.

Bayou Bonfouca, which enters Lake Pontchartrain near its eastern end, is not under improvement by the United States. Between its mouth and the town of Slidell, a distance of 6½ miles, the bayou has depths of 10 feet or more except over the bar in the lake, where there is a narrow channel with a limiting depth of 7½ feet. Local

interests desire a channel 14 feet deep from that depth in the lake to Slidell. The mean range of tide is about 0.8 foot.

The district engineer reports that the bayou has been navigated for many years. The total tonnage moved by water was 81,500 tons in 1922 and 81,000 tons in 1923. This business originates largely at Slidell, which has shipbuilding and repair plants, sawmills, and other industries, besides being a transshipping point from rail to water for lumber cut in the vicinity of Bogalusa, some miles to the north. This transshipment of lumber is increasing, and it is estimated may become 90,000 to 120,000 tons annually.

The investigations of the district engineer indicate the depth of 14 feet was proposed on account of the possible use of a single large towboat, but that the commerce of the bayou could be handled satisfactorily in a 10-foot channel, as there are available a number of light-draft towboats suitable for this depth. The district engineer makes estimates on three different routes across the bar, designated as "A," "B," and "C," and two different cuts from points on the bayou across the salt marsh to the lake, designated as routes "D" and "E." The estimated cost of routes "A," "B," and "C" are from $14,000 to $16,500, and for routes "D" and "E," $40,000 and $75,000, respectively. While either of the latter would eliminate bends in the lower stretch of the bayou, the district engineer considers that the cost would not be justified by the resulting benefits. He recommends route "C," as the least expensive in both first cost and maintenance. This, together with widening of certain sections of the bayou to provide a width of 60 feet up to Slidell, would bring the total cost of the improvement to $22,000, with $1,200 annually for maintenance. Local interests have offered to contribute $3,300 to the cost of the work, but the district engineer believes this to be inadequate, and recommends that the execution of the project be made contingent upon a local contribution of 25 per cent, or $5,500, leaving $16,500 as the net cost to the United States. The division engineer concurs.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the information presented, I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. The commerce which has developed on Bayou Bonfouca concerns not only the immediate locality but also the large and important timber stands and mills in eastern Louisiana north of Lake Pontchartrain, lumber from which is being increasingly transshipped to water at Slidell. The traffic is of sufficient magnitude and general interest to justify the provision of a channel adequate for its economical handling. Such a channel can be secured at a cost which is moderate in view of the benefits to be obtained. I therefore report that the improvement of Bayou Bonfouca, La., is deemed advisable to the extent of providing a channel 10 feet deep at mean low water and 60 feet wide between Slidell and deep water in Lake Pontchartrain, as recommended by the district engineer, at an estimated cost of $22,000, with $1,200 annually for maintenance, subject to the provision that local interests shall contribute $5,500 to the first cost of the work. The entire amount of

the estimated cost to the United States, $16,500, should be made available in the initial appropriation.

MISSISSIPPI RIVER BETWEEN CAIRO AND HEAD OF PASSES

The stretch of the Mississippi under consideration, which is 132 miles long, is part of the section up to Cairo for which there is a 9-foot project. No work has been required below Baton Rouge under this project, as natural depths are far in excess of 9 feet. The limiting depth under ordinary conditions is not less than 34 feet. When, however, there is a high flood followed by a sudden fall of the river, shoals are formed which, while eventually eroded, temporarily interfere with deep-draft navigation. Local interests desire that a depth of 35 feet be maintained at all times from the Head of Passes to Baton Rouge.

That part of the traffic of the Mississippi carried by barges and river steamers is not affected by the proposal. Baton Rouge is, however, an important transshipment point for petroleum products, the commerce of which in 1924 was nearly 4,600,000 tons. These are carried in ocean-going tankers, generally of deep draft, engaged in both coastwise and foreign trade. In addition, the city is developing terminals for general ocean commerce. The district engineer states that the large commerce now existing makes the provision of an adequate channel desirable. He estimates that the dredging necessary to provide it, by removing the temporary bars which sometimes form, will cost not to exceed $14,000 in a year of high floods. He recommends that a project be adopted for a 35-foot channel 300 feet wide on this basis. The division engineer concurs.

This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the above-mentioned reports I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. Southwest Pass, at the mouth of the Mississippi, has a project depth of 35 feet, which depth has been attained by recent work of the War Department. Natural depths in excess of this prevail from the Head of Passes to New Orleans; and for the greater part of the time natural depths of 34 feet or better are found from New Orleans to Baton Rouge. The latter city is therefore in effect a seaport with a 34-foot approach channel, and as a result has developed a large ocean-going commerce in petroleum products. The city's recent activity in terminal construction, coupled with the apparent purpose of a large steel company to make Baton Rouge a distributing point for its products, leads to the belief that this commerce will shortly be increased by a considerable movement of a more general character. It is proper that the United States should guarantee the generally adequate deep channel to Baton Rouge by the removal of the temporary shoals, which, due to flood conditions, occasionally obstruct it. The cost of the work is very small in proportion to the benefits which would ensue. I therefore report that the modification of the existing project for the improvement of the Mississippi River between Cairo and the Head of Passes is deemed advisable to the extent of providing a channel 35 feet deep at low water and 300 feet wide between Baton Rouge and

New Orleans, at an estimated annual cost of $14,000. It is unlikely that expenditures will be required in years other than those of high floods, but as these years can not be anticipated, it is desirable to base the estimate on an annual charge of the amount stated. No first cost of the work is given and no initial appropriation is necessary, as the river at present has adequate depths and the work proposed is essentially maintenance.

LOUISIANA AND TEXAS INTRACOASTAL WATERWAY FROM THE MISSISSIPPI RIVER AT OR NEAR NEW ORLEANS, LA., TO CORPUS CHRISTI, TEX.

The SECRETARY OF WAR:

1. There are forwarded herewith, for transmission to Congress, reports dated June 1, 1923, and December 5, 1923, with maps, by Col. G. M. Hoffman, Corps of Engineers, on preliminary examination and surveys, respectively, of the intracoastal waterway from the Mississippi River at or near New Orleans, La., to Corpus Christi, Tex.; Galveston and Sabine section of the inland waterway of Texas; waterway from Bayou Teche, La., to the Mermentau River; waterway from Lake Charles, La., to the Sabine River, Tex. and La., through the Calcasieu River, La., to Sabine River, Tex. and La., authorized by the river and harbor acts approved March 3, 1923, March 4, 1915, and September 22, 1922.

2. The proposed waterway would pass through southern Louisiana from the Mississippi River to the Sabine River on its western boundary and would extend into the State of Texas, generally following the coast line, to a point about two-thirds of the distance to the international boundary. Existing projects provide for a series of waterways, which would on completion give through inland navigation from the Mississippi River opposite New Orleans to Corpus Christi, except for the section between Port Arthur and Galveston Bay, for which section no canal has as yet been authorized. The limiting depth of this waterway would be 5 feet. Certain sections of the route already have improved or protecte channels with depths of 25 feet or more, viz, Calcasieu River to Sabine River, 30 feet, being provided by local interests; Sabine River to Port Arthur, 30 feet; and Aransas Pass to Corpus Christi, 25 feet. The section between Galveston Bay and Matagorda Bay has been recommended for improvement to a depth of 9 feet and a width of 100 feet (H. Doc. No. 395, 67th Cong., 2d sess.), but no action has yet been taken by Congress. Proponents of a through waterway desire a channel with a depth of 9 feet and a bottom width of 100 feet, extending from the Mississippi River to Corpus Christi.

3. The existing waterway between New Orleans and Bayou Teche, although having a cross section of but 5 by 40 feet, carried in 1922 a total commerce of 171,000 tons. A considerable traffic is also carried by certain of the rivers of southern Louisiana connecting with or forming an integral part of the proposed waterway, the tonnage consisting largely of logs and sugar cane.

4. The division engineer, Gulf division, who was charged with the duty of making the preliminary examination and survey in this case, reports that a large interchange of commerce might be expected between the various Gulf ports which would be connected by the proposed waterway and with the Mississippi River system. The completion within a comparatively few years of the 9-foot project for the Ohio River would add a large through traffic from the great industrial sections along that stream. Return cargoes of Louisiana and Texas products, such as sulphur, oil, salt, rice, and lumber, might be expected, as commodities of this nature could move at lower cost by water than by rail. While a large local traffic would undoubtedly develop, and in fact exists at present on some sections of the waterway even with inadequate depth, justification of the project would be found, in the opinion of the division engineer, in the large potential through commerce between the Mississippi Valley and points on the Gulf coast. A study of probable tonnage was made by Maj. Gen. George W. Goethals, United States Army, retired, at the instance of the Intracoastal Canal Association. His report, which is attached hereto, indicates a potential waterborne commerce of about 12,000,000 tons annually. Allowing for duplication of tonnage in his report, he states that the present possibilities of the proposed waterway are conservatively estimated at five to seven million tons annually.

5. The route proposed by the division engineer extends from the Mississippi River opposite New Orleans to the Atchafalaya River at Morgan City; thence north of West Cote Blanche and Vermilion Bays to Vermilion River; thence

north of White and Grand Lakes to the Mermentau River; thence to the Calcasieu River, following the Lake Misere Canal; thence to the Sabine River at Orange, Tex., via the 30-foot Lake Charles waterway; thence to Port Arthur by the existing Sabine-Neches Canal; thence southwest to Port Bolivar; and thence across Galveston Bay and along the coast to Gulf, Tex. This course differs in some sections from that followed by the existing projects in its avoidance of broad shallow lakes or bays where navigation has been found difficult, and maintenance cost for a 5-foot canal high and uncertain.

6. The existing waterway leaves the Mississippi River at Harvey, opposite New Orleans, where a lock is provided to take care of the difference in elevation of the river and the waterway. The present lock is inadequate for an enlarged waterway, and a new one would be required. The Plaquemine waterway offers a route from the Mississippi, 112 miles above New Orleans, to Morgan City, which can be prepared for the use of traffic at small expense and with little delay, pending completion of the new lock at Harvey and the enlarged canal between that point and Morgan City.

7. The division engineer believes that at least a million tons will move over the proposed waterway, and recommends its construction under certain conditions which are in general as follows:

A channel 9 feet deep and 100 feet wide via the Plaquemine waterway to Morgan City and thence to the Vermilion River, following the route suggested, at an estimated cost of $2,220,000, with $50,000 annually for maintenance, provided adequate guaranties are given of an annual traffic of 250,000 tons, exclusive of local traffic; $110,000 covers the cost of necessary work on the Plaquemine waterway to Morgan City.

A new lock at Harvey at an estimated cost of $600,000, with $35,000 annually for maintenance and operation, when prospective tonnage reaches 250,000 tons annually. A channel from New Orleans to Morgan City via the Harvey Canal route, 7 feet deep and 75 feet wide, at an estimated cost of $2,540,000, with $60,000 annually for maintenance, when an annual traffic of 400,000 tons is assured, and enlargement to 9 by 100 feet, at an estimated additional cost of $1,470,000, with $10,000 annually for maintenance, when a total traffic of 600,000 tons is assured.

A waterway with a least cross section of 9 by 100 feet, from Vermilion River to Galveston, at an estimated cost of $5,282,000 and $80,000 for maintenance, when an additional through traffic of 750,000 tons annually is assured.

A waterway from Galveston to Gulf, Tex., 9 by 100 feet, at an estimated cost of $2,231,000, with $75,000 annually for maintenance, generally in accordance with previous recommendations, but terminating at Gulf and following the modified route.

The purchase of four 20-inch pipe-line dredges at a total cost of $1,600,000.

The provision of all rights of way by local interests without cost to the United States.

The total cost of the work recommended is $15,943,000, with $310,000 annually for maintenance.

8. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. A very thorough investigation has been made by the board through its resident member, who spent several weeks in the field checking the commercial possibilities of the waterway as developed by General Goethals and the division engineer. Careful consideration of all the information presented leads the board to agree with the division engineer as to the advisability of the project, and to recommend its adoption, subject to certain requirements of local cooperation.

9. This portion of the Gulf coast is rich in natural resources, and in the production of agricultural products, and consumes a considerable tonnage of manufactured products. On account of the natural topography, railroad construction is difficult and very costly, and the movement of commerce is now dependent to a large extent on waterways, of which there are many, both natural and artificial. The proposed improvement would pass through this important area, and would provide for the economical transportation of the products of its salt and sulphur mines, oil refineries, and sugar, rice, and lumber mills. It would extend the 9-foot waterways of the Mississippi and Ohio Valleys and admit of direct shipments of manufactured products from large industrial areas as far northeast as Pittsburgh, Pa., for distribution in Louisiana and Texas and northern Mexico. Adequate potential tonnage is available to justify the construction of the waterway at Government expense. To insure a reasonable return on the necessary expenditure, however, it is essential that some provision be made for the actual

movement of commerce by the new route. It appears that this can best be assured by requiring that local interests shall provide adequate vessels, terminals, and auxiliary equipment to move a specified minimum tonnage on the various sections of the waterway.

10. In considering the several points which bear upon the proposed enlargement of the intracoastal waterway westward from New Orleans, I have reached the conclusion that the enlarged waterway should not terminate at Gulf, Tex., as recommended by the division engineer, Gulf division, and the Board of Engineers for Rivers and Harbors. This opinion is based on the following facts:

The first and only important port and railroad center west of Galveston is not at Gulf, but at Corpus Christi, the logical port of Aransas Pass.

Congress already has approved the project for a 25-foot channel from Aransas Pass to Corpus Christi, a distance of 21 miles, which stretch was formerly included as a portion of the intracoastal waterway between the Mississippi and the Rio Grande Rivers. This stretch of 21 miles is thus eliminated from the present proposition for the enlargement of the intracoastal waterway along the coast of Texas.

The town of Gulf, Tex., is served only by a spur of a single railroad, while Corpus Christi is already an established railroad center, having four separate railroads either terminating at or entering the port, besides being the logical point of distribution, etc., for a vast territory to the north and west of said center.

The proposed waterway between Galveston and Gulf, Tex., estimated by the division engineer to cost $2,231,000 to build, including one 20-inch pipe line dredge, will serve only one or two towns having practically a single commodity, while by extending the same waterway westward to Aransas Pass (or in reality to Corpus Christi) a far more important commercial port will be reached.

The difficulty of maintaining a channel 9 by 100 feet through the open bays between Galveston and Gulf appears to be given undue importance. From personal knowledge of the local conditions, gained during tours of duty as district engineer and as division engineer, I am satisfied that a dependable channel can be had without the large expense incident to construction along the north shore of these bays. Following substantially the lines laid down in House Document 395, Sixty-seventh Congress, second session, the waterway can be extended to Aransas Pass without increasing the total cost over that given by the Board of Engineers for Rivers and Harbors, viz, $16,000,000.

11. After due consideration of the above-mentioned reports, I concur in the opinion of the Board of Engineers for Rivers and Harbors that the great and growing importance of this section of the Gulf coast, as a producer of certain basic materials and food products and as a consumer of manufacturing products, is an indication of a potential water-borne commerce, which, if fully developed, would be adequate to justify the Government in undertaking the proposed work not only as far westward as the town of Gulf, Tex., but, for the same reasons, to Aransas Pass and Corpus Christi. I, therefore, recommend the provision of a waterway 9 feet deep at mean low water and 100 feet bottom width between New Orleans and Aransas Pass, Tex., and of the same cross section between the Mississippi and Morgan City, via Plaquemine Waterway, with such passing places, widening at bends, locks or guard locks, and railway bridges over artificial cuts, as are necessary, following in general the route proposed by the division engineer, except between Galveston and Gulf where the open bays should be used, and with such further modifications or changes of routes as may be found desirable by the department, at an estimated cost of $16,000,000, with $300,000 annually for maintenance, including operation of locks, subject to the following conditions:

(1) That local interests shall defray the cost of constructing or remodeling all highway bridges, together with their subsequent maintenance and operation, and shall furnish, without cost to the United States, all rights of way and necessary spoil-disposal areas.

(2) That work on the New Orleans-Sabine River section shall not be commenced until the Secretary of War has received satisfactory assurances that there will be available by the date of its completion adequate vessels, terminals, and auxiliary equipment for the economical handling of at least 500,000 tons of commerce annually.

(3) That work on the Sabine River-Galveston Bay section shall not be commenced until the Secretary of War has received satisfactory assurances that there will be available, by the date of its completion, adequate vessels, terminals, and auxiliary equipment for the economical handling of at least 400,000 tons annually, and that the general carrier service required for the New Orleans-Sabine River section will be extended to terminals on Galveston Bay and at Houston.

(4) That work on the Galveston Bay-Aransas Pass section shall not be commenced until the Secretary of War has received satisfactory assurances that there will be available, by the date of its completion, adequate vessels, terminals, and auxiliary equipment for the economical handling of at least 300,000 tons annually.

12. The initial appropriation should be $4,000,000.

LANSING H. BEACH, *Chief of Engineers.*

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 11, 1924.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the reports of the division engineer, Gulf division, on preliminary examination and survey of the intracoastal waterway from the Mississippi River at or near New Orleans, La., to Corpus Christi, Tex., Galveston and Sabine section of the inland waterway of Texas; waterway from Bayou Teche, La., to the Mermentau River; waterway from Lake Charles, La., to the Sabine River, Tex. and La., through the Calcasieu River, La., to Sabine River, Tex. and La., authorized by the river and harbor acts approved March 3, 1923, March 4, 1915, and September 22, 1922.

2. Federal projects exist for the dredging of channels from the Mississippi River at New Orleans to Bayou Teche; from Franklin on the Teche to the Mermentau River; from the Mermentau to the Calcasieu, and from the Calcasieu to the Sabine. These, when completed, would give a waterway with a governing depth of 5 feet across southern Louisiana from New Orleans to the Sabine River. An existing project also provides for a 5-foot waterway between Galveston and Aransas Pass, and 25 feet thence to Corpus Christi. The Chief of Engineers has recommended a 9-foot waterway from Galveston Bay to the 9-foot depth in Matagorda Bay (H. Doc. No. 395, 67th Cong., 2d sess.); Congress has taken no action on this document. In addition, the Federal Government has made numerous improvements of the principal rivers and bayous in southern Louisiana which intersect or coincide with the routes of the above-mentioned waterways. Local interests have constructed various canals of limited length in this section; the most important is a 30-foot channel from the Sabine River to the Calcasieu and thence north to Lake Charles, now being dredged by Calcasieu Parish. No complete project however, exists for the proposed waterway as a whole, nor for any improvement in the stretch between Port Arthur and Galveston Bay. Consideration was given to a through project in House Document No. 640, Fifty-ninth Congress, second session, but it was at that time considered unjustified except for limited stretches in Texas and Louisiana.

3. The existing waterways carry a material commerce, notably the Harvey Canal, a section of the channel from the Mississippi River to Bayou Teche, which in 1922 had a commerce of 171,000 tons of a general character. The traffic is limited by the restricted depths and by the noncompletion of certain of the projects, which render only local commerce practicable. Certain of the improved streams in southern Louisiana, notably Bayous Terrebonne, LaFourche, and Teche and the Calcasieu River, also carry considerable traffic, of which the most important items are logs and sugar cane destined for mills.

4. The division engineer points out that the waterway, in connection with existing facilities in Lakes Borgne and Pontchartrain and Mississippi Sound, would provide a navigable inland connection between Mobile, Pascagoula, Gulfport, Biloxi, New Orleans, the Sabine ports, the Galveston Bay ports, including Houston, the small ports on Matagorda Bay or its branches, and Corpus Christi. These ports in 1922 handled a total commerce of over 44,000,000 tons, valued at nearly $2,000,000,000. With added facilities a large interchange of commerce between them might be expected. The waterway would, moreover, connect with the Mississippi River and its navigable tributaries, including the Ohio, the contemplated improvement of which to a 9-foot depth within the next few years would then result in a through channel from the great manufacturing areas of Ohio, West Virginia, and western Pennsylvania to the Louisiana and Texas coast. Under these conditions there might be expected a diversion to the water route of a considerable existing all-rail commerce of steel and other manufactured products south, with return cargoes of sulphur, oil, salt, rice, lumber, and other commodities. A large local traffic might also be anticipated, particularly in view of the tonnage now carried, even on restricted depths, in those sections of the waterway now in existence.

5. The division engineer proposes the following route: From the Mississippi River via Harvey Canal No. 1, Little Barataria Bayou, Big Barataria Bayou, a land cut south of Lake Salvador, Harvey Canal No. 2, Bayou La Fourche, the Company Canal, Bayous Terrebonne, Black, Chene, and Boeuf to the Atchafalaya at Morgan City; via the Little Wax Bayou, connecting waterways, and a land cut to Bayou Portage near the west end of the Hanson Canal, and north of West Cote Blanche Bay and Vermilion Bay to the Vermilion River; via the Vermilion, Schooner Bayou, and a land cut north of White Lake and Grand Lake to the Mermentau River; thence west and northwest, utilizing the Lake Misere Canal, Watkins Canal, Bayou Tete Bois, and Bayou Black, to the Calcasieu River; thence along the route of the 30-foot Lake Charles waterway, now under construction, to the Sabine River, and via the existing Sabine-Neches waterway to Port Arthur; thence southwest generally parallel to the Gulf coast, principally by land cut, to Port Bolivar; thence across Galveston Bay and southwest to Gulf, Tex., following in general the route recommended in House Document No. 395, Sixty-seventh Congress, second session, except that the waterway, instead of being carried through West Galveston Bay and Matagorda Bay, would, so far as practicable, be a land cut just to the north of those bays.

6. The route is in general the same as that taken by the existing partial waterways. Wherever possible, however, and notably in the vicinity of Lake Salvador, between Bayou Portage and the Mermentau River, and west of Galveston, the division engineer has avoided the broad, shallow lakes or bays, in which navigation conditions are often difficult and maintenance would be high and uncertain, preferring instead a land cut, which while higher in first cost, would give a more satisfactory and more easily maintained channel.

7. By this route there is necessary one lock at Harvey to pass from the Mississippi River to the general level of the waterway, which is at or very near to Gulf level. A lock west of the Teche is avoided by going southwest from Morgan City through Little Wax Bayou instead of up the Teche and through the Hanson Canal. Guard locks for maintenance purposes would be necessary at the crossing of the Brazos River, as recommended in House Document No. 395. The existing Harvey Canal lock would be quite inadequate for the proposed waterway, and an additional lock would be required.

8. In the opinion of the division engineer, the most important function of the waterway would be as a carrier of through commerce between the Gulf coast and the Mississippi Valley. He points out that a 9-foot channel from the Mississippi to the vicinity of Morgan City can be obtained cheaply and rapidly by limited improvements in Bayou Plaquemine. This he considers should at the beginning of the project be utilized for through traffic in deep-draft barges east of Morgan City, the more expensive channel via Bayou Black and the Company and Harvey Canals being deepened first to 7 feet and later to 9 feet, if commerce justifies it. West of Gulf, Tex., difficult maintenance conditions in Matagorda Bay, disclosed by recent borings and investigations, indicate that as in the section between Galveston and Gulf, an adequate 9-foot waterway should be a land cut north of the bay, and would furthermore probably require guard locks at the crossing of the Colorado River. In view of the resulting large expense, and the limited prospective commerce beyond Gulf, he believes that the 9-foot waterway should end at Gulf, the present 5-foot project beyond that point being adequate under present conditions.

9. A commercial survey of the route was made for the Intracoastal Canal Association, a local body interested in the project, by Maj. Gen. George W. Goethals, United States Army, retired. His report indicates a total potential water-borne commerce of over 12,000,000 tons, some of which, however, probably involves duplication, as being included under the head of both receipts and shipments. The division engineer believes that a conservative estimate of waterway traffic would be at least a million tons, which, if it could be guaranteed, would adequately recompense the Government for its outlay. He accordingly recommends the construction of a waterway as follows:

(1) A channel 9 feet deep and 100 feet wide from the Mississippi via the Plaquemine Waterway to Morgan City, thence via the Atchafalaya River, Little Wax Bayou, and Bayou Blue, with necessary land cuts, to Vermilion River, at an estimated cost of $2,220,000 and $50,000 annually for maintenance; provided that adequate guarantees are given for the provision of transportation facilities and the creation of an annual traffic of 250,000 tons, excluding local and short-distance traffic. Of the above estimate, the cost of improving the Plaquemine Waterway proper is $110,000 with $10,000 annually for maintenance, the remainder being for the channel from Morgan City to the Vermilion.

(2) A new lock 75 feet wide and 425 feet long between gates, with a depth of 12 feet over the sills at low water, at Harvey, La., at an estimated cost of $600,000 and $35,000 annually for maintenance and operation, as soon as there are prospects of an increase in tonnage through it to a total of 250,000 tons annually. A channel from New Orleans to Morgan City, via the Harvey Canals, 7 feet deep with a bottom width of 75 feet, at an estimated cost of $2,540,000 and $60,000 annually for maintenance, exclusive of the first cost and of the maintenance and operation costs of the new Harvey Lock, provided an annual tonnage of 400,000 tributary to this section be assured; this to be enlarged to a depth of 9 feet and bottom width of 100 feet, at an estimated additional cost of $1,470,000 and $10,000 annually for maintenance, when a total annual tonnage of 600,000 is assured.

(3) A waterway from Vermilion Bayou to Galveston, at an estimated cost of $5,282,000 and $80,000 annually for maintenance, when assurances are received that transportation facilities will become available on its completion and use made of the route to the extent of an additional 750,000 tons annually, not including local and short-distance traffic.

(4) A waterway from Galveston to the Gulf, generally in accord with the recommendations of House Document No. 395, Sixty-seventh Congress, second session, except for modifications in routing as given above, at an estimated cost of $2,231,000 and $75,000 annually for maintenance.

(5) The proposed alignment to be subject to such changes as may be deemed advisable by the department on the basis of future investigations.

(6) One 20-inch pipe-line dredge to be constructed by the United States for work east of the Vermilion River, and three similar dredges for work between the Vermilion River and Galveston, at a total cost of $1,600,000; which item is not included in the above total estimates.

(7) All rights of way to be furnished by local interests without cost to the United States.

The total estimated cost of the project is $15,943,000, with $310,000 annually for maintenance. The division engineer recommends an initial appropriation of $4,000,000.

10. The board, before passing on the case, considered further investigation advisable as to the commercial prospects and economic value of the waterway, and directed that this be undertaken by the resident member of the board. A copy of the special report submitted by him is attached hereto.

11. The proposed waterway passes through a section of the Gulf coast which is rich in natural resources and has a considerable and growing population. Immediately west of the Mississippi it has navigable connection with six Louisiana Parishes, which are among the most important sugar raising and milling areas of the United States. West of the Teche it passes three important salt mines, at Jefferson Island, Weeks Island, and Avery Island, whose potential production is almost unlimited and which at presnt are producing in the neighborhood of 400,000 tons per year. Farther west the route is directly through the largest single rice-producing area of the country, and along the southern edge of important stands of yellow pine, cypress, and hardwood. In the vicinity of the Sabine and Galvestion Bay ports are groups of oil refineries, operating both on the production of local fields and on crude oil piped from the mid-continent fields, or imported from Mexico. These ports engage in a large foreign and coastwise traffic in oil, including a considerable movement of crude and fuel oil from the Sabine to the Galvestion Bay ports. At Sulphur, La., Freeport, Tex., and Gulf, Tex., are the only sulphur mines in the United States operating on a commercial scale. Their total output is in the neighborhood of 2,000,000 tons annually, which generally supplies the needs of the country and enters largely into export trade. The Sabine ports and the cities of Galveston, Houston, and Texas City, together with the neighboring refineries and oil fields, are consumers of steel and miscellaneous products from Pittsburgh or Birmingham; and Houston, the largest city in southeast Texas and the focus of a number of important railroads, is an important distributing center. From these facts it is evident that there is, beside strictly local traffic, the possibility of a large through movement on the waterway, consisting partly of raw materials moving east to New Orleans or to the consuming centers of the Mississippi Valley, partly of manufactured products moving west, and partly of oil, sulphur, and other commodities moving from points of production to intermediate ports along the route for export or coastwise shipment. Assuming satisfactory conditions as to equipment, rates, and channel, the estimate in the special report

for the annual tonnage of a 9-foot waterway, section by section, is approximately as follows:

Between New Orleans and Morgan City, 1,600,000 tons, two-thirds eastbound.

Between Morgan City and the Sabine ports, 1,150,000 tons, about balanced.

Between the Sabine ports and Galveston Bay, 1,600,000 tons, four-fifths westbound.

Between Galveston Bay and Gulf, Tex., 700,000 tons, principally eastbound.

The special report states that this would be largely through or long-distance commerce, requiring for economy a breaking and reassembling of tows at New Orleans and to a lesser extent at Galveston. In order to carry it, there must be provided equipment, terminals, and other facilities for at least one large common carrier, comparable in magnitude with the Federal Barge Line on the Mississippi River, using equipment interchangeable with Mississippi River equipment, where practicable. There must also be provided facilities for the movement of bulk oil, particularly between the Sabine ports and Galveston Bay, and for the movement of bulk sulphur from Gulf to Galveston Bay. Given the channels and equipment, there is still the possibility of a wide variation of resulting tonnage either above or below the estimates given, depending on the modification of rail rates which may result from the waterway, and on the provision or nonprovision of satisfactory joint rates and divisions for combined rail and water movements. Suitable and equitable arrangements along this line may require some time to obtain. The experience of the Federal Barge Line indicates, however, that in time, and with persistence and adequate resources, they can be obtained. The best guaranty that they will be in the provision by local or other interests of the necessary facilities for handling prospective commerce, which are likely to involve a capital investment of some millions of dollars; an expenditure that will hardly be entered into unless the interests concerned seriously contemplate extensive use of the waterway and are prepared to make the necessary efforts to attain their end.

12. It is accordingly recommended in the special report that the construction of the waterway from New Orleans to Galveston Bay be predicated upon the provision of equipment to handle a general commerce of at least 500,000 tons per year between New Orleans and points west, including 200,000 tons to or from points in the Mississippi Valley; that that part between the Sabine ports and Galveston Bay be further predicated on the additional provision of equipment for handling 400,000 tons of petroleum products; and that for the section between Galveston and Gulf there be required equipment to handle annually at least 300,000 tons of sulphur. The special report further recommends that the section between Morgan City and New Orleans be constructed initially to the full depth of 9 feet in addition to the Plaquemine waterway improvement; that while a bottom width of 125 feet may be desirable at some future time for the section between New Orleans and Galveston, a uniform width of 100 feet be provided throughout the waterway at present; that provision be made in the project for suitable passing places; and that the Government be not responsible for the construction or operation of bridges over natural waterways on the route.

13. The board is of the opinion that the great and growing importance of this section of the Gulf coast as a producer of certain basic materials and food products and as a consumer of manufactured products is an indication of a potential water-borne commerce which, if fully developed, would be adequate to justify the Government in undertaking the proposed work. The situation is in many ways particularly favorable for the development of such a commerce. The topography of southern Louisiana is such that railroads extending in an east and west direction through the coastal section can be constructed only at large expense. Branch lines have been built along ridges extending in a southerly direction, but much of the country's transportation needs are supplied by numerous waterways, natural and artificial. While this indicates an important local business, there are, directly on the route of the proposed waterway numerous sugar, rice, and lumber mills, salt and sulphur mines, and oil refineries, the products from all of which move to a considerable extent in interstate trade. It is from such sources, and from the through shipments of manufactured products for distribution or consumption at Texas points, that the sustaining business of the waterway is expected to come.

14. The analysis of available traffic in the attached report of the resident member of the board indicates that the Galveston-Gulf section is justified irrespective of the remainder of the waterway by the potential sulphur and oil movements. While the traffic included in the estimates pertains largely to one company, the magnitude of its production, representing a large part of the total

national output of sulphur, justifies the provision of more economical transportation facilities, especially as, under the highly competitive conditions existing in the sulphur business, any saving will probably be reflected in the selling price of the product. Moreover, this part of the waterway would be available for the use of another important sulphur company, at Freeport, which, although it favors the movement of its product by ocean carriers direct from that port, has shipped considerable amounts of sulphur to Galveston in the past for export or coastwise movement. The New Orleans-Sabine River section is also justified irrespective of other sections, though its traffic would be largely increased by the continuation of the waterway farther west. The Sabine River-Galveston Bay section would be likely to carry a considerable general through commerce, but it is somewhat questionable whether this alone would compensate for the cost. To justify this section there should be added to such general commerce a heavy movement in oil.

15. The investigations of the division engineer indicate that an adequate channel beyond Gulf could be provided only at an expense not at present justified, and that between Galveston and Gulf a land route should be utilized where practicable. In view of these additional investigations, the board is constrained to modify its recommendations contained in House Document No. 395, Sixty-seventh Congress, second session, and to concur with the division engineer as regards the terminus of this western section of the waterway. The board considers that a 9-foot depth from New Orleans west is desirable at the outset, as access to that port is essential to the development of any important through commerce. The proposed width of 100 feet on the bottom is believed sufficient at the outset. Passing places may be found necessary and should be authorized Local interests should provide for the construction or reconstruction, maintenance, and operation of all highway bridges. Modification of the details of routing should be left to the discretion of the department.

16. The board therefore recommends the provision of a waterway 9 feet deep at mean low water and 100 feet bottom width between New Orleans and Gulf, Tex., and of the same cross section between the Mississippi and Morgan City, via Plaquemine waterway, with such passing places, widening at bends, locks, or guardlocks, and railway bridges over artificial cuts as are necessary following in general the route proposed by the division engineer, with such modifications as may be found desirable by the department, at an estimated cost of $16,000,000, with $310,000 annually for maintenance, subject to the following conditions:

(1) That local interests shall defray the cost of constructing or remodeling all highway bridges, together with their subsequent maintenance and operation, and shall furnish, without cost to the United States, all rights of way and necessary spoil disposal areas.

(2) That work on the New Orleans-Sabine River section shall not be commenced until the Secretary of War has received satisfactory assurances that there will be available by the date of its completion adequate vessels, terminals, and auxiliary equipment for the economical handling of at least 500,000 tons of commerce annually, exclusive of local movements.

(3) That work on the Sabine River-Galveston Bay section shall not be commenced until the Secretary of War has received satisfactory assurances that there will be available by the date of its completion adequate vessels, terminals, and auxiliary equipment for the economical handling of at least 400,000 tons annually of petroleum products, and that the general carrier service required for the New Orleans-Sabine River section will be extended to terminals on Galveston Bay and at Houston.

(4) That work on the Galveston Bay-Gulf section shall not be commenced until the Secretary of War has received satisfactory assurances that there will be available by the date of its completion adequate vessels, terminals, and auxiliary equipment for the economical handling of at least 300,000 tons annually of sulphur.

17. In compliance with law, the board reports that except as contemplated by the above recommendations there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

H. Taylor,
Senior Member of the Board.

SABINE-NECHES WATERWAY

The waterways under consideration provide for the movement of ocean-going vessels between the Gulf of Mexico and the cities of Port Arthur, Beaumont, and Orange, Tex. The channels being provided by the United States are to have a depth of 30 feet throughout except over the Sabine Pass bar where the depth is 33 feet, and at the upper end of the Sabine River channel where the depth is reduced to 25 feet. The existing project provides for channel widths of 450 feet over the outer bar, 200 feet in the jetty channel, 150 feet through Sabine Pass and the Port Arthur Canal, 125 feet in cuts and 150 feet in open water in the Neches River up to the turning basin at Beaumont, and 125 feet in the Sabine River to the cut-off near the Orange municipal wharf, and thence 150 feet to the turning basin. The project also provides for an anchorage basin in Sabine Pass 1,000 feet by 2,000 feet and 32 feet deep, which has never been dredged; for turning basins at Beaumont and Orange, each 500 feet by 1,500 feet; for two other turning basins at the head of the Port Arthur Canal; and for two rubble-mound jetties. Local interests desire increased dimensions in various stretches of the channels.

The commerce passing through Sabine Pass in 1924 totaled 14,304,000 tons; through the Port Arthur Canal, 13,287,000 tons; through the Sabine-Neches Canal, 4,804,000 tons; and on the Neches River, 4,803,000 tons, of which 2,317,000 tons moved on the stretch above mile 9.3. During the same year 540,000 tons were moved on the Sabine River. Some 90 per cent or more of the tonnage credited to the Sabine ports is petroleum and its products, the locality being an important center for oil refining and transshipment.

The district engineer points out that the channels serving the Sabine ports include 23 miles of canals and 35 miles of rivers. Their improvement has, therefore, required large expenditure, and any increase in channel dimensions will be expensive both in first cost and maintenance. He is of the opinion, however, that every reasonable effort consistent with economy of expenditure should be made to facilitate the movement of the very large commerce involved.

It is claimed by interested parties that they have been put to considerable expense from delays, groundings, and collisions. Some of the cases cited are, in the opinion of the district engineer, not properly chargeable to present channel conditions, as they occurred when the project dimensions were even more restricted. Moreover, he considers a certain amount of damage or extra expense inevitable where such a heavy tonnage is involved. It seems to be the general opinion, as locally expressed to the district engineer, that safe day navigation in the Port Arthur and Sabine-Neches Canals requires a channel width of 200 feet, and safe night navigation a width of 250 feet to 300 feet. The district engineer points out that considerably lesser widths appear to have been found satisfactory on important European canals. Taking into consideration the needs of shipping and the cost of the improvement, he believes that suitable channel widths would be 300 feet in the jetty channel and in Sabine Pass, 175 feet in the Port Arthur Canal, and 150 feet in the Sabine-Neches Canal. A greater depth than the 30 feet provided for by the existing project he believes unnecessary, as all except a limited number of oil tankers can negotiate such a channel.

The work recommended by the district engineer, together with its estimated cost, is listed in the following table:

Location	Proposed dimensions	Cost
Sabine Pass Jetty Channel	30 by 300 feet	$36,000
Sabine Pass	30 by 300 feet	36,000
Port Arthur Canal, including easing of bend at mouth	30 by 175 feet	56,000
Port Arthur Canal, two passing places	30 by 225 feet	16,000
Sabine-Neches Canal	30 by 150 feet	216,000
Rebuilding of Government structures necessitated by widening of Sabine-Neches Canal.		30,000
Cut-off on the Neches River at mile 9.3	30 by 125 feet	192,000
Extension of Beaumont turning basin		60,000
Modified anchorage basin Sabine Pass	4,500 by 800 by 30 feet	[1] 99,000 [2] 207,000
Total		948,000

[1] For dredging. [2] For dolphins.

The anchorage basin, with dolphins for tying up vessels, mentioned as the last item above, is a substitute for the present projected basin whose cost is estimated at $132,000. The net cost of the new work proposed would thus be $816,000. Approval of these changes in the existing project should, in the opinion of the district engineer, be contingent upon the provisions that local interests furnish, free of cost to the United States, all needed rights of way and dumping grounds; assume liability for damage claims resulting from the construction of the enlarged waterway; remove the bascule bridge across the Sabine-Neches Canal at Port Arthur or reconstruct it according to plans to be approved by the department; and maintain a strip 75 feet wide adjacent and parallel to all municipal wharves bordering on the Beaumont turning basin. The division engineer concurs in the views and recommendations of the district engineer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board concurs with the district and division engineers as to certain of the items of work proposed, but believes that the Port Arthur Canal should have a width of 200 feet instead of 175 feet; that two passing places should be provided in the Sabine-Neches Canal; and that no work should be undertaken in the Neches River, except extension of the turning basin, until information is available additional to what can be obtained at this time without delaying submission of the report. It believes also that local interests should provide mooring dolphins for the Sabine Pass anchorage basin, and that only such length of that basin should be dredged as will provide access to the number of dolphins actually to be installed.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. The tonnage of the Sabine ports is very large; petroleum and its products, however, constitute nine-tenths of the traffic. The number of oil tankers requiring a greater depth than 30 feet is limited, and data are not at hand which demonstrate the economy of a present increase in depth. Widening of the Sabine-Neches Canal and the channels below it to the extent recommended by the board is, however, desirable to facilitate navigation, as are the other items which it pro-

poses. The question of further improvement of the Neches River deserves more careful study than can be given it without unduly delaying submission of the present report. Such study can be made at any time at the direction of Congress; and since the Neches River channel has not been dredged even to the dimensions authorized by the existing project, no loss is likely to be involved to the interests affected by a delay in considering the case. Certain work which local interests desire at the mouth of Taylors Bayou can be undertaken under the present project. I therefore report that modification of the existing project for the improvement of Sabine-Neches waterway and Port Arthur Canal is deemed advisable so as to provide for channel widths of 300 feet in the Sabine Pass jetty channel and in Sabine Pass, 200 feet in Port Arthur Canal, and 150 feet in the Sabine-Neches Canal up to the mouth of the Neches River; to provide for two passing places in the Sabine-Neches Canal; for easing the bend at the mouth of the Port Arthur Canal; for moving and reconstructing the buildings, revetment, and wharves pertaining to the United States Engineer field office at Port Arthur; for extending the Beaumont turning basin upstream 200 feet above the new city wharves; and for an anchorage basin in Sabine Pass 4,500 feet long, 800 feet wide, and 30 feet deep in lieu of an anchorage 2,000 feet long, 1,000 feet wide, and 32 feet deep, at a total estimated cost of $654,000, with $420,000 annually for maintenance, which is $164,000 more than the estimated cost of maintaining the present authorized channels; provided that local interests furnish satisfactory assurances to the Secretary of War and the Chief of Engineers that they will provide, without cost to the United States, all necessary rights of way and dumping grounds for the disposal of material removed in connection with the work and its subsequent maintenance; will hold and save the United States from all damage claimed resulting from the construction of the enlarged waterway; and will maintain that part of the Beaumont turning basin which lies within 75 feet of all municipal wharves; and provided that only such length of the Sabine Pass anchorage basin shall be dredged as will provide access to the number of dolphins which the local interests actually agree to install. The United States should reserve the right to require the removal or alteration of the bascule bridge at Port Arthur as a condition to the carrying out of such items of the project as, in the opinion of the Chief of Engineers, are or may be affected by the presence of the bridge in its existing condition.

MISSISSIPPI RIVER AT MOLINE, ILL.

The section of the Mississippi River near Rock Island and Moline is under improvement by the United States for the provision of a 6-foot channel, with a side channel to Moline. The Rock Island Arsenal is located on Arsenal Island which lies in front of the city of Moline, about 315 miles above St. Louis. A dike extends about 15,000 feet upstream from this island, dividing the river into two longitudinal sections, that next to the city being known as Moline Pool. At the lower end of the pool, on opposite sides of the island, are two power dams and a lock. Between the dike and the Iowa shore the low-water channel has been contracted by the construction of a number of

spur dikes for the purpose of raising the water level of Moline Pool. Rock Island Harbor is located about 2½ miles below Moline Pool. Local interests desire increased depth in Moline Pool.

A channel 6 feet deep at low water has been provided through Moline Pool and an equal depth is available over the sills of the lock. The water surface is, however, lowered about 2 feet near the head of Arsenal Island due to the operation of the power plants. That part of the existing project which provides for a side channel to Moline Landing, widened where the channels diverge and with a large basin above the bridge, has never been completed.

Aside from the question of navigation, the Moline authorities are disturbed by the danger of interference with the city water supply, the intake for which is below the head of Arsenal Island. It is claimed that, with the limited depth in the pool, the water is likely to freeze solid in the winter, shutting off the water supply and preventing the production of power. The latter contingency would also make it necessary for the Rock Island Arsenal to purchase its power and would also increase the fire risk there.

The district engineer has available in his office all necessary data, and a survey has not been required. The provision of a 6-foot depth at low water over the entire area of Moline Pool by dredging, with no allowance for the draw-down caused by the development of power, would involve a large amount of excavation, about 10 per cent of which would be rock, at an estimated cost of $2,890,000. Equivalent results could be obtained by raising the level of the pool through modification of the works at the head of the open channel between the longitudinal dike and the Iowa shore. At this point two opposing spur dikes, Nos. 9 and 39, have been built. A submerged sill, costing about $10,000, could be built connecting the ends of these dikes, which would raise the low-water level at the head of Moline Pool from 575.8 to 580.8, Cairo datum. Necessary repairs to the longitudinal dike would cost an additional $30,000. This method is recommended by the district engineer and the division engineer. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the above-mentioned reports, I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. A through 6-foot channel can not be provided in the Mississippi River unless a change is made in the plans for improvement at Moline. The cost of providing an adequate channel in Moline Pool by dredging is prohibitive. The installation of a sill at the head of the northerly channel was considered by the department several years ago, but it was found that existing law prevented its construction. It is important that adequate provision be made for navigation without jeopardizing existing power development, water supply, and fire protection. Raising the water level at the head of Moline Pool will accomplish this purpose at slight expense. Fear has been expressed that the work might affect adversely the water supply and sewage disposal of Davenport, Iowa, but this has been shown to be groundless. While the work proposed would raise the low-water level for a few miles upstream from the head of the pool, flood levels would not be noticeably affected.

As the proposed sill would be submerged at all times, it would not offer an obstacle to the passage of fish.

I therefore report that modification of the existing project for the improvement of the Mississippi River at Moline, Ill., is deemed advisable, so as to provide for the construction of a submerged sill between Dikes Nos. 9 and 39, designed to produce a low-water level at the upper end of Moline Pool of 580.8 feet, Cairo datum, as proposed by the district engineer, at an estimated cost, together with repairs to the longitudinal dike, of $40,000, with no increase in the present maintenance cost of the project. The entire amount of the estimated cost should be made available in the initial appropriation.

MILL CREEK AND SOUTH SLOUGH AT MILAN, ILL.

Mill Creek is a small stream which formerly flowed into Rock River, near the village of Milan, about 4 miles from the point where Rock River discharges into the Mississippi. The Illinois & Mississippi Canal, constructed by the Federal Government, parallels the south bank of Rock River at this point. When the canal was built the Federal Government closed the mouth of Mill Creek and diverted its waters into South Slough, which runs generally west into the Mississippi. The construction of the canal embankment between Milan and Rock River has rendered the village safe from floods of the river, which formerly caused damage there. On the other hand, the diversion of Mill Creek into South Slough has resulted in an additional menace from the flashy floods which occur in the creek. Damage has resulted to the village on several occasions from this source. The United States attempted in several ways to improve conditions, but the measures adopted proved inadequate.

The district engineer states that the diversion of Mill Creek by the United States has undoubtedly caused damage to the locality. Various remedies have been proposed in past years. Until recently the only practicable solution which would meet with local approval appeared to be the payment of damage claims in cash. The district engineer, while unable to make a close estimate of damages for which the United States might be considered responsible, selected a method of estimate which appeared the most reasonable and by it computed the figure of $67,000, which he considered more than sufficient to compensate for actual and potential flood damages.

The situation has recently been materially changed by the local organization of the Big Island drainage district, which contemplates reclamation of farm lands in the neighborhood of Milan. As a result of the efforts of this organization, local interests appear to be unanimous in requesting adoption of the plan first proposed by the board in 1922 for the construction of a siphon to carry the waters of Mill Creek under the canal into Rock River. The district engineer submits plans, specifications, and estimates for such a project. They include, beside the siphon and an aqueduct for the canal, suitable levees along Mill Creek above the siphon. The design would admit of water flowing across the canal in event of the clogging of the siphon. A further measure of security for the village would be provided by building the levee on the east bank of the creek to a height 2 feet less than that on the west bank. Regulated flow down South Slough would be provided to care for sewage disposal

and the railroad water supply. The district engineer estimates this work at $96,000.

The Big Island drainage district offers to cooperate as follows:

(1) By contributing necessary rights of way.

(2) By obtaining from all land owners immediately to the east of Mill Creek and north of the Water Street Bridge, releases from claims against the Government for damages which might arise from overflow due to the construction of the east levee to a height 2 feet less than that of the west levee.

(3) By paying any excess in the cost of undertaking the siphon and aqueduct plan, above the figure of $67,000, provided such excess is not more than $20,000, or alternatively.

(4) By entering into a contract with the United States to do the entire work for the sum of $67,000, acting through responsible subcontractors, provided the tentative plans and specifications are not materially changed, and are approved by the drainage district.

In view of the general approval of the siphon plan, which he considers an adequate solution of the problem, the district engineer recommends its adoption, at an estimated cost of $67,000 or $96,000, depending upon the method of carrying on the work, and with annual maintenance estimated at $2,500. The division engineer concurs.

These reports have been referred as required by law to the Board of Engineers for Rivers and Harbors and attention is invited to its report herewith. The board states that if Congress desires to effect a cash settlement with the injured property owners the sum of $67,000 should be appropriated for the purpose and paid to them under certain specified conditions. It believes, however, that the diversion plan now proposed is a more satisfactory solution and recommends its adoption along the general lines of the district engineer's report, subject to certain conditions of local cooperation.

After due consideration of the above-mentioned reports I concur in the views of the Board of Engineers for Rivers and Harbors. The action of the Government in modifying the natural regimen of Mill Creek, in connection with its construction of the Illinois and Mississippi Canal, has resulted in damages to the village of Milan and vicinity. It is impracticable to ascertain the exact extent of these damages. The method of estimate adopted by the district engineer appears, however, to be a reasonable and liberal one. The resulting figure of $67,000 is in my opinion ample to compensate the injured property owners for all damages, past and future, arising out of the diversion of Mill Creek into South Slough by the United States. If, therefore, Congress desires to effect a cash settlement, I recommend that $67,000 be paid to the Big Island drainage district for payment by it to the injured property owners in accordance with the conditions and guaranties set forth by the board in paragraph 8 of its report. I consider, however, that the alternative plan of rediverting the waters of Mill Creek into Rock River, proposed by the district engineer, which appears to have the unanimous approval of local interests, is a more satisfactory solution to the problem. It is not advisable that the Government finally commit itself at this time to the acceptance of either of the forms of local cooperation mentioned in subparagraphs (3) and (4) of paragraph 5 above. The fact that these have been offered, however, makes it proper to select the figure of $67,000 as the estimated cost. The additional cooperation proposed by the Board

of Engineers for Rivers and Harbors is intended to prevent any claims for possible future damages being made against the United States, and it is desirable that it be included in order to effect a final and permanent solution of the problem. I therefore report that it is advisable to adopt a project for the diversion of Mill Creek, Ill., into Rock River in the vicinity of the town of Milan by an inverted siphon under the Illinois and Mississippi Canal, or flood gates in the walls of the canal, or a combination of these or other works, as may be found most efficient and economical by the Chief of Engineers, together with necessary levees on both banks of Mill Creek, in general as proposed by the district engineer, at an estimated cost of $67,000, with $2,500 annually for maintenance; provided that local interests furnish free of cost to the United States the necessary rights of way, give satisfactory assurances that they will, if the Secretary of War and the Chief of Engineers desire, carry out either of the cooperative proposals made in letter of the attorneys for the Big Island drainage and levee district to Maj. B. C. Dunn, United States Engineer Office, Rock Island, Ill., dated June 12, 1924, and referred to above, and agree to hold and save the United States from any and all claims for damages, past or future, arising from Mill Creek floods. The entire amount of $67,000 should be made available in a single appropriation.

OHIO RIVER ICE PIERS

The Ohio River is being improved under a lock and dam project which provides for a minimum depth of 9 feet. This project is well advanced and the river is being used by a variety of floating craft. At several points ice piers or shelter harbors have been constructed for the protection of vessels against destructive ice floes, some by private interests and some by the United States. The district engineer recommends the construction of 10 additional harbors at convenient intervals at an estimated cost of $522,000. The division engineer is in general accord with the views of the district engineer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors and attention is invited to its report herewith. The board states that the commerce on the section of river where the slackwater system is approaching completion has shown marked improvement and that experience has shown the need of ice harbors and that this need will become more pressing as navigation increases. In view, however, of the uncertainty of actual future requirements it believes that the provision of such harbors should be undertaken cautiously and not in advance of demonstrated necessity. The board concludes that two additional harbors, one in the vicinity of Cincinnati, Ohio, and one near Huntington, W. Va., will fairly meet present needs and give opportunity to determine the advisability of other harbors. The board recommends the construction of these two harbors, approximately as proposed by the district engineer, at an estimated cost of $110,000, provided that before work is begun at either place local interests will convey to the United States, free of cost, such riparian rights as may be considered necessary in connection with the improvement at said locality.

The Ohio River is peculiar in its ice conditions, in that at times it remains open for navigation during the whole winter, while at others navigation is interrupted for months continuously by ice. During the winter of 1917–18 great loss was occasioned to the vessel interests along the stream, due to the manner in which the ice ran out. The solid ice which had not been softened by warm weather was run out of the stream by a heavy rain on the headwaters of the Kanawha. This ice run destroyed or badly injured almost every vessel which was not protected by the few ice piers which had been established on the river or which was unable to take advantage of some small local protection. A large portion of the Government dredging fleet would have been destroyed that year had it not found protection behind the ice piers at Maysville, Ky. Heavy losses have occurred in other years.

Under these circumstances and after due consideration of the above-mentioned reports, I concur with the Board of Engineers for Rivers and Harbors, to the extent of recommending an appropriation at as early a date as possible of $110,000 for the construction of two sets of ice piers as recommended by them. I am, however, so thoroughly convinced of the necessity of ice piers at proper localities upon the river as navigation develops following the extension of the lock and dam system that I regard it as of the utmost importance to have ice piers built from time to time as needed. It is, therefore, recommended that the construction of ice piers be regarded as a part of the approved project for the general improvement of the Ohio River, these piers to be built by funds allotted from the appropriations for the general improvement of the river. This fund can probably be applied to this purpose without any appreciable increase of appropriations for, as the lock and dam system now under progress approaches completion, there will be a diminution in the amounts required for snagging and dredging.

YOUGHIOGHENY RIVER, PA.

The Youghiogheny River is a tributary of the Monongahela River, which it enters from the east 15 miles above Pittsburgh. An existing project provides for canalization from the mouth at McKeesport to West Newton, 19½ miles, but no work has been undertaken. This project was recommended for abandonment in 1916 and 1919, but Congress has taken no action thereon. Interested parties now desire a channel 10 feet deep and 200 feet wide from the Monongahela River to Fifteenth Street, McKeesport.

The district engineer reports that McKeesport, with a population of about 50,000, has a number of large industrial plants. Certain of these use the river for the transportation of coal, sand, and gravel. In 1924 such movements amounted to 275,000 tons, of which 157,000 tons were coal. The situation is favorable for the development of additional water terminals and an increase in water-borne tonnage. Some dredging has been done at local expense, but commerce is still handicapped by the fact that the channel in the Youghiogheny has less depth than is available on the lower Monongahela, over which the inbound and outbound tonnage must move. Monongahela River barges, which have loaded drafts of 8 to 8¾ feet, must underload to operate on the Youghiogheny at low water. The district

engineer believes that a depth corresponding to that in the Monongahela would result in a considerable larger water movement and in an ultimate saving which would justify the necessary Federal expenditure. He recommends a channel up to Fifteenth Street 200 feet wide and 9 feet deep at datum of Monongahela River pool No. 2, at an estimated cost of $35,000, with $2,000 annually for maintenance.

The division engineer concurs with the district engineer as to the extent of the improvement, but considers that the local benefits which would result justify the requirement of a local contribution of 50 per cent of the first cost. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district engineer.

After due consideration of the above-mentioned reports, I concur in the views of the district engineer and the Board of Engineers for Rivers and Harbors. The Monongahela River is one of the country's most successful improved waterways, its annual commerce being over 20,000,000 tons. The lower Youghiogheny River is essentially a harbor on the Monongahela. In its present condition a considerable traffic of general interest moves over it. The saving in transportation costs which would result from the use of fully loaded barges for the present and prospective commerce is sufficient to justify the comparatively small expenditure required of the United States for providing a deeper channel. I therefore report that modification of the existing project for the improvement of Youghiogheny River, Pa., is deemed advisable with a view to providing a channel 9 feet deep at low water of pool No. 2, Monongahela River, and 200 feet wide from the mouth to Fifteenth Street, McKeesport, Pa., in general as proposed by the district engineer, at an estimated cost of $35,000, with $2,000 annually for maintenance. The entire amount of the first cost should be made available in a single appropriation.

DULUTH-SUPERIOR HARBOR, MINN. AND WIS.

Duluth-Superior Harbor has been improved by the United States to provide entrance channels and various interior channels and anchorages of a depth of 20 feet or more at low water. Howards Bay is a channel in the inner harbor, not under Federal improvement, which extends generally southeast for about 6,000 feet from the improved channel in West Gate Basin. Tower Bay Slip connects with Howards Bay near the northern end of the latter. Request is made for improvement to a depth appropriate to that in the other improved portions of the inner harbor.

Howards Bay was deepened many years ago at local expense and now has depths varying from 20 feet near the entrance to 16 feet near the upper end. There are a number of industries and terminals on the bay and its connecting slips. The water-borne commerce in 1924 was 328,000 tons, the principal items being coal, sand, salt, and flaxseed. The district engineer states that an increase in existing depths would facilitate the maneuvering of vessels and would permit them to load to greater drafts with corresponding reduction in transportation costs. He recommends the provision of a channel from

the mouth of Howards Bay to a point about 1,200 feet above the entrance to Tower Bay Slip, 20 feet deep at low water, with widths varying from 340 feet to 160 feet, the channel lines being in general parallel to and 100 feet from the harbor lines. His estimate for the work is $8,000. The division engineer concurs. The reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district and division engineers.

After due consideration of the above-mentioned reports I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. The terminals and industries on Howards Bay make a material contribution to the immense commerce of Duluth-Superior Harbor. The bay is navigable by large lake vessels, which, however, can not in general load to full draft on account of the limitation in depth. The provision of a depth of 20 feet, corresponding to that elsewhere in the inner harbor, would be of material benefit to commerce. The cost would be very small, on account of the extensive dredging already done at local expense The wording of the item of law permits consideration of improvement only in the general vicinity of the junction of Howards Bay and Tower Bay Slip; the channel proposed by the district engineer is within the limitation thus imposed, and its benefits will extend to a large portion of the total commerce of the bay. I therefore report that modification of the existing project for the improvement of the harbor at Duluth, Minn., and Superior, Wis., is deemed advisable, with a view to deepening to 20 feet at low water the channel in Howards Bay at and near the entrance to Tower Bay, in general along the lines proposed by the district engineer, at an estimated cost of $8,000, with $1,000 annually for maintenance. The entire amount of the estimated first cost should be made available in a single appropriation.

ILLINOIS RIVER, ILL.

Referring to letter of the chairman of the Committee on Rivers and Harbors of the House of Representatives, dated April 17, 1924, inclosing a copy of a resolution of the committee dated April 14, 1924, requesting the Board of Engineers for Rivers and Harbors to review the reports submitted in House Document No. 1374, Sixty-first Congress, third session, and No. 50, Sixty-first Congress, first session, and in Rivers and Harbors Committee Document No. 2, Sixty-seventh Congress, first session, and No. 7, Sixty-seventh Congress, second session, with a view to ascertaining and reporting the costs of constructing channels, each 200 feet wide and of 7, 8, and 9 feet in depth, respectively, in the Illinois River, Ill., between Utica and the mouth, including separate estimates for each of the aforesaid channels upon the basis of assumed diversions of water from Lake Michigan through the Illinois River of 2,000, 4,167, 7,500, 8,500, and 10,000 second-feet, respectively; also with a view to recommending such depth and width of channel in said river which would be most suitable for navigation purposes, the quantity of diversion from Lake Michigan necessary for navigation purposes in said recommended channel; and to report when, assuming all funds

for such purposes available, the Sanitary District of Chicago can have in operation sewage treatment plants capable of treating the sewage with the amount of water recommended as necessary for navigation in such recommended channel, I inclose herewith the report of the board, dated March 23, 1926, in response thereto.

2. The Illinois River rises in northeastern Illinois and flows generally south and west into the Mississippi. The United States has provided a channel with a project depth of 7 feet at low water of 1879 for a distance of 223 miles from the mouth to La Salle. Included in this stretch are two Federal locks and dams and two State locks and dams. The Sanitary District of Chicago some years ago constructed a drainage canal from Lake Michigan to the upper reaches of the Illinois, which reversed the flow of the Chicago River and permitted water from it and from Lake Michigan to flow down the Illinois. The State of Illinois is now constructing the so-called Illinois waterway, a navigable connection from Lockport, the lower end of the drainage canal, to Utica on the Illinois River. With the completion of this project, and with the improvement of the short stretch of river between Utica and La Salle, there would be a through channel from the Great Lakes to the Mississippi system.

3. The above resolution directs the review of four congressional documents, comments on which appear in the district engineer's report, and pertinent data on which have been utilized in making the present report. The resolution next calls for the answers to four specific questions. These, and the answers thereto of the Board of Engineers for Rivers and Harbors, are given successively below.

Question 1. What is the estimated cost of channels each 200 feet wide and of depth of 7, 8, and 9 feet, from Utica to the mouth of the Illinois River, on the basis of assumed diversions of water from Lake Michigan of 2,000, 4,167, 7,500, 8,500, and 10,000 second-feet?

4. The board, in paragraph 7 of its report, discusses in some detail the definition of diversion, its essential characteristics, and the effect of its amount, control, and fluctuations on a navigation plan. These points must be carefully studied to make the problem clear.

5. For any of the three depths referred to in the resolution, the river can be improved by two or more of at least four different methods, viz, (1) complete canalization, using five locks and dams; (2) partial canalization, using the four existing locks and dams; (3) partial canalization, using the two existing Federal locks and dams and partially removing the two State dams; and (4) open-channel improvement, involving partial removal of all four dams. The district engineer submits estimates on all the cases involved. The division engineer and the board concur in his estimates, subject to the qualifications contained in paragraph 7(e) of the board's report. The following condensed table shows costs for a 9-foot channel:

Illinois River, Ill.

Method of improvement	Instantaneous maximum diversion, Lockport, cubic feet per second	Annual average diversion, Lockport, cubic feet per second	Cost, thousands of dollars [1]		
			First cost	Maintenance and operation	Annual charge (maintenance and operation plus 4 per cent first cost)
Complete canalization [2]	1,650	1,000	2,666	226	[2] 333
Partial canalization (State dams out)			5,133	210	415
Complete canalization [2]	3,300	2,000	2,619	216	[2] 321
Partial canalization (State dams out)			5,108	171	375
Open channel			6,050	105	347
Partial canalization (present dams retained) [2]	4,580	3,000	1,914	191	[2] 268
Partial canalization (State dams out)			3,697	147	295
Open channel			4,482	97	277
Partial canalization (present dams retained)	6,050	4,167	1,383	180	235
Partial canalization (State dams out) [2]			2,262	133	[2] 224
Open channel			3,465	89	277
Partial canalization (present dams retained)	7,050	5,000	1,264	178	229
Partial canalization (State dams out)			1,789	130	202
Open channel [2]			2,365	87	[2] 182
Partial canalization (present dams retained)	8,250	6,000	1,141	168	214
Partial canalization (State dams out)			1,349	126	180
Open channel [2]			1,925	80	[2] 157
Partial canalization (State dams out)	10,050	7,500	942	122	160
Open channel [2]			1,540	76	[2] 138
Partial canalization (State dams out) [2]	11,250	8,500	171	114	[2] 121
Open channel			1,320	70	123
Partial canalization (State dams out)	13,050	10,000	171	105	112
Open channel [2]			990	63	[2] 102

[1] On the assumption that the flow is regulated primarily in the interests of navigation.
[2] Indicates method which, considering, first, maintenance and operation costs, is cheapest, in terms of Federal money expended, for the given diversion.

Question 2. What are the depth and width of channel most suitable for navigation purposes?

The district engineer, as a result of a careful economic study, is of the opinion that the most suitable dimensions are a governing depth of 9 feet and a governing width of 200 feet. The division engineer concurs in this view. The Board of Engineers for Rivers and Harbors also concurs, on the basis both of the district engineer's computations and of the general significance of a navigable connection between Lake Michigan and the Mississippi as an important part of the future system of trunk-line waterways in the interior of the country.

Question 3. What is the quantity of diversion from Lake Michigan necessary for navigation purposes in the said recommended channel?

On the basis of the data in the reports of the district and division engineers, the board states that the least possible diversion which will permit of 9-foot navigation at all times in the Illinois River may be taken as approximately 1,000 cubic feet per second annual average and 1,650 cubic feet per second instantaneous maximum, based on the worst navigation conditions of record in the Illinois River, and subject to the qualifications contained in paragraph 7(e) of the board's report. This figure is approximate only, since it involves complete canalization of the Illinois and is computed on the flow necessary for lockages, with due allowance for seepage, evaporation, etc.; and computations on lockages necessarily turn on assumptions as to the future traffic.

The question of what diversion is necessary to produce a channel 9 by 200 feet by any of the several practicable schemes, other than complete canalization, is answered by the table in paragraph 5 above. More complete data on this and other depths appear in the district engineer's report.

Question 4. How much time would be required by the Sanitary District of Chicago to have in operation sewage-treatment plants capable of treating sewage with the amount of water recommended as necessary for navigation in such recommended channel?

The board points out that the question turns essentially on an arbitrary definition of the degree of purity which is to be required in the waters into which the sewage effluent discharges and the point on the drainage canal or the Illinois River where this degree of purity is to be required. The arbitrary assumption made by the department for the purpose of this report was such that there should be no appreciable nuisance in the Illinois or Des Plaines Rivers due to Chicago sewage. The board points out that, on any such assumption as this, it is possible to compute in a general way the cost of the necessary works, but that it is not within its knowledge or purview whether the authorities concerned will be prepared to tolerate less favorable conditions, or, if so, how much less favorable? The board further points out that, even with Chicago's sewage handled satisfactorily according to any standard which may be chosen, there would still be a material nuisance in the river due to other sources of pollution.

On the standard above adopted a study was made, with the assistance of a firm of expert sanitary engineers retained for the purpose, of the character and cost of appropriate sewage-treatment works with various diversions. Its results are contained in the district engineer's report. From the cost figures obtained, and from a consideration of the time necessary to plan and execute the works, the district engineer estimates that seven years would be necessary to have in operation works not involving the use of sand filtration, i. e., works corresponding to a diversion at least as low as about 4,000 cubic feet per second and probably somewhat lower. For works involving sand filtration he estimates on the same basis that the time required would be 10 years. The division engineer and the board concur in these approximate time estimates.

RECOMMENDATIONS

The district engineer recommends a 9-foot channel 200 feet wide, to be obtained by an annual average diversion of 4,167 cubic feet per second and a maximum instantaneous diversion of 6,050 cubic feet per second, both measured in the drainage canal at Lockport, the channel to be provided by dredging, partial removal of the two State dams, and retention and alteration of the two Federal dams, at an estimated cost of $2,262,000, with $133,000 annually for maintenance. The division engineer submits certain comments on the amount of diversion required for navigation. Taking all factors into consideration, he concurs in the recommendations of the district engineer as to the works to be undertaken, and considers that the diversion at Lockport should not exceed 4,167 cubic feet per second annual average

12. The Board of Engineers for Rivers and Harbors reviews briefly the history of the diversion at Chicago. It points out that the amount of this affects various important interests. These interests and their relation to the problem are briefly as follows:

(*a*) *Navigation on the Great Lakes.*—This is of immense volume and importance; the annual tonnage of freight on the Lakes, disregarding Canadian coastwise trade, is in the neighborhood of 125,000,000 tons per year, and careful studies indicate that its benefit to the Nation in direct savings is at least $125,000,000 per year, sufficient to amortize annually the entire first cost to the Federal Government of works of channel improvement on the Lakes and their connecting channels. Diversion at Chicago lowers the level of the Lakes and thereby reduces the depths in harbors and channels and the amount of freight that can be carried on large freighters. It has been estimated that the loss on this amount is about $325,000 per year for each 1,000 cubic feet per second diverted.

(*b*) *Navigation on the Illinois River.*—As the diversion is decreased, the State must expend more money to provide a 9-foot channel. Reduction from 10,000 cubic feet per second to 4,167 cubic feet per second (annual average) will cost the State about $1,200,000. Further reduction will increase this.

(*c*) *Navigation on the Mississippi.*—Increased flow in the Illinois will benefit the Mississippi channel below Grafton. The benefit will be confined to low-water months and has probably been overestimated at times; nevertheless it will exist. Its amount can not be stated without careful study.

(*d*) *Chicago sewage disposal.*—As the diversion decreases, the cost of sewage-disposal works to produce any given degree of purity increases. The amounts are set forth in the district engineer's report.

(*e*) *Power.*—Water diverted down the Illinois is available for producing power along the Illinois waterway; there is a plant at Lockport, and others are planned. If the same water be retained in Lake Michigan it will ultimately flow down the Niagara and St. Lawrence Rivers. Under existing conditions, water which is thus retained in the Great Lakes instead of being diverted will produce no material power, since the plants on the Niagara River are already using all the water permitted by the treaty of 1909. If more diversion at Niagara is ever permitted and power plants are built on the St. Lawrence, then water will produce several times as much power if it flows by natural channels to the sea as it will if diverted down the Illinois.

The board points out that data are not at hand accurately to evaluate these interests, but that developments and investigations are under way which will tend to this end. For the present the board is unable finally to give an opinion as to the exact amount of diversion which would result in the maximum of benefit to the Nation as a whole, taking all factors into account. It therefore feels that it would be premature and undesirable finally to fix the amount of the diversion at this time. It is needless to do so from the point of view of the present problem, since, as shown above, a satisfactory 9-foot channel can be provided in the Illinois River by any one of several methods over a wide range of possible diversions. The board especially favors two methods: (1) Partial canalization, by partial removal of the two State dams and retention of the two Federal locks

and dams, and (2) an open channel provided by the partial removal of all four dams, together with dredging and supplementary work. Either of these methods is applicable for any diversion equaling or exceeding 2,000 cubic feet per second, up to the limit of 10,000 cubic feet per second considered in the report. The method of partial canalization is cheaper in first cost than is open-channel work for any particular diversion, though operation and maintenance are more expensive. The district engineer submits data to indicate that partial canalization will give more satisfactory navigation conditions than will open-channel work. Local interests contend that this is not the case, since the two existing Federal locks, with dimensions of 350 feet by 73 feet, have considerably less capacity than the locks under construction by the State in the Illinois waterway, with dimensions of 600 feet by 110 feet. The board's view is that, if at some future date, after completion of the Illinois waterway and the growth of a large commerce, the present locks prove an obstruction, additional lock capacity can be provided or the dams removed as appears more desirable.

Estimates for work done under existing conditions of diversion must be based on the special conditions arising from low lake levels and from the current practice of manipulating the flow primarily in the interest of sewage disposal; see paragraphs 7 (e) and 26 of the board's report. Under these conditions the estimated first cost is $1,349,000 by partial canalization.

The board therefore recommends modification of the existing project for the Illinois River to provide a channel with least dimensions of 9 feet in depth and 200 feet in width from the mouth to Utica, by dredging and by the partial removal of the two State dams and the retention and minor alteration of the two Federal locks and dams, at an estimated cost under present conditions of diversion of $1,350,000, with $126,000 annually for operation and maintenance; provided that the State of Illinois transfers to the United States without cost all rights and titles in the two State-owned dams on the Illinois River; that local interests furnish the United States without cost all necessary areas for the economical disposal of material dredged in creating and maintaining the channel; provided further that no work on the Illinois River shall be carried out according to the project herein outlined, with the existing or any subsequent diversions, until the Secretary of War and the Chief of Engineers shall have received satisfactory assurances that local interests will provide an equal depth for through navigation in the Illinois waterway. The amount of $1,350,000 should be made available in the initial appropriation. With any future reduction in the diversion a reestimate of the cost of completing or revising and maintaining the project will become necessary. If after the completion of the Illinois waterway several years hence the large commerce expected has developed in such a way that the Federal locks are becoming inadequate for the navigation, consideration should at that time be given to the relative desirability of the partial removal of the dams or the provision of increased lock capacity, as may then appear best.

The board states that the position of the War Department in the matter of the diversion at Chicago is set forth in the documents connected with the issue of the permit of March 3, 1925,

namely, that every effort should be made to restrict the amount of diverted water. The board, in its present report, is concerned primarily with providing an immediately workable scheme of navigation in the Illinois River, and hence has based its estimates on the actual existing diversion, which, as explained in paragraph 26, is approximately 8,250 cubic feet per second. It invites attention to the fact that it does not recommend this as the final figure; the work it proposes will be useful in any future project that may be based on a lesser diversion. As indicated in paragraph 20 of the board's report there are many facts which have a bearing on the matter of the amount of diversion, among these being the successful and economical operation of the immensely important commerce of the Lakes, whose magnitude and benefits far exceed those of any probable commerce now foreseen on the Illinois River and waterway. It has been shown by the present investigation that the amount of the diversion is not a governing factor in providing a 9-foot channel on the Illinois, as the amount can be varied within wide limits and still leave such a channel entirely practicable, though its cost would be increased as the diversion decreases. The problems in question are in process of investigation and it is hoped of orderly settlement. For the present, therefore, the board does not recommend that any final figure for the diversion should be set; nor that any change be now made in the policy with respect to the proper ultimate diversion.

After due consideration of the above-mentioned reports, I concur in in the views and recommendations of the board.

ST. MARYS RIVER, MICH.

The connecting channels of the Great Lakes between Duluth and Buffalo are improved to project depths of 20 to 21 feet in soft bottom. increased in certain cases over hard bottom or in exposed localities. The datum planes to which the depths are referred are as follows: Lake Superior, 601.6 feet; Lake Huron, 579.6 feet; Lake Erie, 570.8 feet. Due partly to diversion of water at Chicago and more largely to climatic conditions, the Lakes have fallen considerably below these standard levels. In April, 1925, the mean level of Lake Superior was 600.85 and that of Lake Huron 578.56. It appears that the level of 578.5 given in the above item of law was selected with reference to this condition. The district engineer points out that a general deepening of all the through channels to the extent contemplated by the item would involve excavation of a foot or so of material over long stretches. This would be not only very expensive but very uneconomical, inasmuch as the removal of such a thin layer of material would involve unduly high unit costs. The district engineer considers it likely that within a few years the commerce of the Lakes will require provision for vessel drafts considerably greater than 20 feet. He therefore thinks it unwise to undertake a wholesale partial deepening at the present time. The division engineer concurs in this view.

The district engineer next discusses three items of work which local interests consider urgent. The first is the extension of the pier at the upper entrance to the fourth lock at St. Marys Falls. This pier is used for the mooring of vessels waiting lockage and its limited

length often involves undue delays, as vessels waiting their turn at the locks are obliged to anchor some distance up the river. He recommends an extension of the pier by 1,200 feet, at an estimated cost of $277,000. The second item is for the removal of a shoal known as Round Island Middle Ground, about 9 miles above the Soo Locks. Difficulties of navigation at this point have led to successive widenings of the channel, but it remains, in the district engineer's opinion, the most dangerous point in the connecting channels of the Lakes. He recommends that the shoal be removed by dredging to the 577.5-foot level, at an estimated cost of $921,000.

The third request concerns improvement at Neebish Channels. The upper end of these is 8 miles below the Soo Locks. There are two improved channels, known as the West Neebish and the Middle Neebish, located on the opposite sides of Neebish Island, and used, respectively, for downbound and upbound traffic. The present project for each is for a 300-foot width and a 21-foot depth. Request is made for the widening of one of them sufficiently to make it available for two-way traffic, the fear being expressed that if either one were blocked by an accident, the entire Lakes commerce would be forced to move through the other by a system of shuttling, upbound vessels being alternated with downbound, with resultant great delay.

The district engineer gives at length his reasons for believing that such a widening is desirable. In the report of survey it is recommended that the West Neebish Channel be the one selected for widening, the principal reason being that this channel which has in places a 2½-mile current, carries the downbound traffic, and consequently is the one in which there is greater likelihood of an accident. The minimum width for a satisfactory two-way channel, in the opinion of the district engineer, is 650 feet, which would permit a large lake vessel, if it were forced to drop its bow anchor while proceeding downstream, to swing 180° without blocking the channel. The minimum depth should be 23 feet in rock at standard datum. In view of possible extensive future deepening of all channels, it may be sound economy at this time to make the rock cuts to a depth of 27½ feet at standard datum. For reasons connected with economical maintenance, the district engineer believes that in either case the earth sections should be dredged to 24 feet at standard datum. The estimated cost is $9,427,000 or $10,280,000, depending on whether the rock is removed to a depth of 23 or 27½ feet.

In the report of survey the district engineer further recommends that the standard datum planes of the Great Lakes improvements be modified to take into account the exceptionally low water now prevailing.

The division engineer concurs with the district engineer as to extending the pier at the Soo Locks and as to removing the Round Island Middle Ground, except that he believes that the latter should be removed only to a swept depth of 23 feet at standard datum. Regarding the Neebish Channels, he points out that, in the 18 years since the West Neebish has been opened, it has been blocked only once, by a vessel grounding. He considers unjustified so large an expenditure as that recommended by the district engineer. He proposes to widen Middle Neebish Channel, preferably to 500 feet, with a depth in the new cut of 22 feet in both earth and rock sections.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board concurs with the recommendations of the division engineer. Its estimates for the work, obtained from the district engineer, are $277,000 for the pier, $802,000 for the Round Island Middle Ground, and $3,842,000 for the Middle Neebish Channel, a total of $4,921,000, with $75,000 annually for maintenance. The board also discusses the possibility of a general future deepening of the Great Lakes connecting channels, either in connection with a possible deep channel to the Atlantic Ocean or as a result of the increase in draft of the lake fleet. In the latter connection, it invites attention to the figures in the district engineer's report, showing that that portion of the fleet utilizing the St. Marys River could carry an additional 23,000,000 tons a year if channel depths permitted all vessels to load to capacity. For reasons stated in its report, the board does not, however, feel that at the present time and under the present item of law, it can take account of these possibilities in making its recommendations.

After due consideration of the above-mentioned reports I concur in the views of the division engineer and the Board of Engineers for Rivers and Harbors. The immense economic importance of the through traffic of the Great Lakes, unquestionably justifies any reasonable expenditures which will in a material degree facilitate this traffic or increase the ease and safety of navigation. The pier extension at the Soo locks and the removal of the dangerous shoal at Round Island Middle Ground are both highly desirable improvements. In the latter case it is needless at present to dredge the shoal deeper than the adjacent channel; that is, to 23 feet at standard datum. The situation at the Neebish Channel presents possibilities of serious delay and damage. The blocking of either by an accident would require all commerce to move through the other. With the present width a two-way movement would be out of the question, and a shuttling system would have to be adopted until the obstruction in the other channel had been removed. The delay involved might have serious economic effects on the Nation, which depends on the lake carriers for a great part of the iron ore used by the steel industry, and of the grain moved from the Northwest for consumption or export. A considerable expenditure is justifiable as a measure of insurance against such an occurrence. It is evident, however, that absolute safety can not be assured; given any channels of dimensions obtainable at a reasonable expense, it is still within the bounds of possibility that one, or even both, might be blockaded. Obviously it is desirable to strike a mean between the expenditures to be made and the measure of safety to be provided. In my opinion, the most satisfactory arrangement is the provision of the least width reasonably adequate for two-way traffic, in that one of the two channels where it can be the more cheaply provided. The appropriate dimensions are those proposed by the division engineer, namely, a 500-foot width and a 22-foot depth, and such a channel can be dredged more economically in the Middle Neebish than in the West Neebish. The selection of the Middle Neebish for widening has been recommended by the Lake Carriers Association. It has moreover the advantage that, if future developments on the Lakes should demand a widening of the West Neebish as well, this

could be done more economically by coffering off the channel and excavating in the dry; and before the West Neebish could thus be temporarily closed to navigation, a two-way channel in the Middle Neebish would be needed.

I therefore report that modification of the existing project for the improvement of St. Marys River, Mich., is deemed advisable to provide for the removal of Round Island Middle Ground to a depth of 23 feet; for the extension of the northwest pier at the fourth Soo Lock by 1,200 feet; and for widening Middle Neebish Channel to 500 feet, with a depth of 22 feet in the new area, depths being referred to present standard datum planes, at an estimated cost of $4,921,000, with $75,000 annually for maintenance. The initial appropriation should be $3,000,000, the balance of the estimated cost being made available the following year.

I concur with the Board of Engineers for Rivers and Harbors, that at the present time it would be premature to modify the standard datum planes of the Lakes. I concur with the district and division engineers and the board that deepening of all connecting channels by a foot or so, in order to take account of present low-water levels, is undesirable on account of the extremely high unit and total costs of such work. In connection with possible future deepening, to a more considerable extent, of the Lakes channels, and the relation of this possibility to the present recommendation, I invite attention to, and concur with, the remarks of the board in paragraphs 19, 20, and 21 of its report.

BUFFALO HARBOR, N. Y.

Buffalo, N. Y., situated at the eastern end of Lake Erie, has been provided by the United States with an outer harbor about 4½ miles long, formed by a system of breakwaters approximately parallel to the shore. The outer harbor has a depth suitable for deep-draft lake vessels, with entrance channels 21 to 23 feet deep to the outer and inner harbors. The inner harbor, consisting of Buffalo River and connecting canals and slips, has been improved by State, city, and other local interests.

In point of tonnage Buffalo ranks as the second port on the Great Lakes. Its commerce in 1922 totaled 18,660,000 tons, of which the principal items were grain, iron ore, coal, and limestone. As the Lake Erie terminus of the New York State Barge Canal, it is a transshipping point for a large tonnage.

The improvements now desired by local interests are as follows:

(*a*) Making the present breakwater system safer.
(*b*) The construction of a westerly arm to the north breakwater.
(*c*) The closing of the middle gap in the breakwater system.
(*d*) Cooperation in planning port development.
(*e*) The construction of an additional breakwater 1 mile lakeward from the existing system.
(*f*) The removal of shoals at the south entrance to Erie Basin.

The district engineer states that, in connection with the maintenance of the existing breakwater, the timber superstructure is being replaced by stone and concrete and heavy riprap is being placed on exposed sections. The safety of the structures is thus assured. He is of the opinion that the present breakwater height, which is greater than is customary in the Great Lakes, is sufficient to give full protection. He points out that the damage to shipping sustained in the

exceptionally severe storm of 1921 was due to the high winds rather than to wave action and that a higher breakwater would have no material effect in alleviating danger from gales. The construction of a westerly arm to the north breakwater would reduce the width of the entrance channel and probably result in increased velocity of flow during floods in Buffalo River or during periods of rapid oscillation of lake level. Navigation is now difficult at such times, due to the considerable velocity attained by the water in passing through the restricted openings. The district engineer believes that the reflection of waves complained of can more safely be corrected by riprap placed on the lake face of the north breakwater to break up the waves. Closing the gap in the breakwater system would largely eliminate wave disturbance in the outer harbor, but the current velocities in the north and south entrances would be increased in the same manner as would result from restricting the north entrance. Wave disturbance could better be prevented by extending one of the arms sufficiently to overlap the other, but the district engineer believes that the advantages would not be sufficient to justify any change in the present arrangement. Cooperation in planning port development is provided by section 500 of the transportation act approved February 28, 1920. The War Department is always ready to advise with local authorities on the subject, and maintains in the office of the Chief of Engineers an organization for that purpose. A breakwater 1 mile lakeward from the existing structure would have to be 7 miles long and would be located where the average depth of water is more than 35 feet. The district engineer is unable to find sufficient need for such a structure to justify the very large cost of its construction.

At the south entrance to Erie Basin is a triangular area of ledge which is said to interfere with the movement of deep-draft lake vessels between Buffalo River and Erie Basin. The district engineer's survey of this area shows that it has a limiting depth of about 19 feet. Erie Basin, just to the north, has controlling depths generally less than 18 feet. In view of this condition and of the fact that the area is located outside of the limits of the existing project and between the dock of the Delaware, Lackawanna & Western Railroad and Erie Basin, the district engineer thinks that if improvement is desired it should be made either by the railroad, under an implied condition in its permit for the removal of the north jetty, or by the State of New York as part of the improvement of Erie Basin. The estimated cost of the work is given as $22,000, with no material increase for maintenance over that now required for Buffalo Harbor.

The division engineer concurs with the district engineer in recommending against further improvement, except as to the shoal at the south entrance to Erie Basin. In his opinion the location of this shoal is such that it might be removed with propriety either by the United States or by the State of New York. Many factors require consideration in arriving at a definite decision as to who should be responsible for the improvement of the area. In the improvement of Erie Basin and the development of barge canal terminals at Buffalo the State has expended about seven and one-half million dollars, which he considers sufficient justification for the assumption of the present small additional work by the United States.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith agreeing with the division engineer. The board believes, however, that no work should be undertaken until the State of New York has completed arrangements for dredging to an equal depth in Erie Basin from the area in question to the barge-canal terminals.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. Sufficient authority already exists for providing such relief and assistance as will meet the ends sought by proposals (*a*), except as to increased height of breakwater, and (*b*) and (*d*). The benefits to be derived from increased breakwater height and from items (*c*) and (*e*) are incommensurate with the expenditure involved. Item (*f*), however, appears worthy of adoption. In the development of Erie Basin and the barge canal terminals thereon, the State of New York has expended a large sum. A channel of approach at the northerly end of the basin has been provided by the United States in connection with the improvement of Black Rock Channel. An adequate southerly entrance is also desirable to serve deep-draft traffic between points on Buffalo River and terminals on the basin. The shoal lying between these points will interfere with the direct movement of vessels when the adjoining part of the basin has been deepened. The position of the shoal is such that responsibility for its removal can not with certainty be placed. No sufficient reason is, however, apparent for requiring the Delaware, Lackawanna & Western Railroad Co. to undertake the work, which therefore devolves either on the United States or on the State of New York. Action by the United States is justified in the interests of navigation under the same policy as led to the provision of the northerly entrance to the basin. Moreover, a change in the northerly limit of the existing Federal project at this point seems desirable. The full width of the Buffalo River entrance would be made available for navigation by the removal of the shoal, which projects about 100 feet from the north into the 21-foot fairway dredged by the United States and local interests. I therefore report that the further improvement by the United States of Buffalo Harbor, N. Y., is deemed advisable to the extent of providing for the removal to a depth of 21 feet of the triangular area lying just west of the Delaware, Lackawanna & Western Railroad Co.'s slip, and between Erie Basin and the entrance channel to Buffalo inner harbor, at an estimated cost of $22,000, subject to the provision that work shall not be undertaken until the State of New York shall have given satisfactory assurance to the Secretary of War that it will dredge to an equal depth in Erie Basin between the area in question and the barge-canal terminals.

SAN JOAQUIN RIVER AND STOCKTON CHANNEL, CALIF.

The San Joaquin River has its source in the southern part of the central valley of California and flows generally northwest into Suisun Bay, combining with the Sacramento River near its lower end. The United States has provided an improved channel in Suisun Bay with a least depth of 20 feet, and a 9-foot channel, 200 feet wide, from the

bay to the city of Stockton, which is located near the San Joaquin River, about 90 miles by water from San Francisco. The range of tide between mean lower low water and mean higher high water is 6 feet in Suisun Bay and 3 feet at the mouth of Stockton Channel. Request is now made for a channel from the bay to Stockton suitable for ocean carriers.

The district engineer, after an investigation of the sources of commerce of the territory tributary to Stockton, arrives at the conclusion that much of the traffic to or from that territory, now transshipped at San Francisco Bay, might instead be transshipped at Stockton if a suitable channel were provided. He estimates the resultant savings, under present conditions, at $330,000 a year, which he believes would in 1940 be increased to nearly $2,000,000 a year. He accordingly feels that Federal assistance is justified, provided the cost is not excessive. He submits estimates for various channels following three alternative routes, designated as the "southern," the "middle," and the "river route," and concludes that for a 24 or 26 foot channel the latter would be satisfactory, although if a 30-foot channel were provided, the middle route would be preferable. He favors a depth of 24 feet for the initial development and a bottom width of not less than 150 feet. His decision on the width is based not only on the needs of navigation, but especially on the fact that with the soft and easily eroded material to be encountered it is desirable that the channel be as wide as is economically feasible, in order to reduce the effect of wave wash from passing vessels. His latest cost estimates are contained in supplementary reports of October 25, 1924, and November 18, 1924. The most important of these are as follows:

Dimensions	Dredging and levees	First cost, Government dredges	Total cost
24 by 100 feet	$2,052,000	$708,000	$2,760,000
24 by 150 feet	2,406,000	708,000	3,137,000
26 by 100 feet	2,435,000	708,000	3,143,000
26 by 150 feet	2,927,000	708,000	3,635,000

Estimates for annual maintenance are as follows:

Channel	Maintenance first year	Maintenance annually thereafter
24 feet	$135,000	$90,000
26 by 100 feet	195,000	155,000
26 by 150 feet	175,000	121,000

It will be noted that these estimates include the provision of two 20-inch hydraulic pipe-line dredges, of which the remaining value to the Government after the completion of the work would be about $531,000. The district engineer favors provision of the dredges, in view of the scarcity of such plant in the vicinity, to permit completion of the project in a reasonable period.

The district engineer's final recommendation is for a channel by the river route 24 feet deep and 150 feet wide on the bottom, at the cost given above, provided local interests meet half the first cost, exclusive of the remaining value of the dredges, furnish rights of way and spoil-disposal areas, and assume the maintenance of the levees. He also recommends that, irrespective of the decision as to the deep-water channel, the Government undertake the further improvement of Mormon Slough, a channel connecting with Stockton Channel, by deepening the present channel from 4 feet to 9 feet, and increasing its width to 150 feet, in order to provide for the expansion of the present large traffic in barges and river craft centering at Stockton. His estimate for this work is $105,000, with no increase for maintenance over the present estimate for Stockton and Mormon Channels.

The division engineer concurs in general in these views. He recommends, however, that the levees on one bank of the deep channel be sited a sufficient distance back to permit of possible future deepening of the channel without changing the location of the levees. He also considers that for a 26-foot channel, with 100 or 150 foot width, the maintenance cost, after a few years, would become in either case about $125,000.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board has made a careful study of the case, has held several hearings, and has made an inspection on the ground through a committee of its members. It discusses in detail the economic aspects of the proposed improvement, basing its discussion primarily on a brief submitted by local interests. In this brief it is estimated, with certain assumptions as to present and future rail and water rates, and based on available figures of present commerce, that under existing conditions the potential traffic of a deep-water port at Stockton is 770,000 tons a year, with a corresponding annual saving of $694,000. For the year 1930 it is estimated that these figures would be increased to 1,000,000 tons and $900,000 annually. The board is of the opinion that the data in the brief have been carefully and conservatively gathered, and that the assumptions regarding rates are justifiable. Some reduction of the estimates of tonnage and savings appears desirable, however, in view of the uncertainty of the movement of certain commodities, including a portion of the barley and much of the canned goods and vegetables which are included in the potential commerce. It concludes that, even with this correction, the probable saving would still be sufficient to justify Federal participation in a deep-water project on suitable terms of cooperation.

The board concurs with the district and division engineers in selecting a medium-draft channel for the initial development and in preferring the river route for this channel. It believes, however, that a 26-foot depth would be much more effective than a 24-foot, especially in view of the probable difficulty of obtaining the full project depth in the early stages of the development, and of the present practice, at San Francisco Bay, of moving barley in ships averaging a loaded draft of 26 feet or more. It considers also that a 100-foot bottom width should be adequate for the needs of navigation, citing for purposes of comparison the former deep channels to Houston and

in the Sabine-Neches Canal. To meet the district engineer's objection regarding erosion and wave action in the narrower channel, it proposes setting back both levees on the banks of the main channel by supplementary excavation along the sides, thus producing a greater surface width than in his proposed 150-foot channel with a material saving in cost, while at the same time providing for possible future channel deepening. It concurs with the recommendation that two hydraulic pipe-line dredges be allowed for in the estimate, although the necessity for providing the two may not arise. It bases its estimates, however, on dredges of a more expensive but more efficient type than those considered by the district engineer, and sets the first cost of the two, with their auxiliary equipment, at $1,100,000. The board's estimate then becomes:

Dredging and levees	$2, 560, 000
First cost of two dredges	1, 100, 000
Total first cost	3, 660, 000

This would leave the Government, at the end of the initial excavation, in possession of two dredges with an estimated remaining value of $825,000.

The board considers that, in view of the large local benefits to be derived, the locality should furnish rights of way and spoil disposal areas; should contribute half of the first cost, exclusive of the estimated remaining value of the dredges; should pay half of the first year's maintenance cost, and thereafter for a period of four years contribute $45,000 annually to maintenance; should assume the maintenance of all levees, and should undertake or plan for certain present and future terminal developments, which it specifies. It recommends that a turning basin at Stockton and passing places in the channel be authorized as part of the project. It further concurs with the district engineer that additional improvement be provided in Mormon Channel by deepening it to 9 feet, in order to take care of the growing demands made by the important river traffic. It considers, however, that an initial width of 100 feet for such channel is adequate, at an estimated first cost of $55,000.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors except as to the amount of local cooperation. The central valley of California is an important and rapidly developing area, which annually produces and consumes large quantities of freight. Transshipment of this to or from deep water now occurs at the ports of San Francisco Bay, and these ports will undoubtedly continue to handle a large part of the business, in addition to their very important function as a major gateway for much of the western United States. There is, however, a considerable tonnage of freight, notably in bulk commodities, which under present rate conditions might be transshipped at a point farther inland, with large savings both to the locality and to the general public. Stockton is well situated to become such a transshipment point, with reference both to the topography of the valley and its rivers and to the location of railroads. It is situated on three transcontinental roads which also serve practically the entire Sacramento and San Joaquin Valleys. The present rate situation gives it considerable differentials under San Francisco for most intrastate movements, and, as pointed out by the

board, the conditions and local practices are such that these differentials are not likely materially to be modified as the result of a deeper channel. I am of the opinion that the provision of such a channel by the Federal Government is justified under suitable conditions and with local cooperation, and that the layout and dimensions of the channel and the extent of cooperation proposed by the board are reasonable and equitable for all concerned. In connection with the improvement some dredging is involved at the mouth of the San Joaquin River in Suisum Bay, and if the proposed project is adopted, limitation of the Suisum Bay project to the section below Point Edith is implied.

I therefore report that the further improvement of San Joaquin River and Stockton Channel is deemed advisable to the extent of providing for a channel from deep water in Suisun Bay to the city of Stockton, 26 feet deep at mean lower low water and 100 feet wide on the bottom, following the river route in general as laid out by the district engineer, with levees set back 230 feet from the center of the channel, and having suitable passing places and a turning basin at Stockton; and for dredging in Mormon Slough from its mouth to Center Street, to a depth of 9 feet at mean lower low water and a width of 100 feet, at a total estimated first cost of $3,715,000 for excavation, levee work, and dredging plant, and $195,000 for maintenance the first year, and $125,000 annually thereafter, subject to the provisions that local interests shall furnish, without cost to the United States, a suitable right of way 750 feet wide for the deep channel, and of necessary width for Mormon Channel, and suitable areas for the disposal of dredged material; shall contribute $1,307,500 to the first cost of dredging, which is one-half the estimated cost of this work; shall assume the maintenance of levees; shall furnish satisfactory assurances that they will complete, by the date of completion of the channel, terminals with a berthing space of at least 1,200 linear feet, of which at least 800 linear feet shall be provided with transit sheds suitable for the handling of general cargo; and shall at once acquire the necessary water-front area for and prepare and submit plans for an ultimate terminal development capable of handling at least 1,000,000 tons per year; all plans for present or future terminal development to be subject to the approval of the Secretary of War and the Chief of Engineers. The net estimated first cost to the Government is $2,407,500. The initial Federal appropriation should be $950,000, the remainder to be furnished in three approximately equal annual installments. The initial contribution of local interests should be $400,000, and subsequent contributions toward first cost should be in three approximately equal annual installments.

SACRAMENTO RIVER, CALIF.

The Sacramento and San Joaquin Rivers are the principal waterways of the important and populous agricultural section in the central valley of California. The problems of the San Joaquin River as to navigation and flood control have been covered in the recent reports contained in House Documents No. 217, Sixty-eighth Congress, first session, and No. 554, Sixty-eighth Congress, second session, and the present report is therefore restricted to the Sacramento. This river is under improvement by the United States

under a project providing for a 7-foot channel from the mouth to Sacramento, a 4-foot channel thence to Colusa, a 3-foot channel thence to Chico landing, and such depths as are practicable thence to Red Bluff. Request is now made for a 10-foot channel to Sacramento and a 6-foot channel to Colusa.

The water-borne commerce of the Sacramento River for the period 1917–1923 has averaged 1,225,000 tons annually, with an average value of $74,000,000. In 1924 the tonnage was 1,796,000 and the value $58,663,000. One hundred and ninety thousand tons in 1923 and one hundred and nine thousand tons in 1924 moved over the stretch above Sacramento, but the bulk of the commerce was at and below that city. A large proportion of the freight is high grade, and the larger carriers utilize the low-water depth to the limit.

A 7-foot channel to Sacramento has, in general and with limited interruptions in exceptionally bad years, been maintained since its adoption in 1899, through the dredging and regulating works carried out under the navigation project, combined with the beneficial effect of the flood-control project adopted for the river in connection with the elimination of mining débris. Project dimensions above Sacramento have not, however, been maintained in low-water seasons. The district engineer is of the opinion that the maintenance of even the present project channels above Sacramento by open-channel methods would require a flow of not less than 3,500 second-feet. A flow of not less than 2,000 second-feet would permit the maintenance of project depths in a canal paralleling the river between Sacramento and the mouth of the Feather. The actual flow at low water is less than either of these figures, due both to natural conditions and to irrigation diversions, so that a year-round channel of existing project dimensions could be assured only by canalization of the river. A 6-foot channel to Colusa, as now requested, would require canalization of the river irrespective of the flow. The cost of such work would be so large that the district engineer does not consider it justified.

Channels from the mouth to Sacramento 9 feet and 10 feet deep are estimated to cost, respectively, $86,000 and $161,000, with annual maintenance of $63,000 and $92,000, respectively, the latter figures not including maintenance of the present project above Sacramento, now estimated at $55,000 per year. The district engineer is doubtful of the practicability of obtaining at all times a 10-foot channel below the city by dredging and regulation, and as an alternative proposes a lock and dam at Freeport, at a total estimated cost, together with supplementary dredging and regulation, of $2,679,000. Maintenance in this case is estimated at $25,000 below the city and $30,000 above, these reduced figures being due to the beneficial effect which the dam would have on depths in the upper river. The dam would also produce slack water over a 9-mile stretch in the lower part of the Feather River, improvement of which is being reported on separately by the department.

In view of the large, important, and growing commerce of the Sacramento, and the full utilization by traffic of the existing project depths, the district engineer believes that an increase to 10 feet up to the city of Sacramento is warranted, and recommends such a

project to be attained by a dam at Freeport and supplementary work, at the estimated cost given above.

The division engineer concurs with the district engineer as to the need of a 10-foot channel to Sacramento. He considers, however, that there is a reasonable surety that it can be created and maintained without a lock and dam. He believes that such a structure, besides being unnecessary and expensive, would be a serious disadvantage at a later date if justification should arise for a channel to Sacramento suitable for ocean vessels. He invites attention also to the fac that one of the most important transportation companies on the river objects to the dam. He therefore recommends the 10-foot project by open-channel work.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the division engineer.

After due consideration of the above-mentioned reports, I concur in the views of the division engineer and the Board of Engineers for Rivers and Harbors. The Sacramento is one of the most important and successful internal waterways in the country, carrying a large commerce with an exceptional proportion of high-grade freight, and navigated by efficient and well-organized transportation lines. The limiting low-water depth of 7 feet has already proved a handicap, a condition which will be aggravated on the completion of larger and more efficient carriers such as are now under construction. This commerce deserves great consideration from the Government, and for its efficient operation the proposed low-water depth of 10 feet, with widths of 150 to 200 feet, is considered entirely justifiable. It is likely that such a project depth can be maintained practically without interruption by open-channel work.

At seasons of extreme low water it is possible that there would be small temporary reductions in depth, involving temporary underloading of certain of the carriers, but the economic losses from such a source would be insufficient to justify the large expense of a lock and dam. Such a structure, moreover, has other serious drawbacks, as is pointed out by the division engineer. The river above Sacramento, while carrying a considerable commerce, is much less important than the lower river, and the natural difficulties of improvement on account of low summer flow and débris deposits, aggravated by the extensive diversions for irrigation, make it impracticable even to insure present project depths at all times by the methods now authorized, and render work designed to assure these depths, or to provide increased depths, so expensive that the resulting benefits would not justify them. I therefore report that modification of the existing project for improvement of the Sacramento River, Calif., is deemed advisable to the extent of providing for a channel 10 feet deep at mean lower low water and from 150 to 200 feet wide from the mouth of the river to Sacramento, at an estimated cost of $161,000, with $92,000 annually for maintenance of this section.

Attention is invited to the remarks on the subject of the relation among the various interests utilizing the river, and the necessity for a coordination of their activities, made by the Board of Engineers for Rivers and Harbors in its present report, and in its report on flood control in the Sacramento which is being transmitted this date. I concur in the views therein expressed.

SAN PABLO BAY AND MARE ISLAND CHANNEL, CALIF.

Pinole Shoal occupies the southeastern portion of San Pablo Bay, and the channel through it is the main ship channel connecting San Francisco Bay proper with Carquinez Strait, Suisun Bay, and the Sacramento and San Joaquin Rivers. Mare Island Strait is the term applied to the lower improved stretch of Napa Creek, which enters Carquinez Strait just east of the point where the latter joins San Pablo Bay. The United States has improved these waterways under a project for a channel 35 feet deep at mean lower low water and 500 feet wide across Pinole Shoal, and of the same depth and width through Mare Island Strait, with a 1,000-foot turning basin opposite the upper end of the navy yard. The latter improvement is known as Mare Island Channel. Range of tide between mean lower low water and mean higher high water is 6.5 feet. Local interests have made certain requests for work in San Pablo and Suisun Bays and in Carquinez Strait, which are outside the scope of the item of law authorizing the present investigation. The Navy Department states that its needs can be met by a channel 35 feet by 500 feet across Pinole Shoal and 30 feet by 600 feet in Mare Island Strait, with a slight increase in the area of the turning basin.

The district engineer points out that Pinole Shoal Channel carries a large and important commerce, amounting in 1923 to about eight and a quarter million tons, of which much is in ocean vessels drawing up to 30 feet or more. This can be adequately accommodated by the 35-foot depth requested by the Navy Department. In view, however, of the large amount of shipping, the difficulty in maintaining the channel at all times to full project depth and width, and the prevalence of fogs, he believes that the width should be increased to 600 feet. Mare Island Strait carries a considerable commercial traffic, all of which, however, can be accommodated by a channel of the dimensions requested by the Navy Department. These dimensions appear necessary in the interest of national defense.

The district engineer submits the results of a careful study of the silting which occurs in the two channels under consideration and of the means which might be adopted to reduce it. The study includes results of monthly and bimonthly surveys extending over about a year, and of borings, current observations, and studies of the character of the silt deposits. He concludes that the basic cause for the shoaling is the existence of immense deposits of soft material in San Pablo Bay, brought down in the past by the Sacramento and San Joaquin Rivers, the volume of which deposits was greatly increased by uncontrolled hydraulic mining operations. The silting in Mare Island Strait is caused largely by the action of the flood tide, which, advancing up San Francisco Bay, moves across the broad shallow expanse of water in the northern part of San Pablo Bay, picks up the light material there deposited and carries it into Carquinez Strait and up Mare Island Strait. The ebb tide removes some but not all of the material thus brought in. A certain amount is also carried down into Mare Island Strait from the tidal marshes along the upper reaches of Napa Creek.

Three possible methods are discussed for improving conditions in Mare Island Channel. The first is by a dam across Napa Creek above the navy yard, and the diversion of the creek and its burden of

silt into San Pablo Bay. This would not, however, affect the major source of the deposits, which, as stated, is the silt from San Pablo Bay brought in by the flood tide. The diversion dam would also be quite expensive, would restrict the extension upstream of commercial developments on the opposite side of the strait from the navy yard, would interfere with the light-draft navigation now existing on the upper reaches of Napa Creek, and might have a deleterious effect on the regimen of Pinole Shoal Channel. The district engineer therefore does not consider the dam a sound solution.

The two other solutions are regulating works and dredging The Navy Department has in the past provided dikes on, and at the entrance to, Mare Island Strait, which have had a beneficial effect on the channel. Some of these have deteriorated, but the Navy Department proposes repairs and modifications which in the opinion of the district engineer are adequate and satisfactory. There was also constructed, in 1912, a dike running southwest and west from the mouth of Mare Island Strait into San Pablo Bay, with a view to catching the silt brought across that bay by the flood tide. This dike served a useful purpose, but the amount of silt deposited behind it was so great that its utility as a catch basin is now very limited. The district engineer considers a possible extension of the dike or the construction of a supplementary dike north of and parallel to it. Due to the activity of marine borers, and to the pressure against such a dike on account of tidal head and silt deposits, it would be necessary to make the structure of treated timber and to reinforce it initially or eventually with riprap. An expenditure of several million dollars would be required, the deposits behind the dike would reduce the tidal prism in San Pablo Bay, and it is unlikely that the saving in the cost of maintaining Mare Island Channel would be as great as the carrying and maintenance charges on the dike. The district engineer accordingly feels that no further regulating works are justified than those now in existence or proposed by the Navy Department.

The only remaining method of maintenance is dredging. This has been carried on on a large scale for some years by the department, which as a result of recent studies and experiments has been able to reduce the unit cost of the work and to maintain the channels more adequately with the funds available. The district engineer submits various estimates for the dredging and maintenance of channels of different dimensions. Those now proposed involve a first cost of $481,000, with annual maintenance of $135,000 for Pinole Shoal and $205,000 for Mare Island Channel and turning basin, a total maintenance cost of $340,000. He recommends adoption of such channels under these estimates.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district engineer.

After due consideration of the above-mentioned reports, I concur in the views of the district engineer and the Board of Engineers for Rivers and Harbors. Pinole Shoal Channel is of very great commercial importance. The 35-foot depth now provided has been amply justified by existing traffic, and the volume and difficulties of navigation make proper the 100-foot increase in the width now proposed, which can be provided for a small part of the total cost.

The channel now requested by the Navy Department in Mare Island Strait is 100 feet wider than the existing project channel, but has a depth of 5 feet less. Maintenance of such a channel is a national defense matter, and the dimensions proposed for this purpose by the Navy Department are adequate commercially. The principal question here is how most economically to accomplish the large amount of maintenance which is continuously necessary. The careful studies embodied in the district engineer's report are supplementary to, and in general confirm, the results of previous studies made by the War and Navy Departments. Diversion of Napa Creek would be an expensive and inadequate solution and possesses several other drawbacks. Regulation has been undertaken on a considerable scale, and it does not appear that further work of this character would in the long run be economical. It is therefore necessary to continue the dredging work which is now being carried on, and which, by the investigations and experiments of the department, has been brought to a high degree of efficiency. The estimates of the district engineer for the work proposed appear reasonable and adequate. I therefore report that modification of the existing project for Pinole Shoal and Mare Island Channel and turning basin, California, is deemed advisable to the extent of providing a channel 35 feet deep and 600 feet wide across Pinole Shoal in San Pablo Bay, and thence a channel 30 feet deep and 600 feet wide in Mare Island Strait, with a turning basin of the same depth, except at the northeasterly corner where it should be 26 feet, and 1,000 feet wide, along the general lines proposed by the district engineer, at an estimated cost of $480,000, with $340,000 annually for maintenance. Funds for new work should be made available in three approximately equal annual installments.

FEATHER RIVER, CALIF.

Feather River is an important tributary to the Sacramento, which it enters about 20 miles above the city of Sacramento. The United States has improved it under a project adopted by Congress in 1916, which has been interpreted as calling for a channel with a low-water depth of 2½ feet, to be attained by clearing and a limited amount of dredging and regulation. House Document No. 1460, referred to above, contained an unfavorable recommendation by the Chief of Engineers on an improvement of this stream. Congress adopted a project, appropriating $10,000 on condition of local contribution of a like sum. This contribution was made and some work done, which was suspended on account of the war. Request is now made for an improved channel up to the city of Marysville, about 30 miles above the mouth.

The district engineer states that the least channel depth which might result in a regular commerce would be 3 to 4 feet maintained throughout the year. To attain this by locks and dams would involve a minimum expenditure of over $3,000,000, which sum is predicated upon the construction, as recommended by the district engineer in another report, of a lock and dam on the Sacramento River at Freeport, whereby the cost of canalizing the Feather would be reduced by creating slack water in its lower stretches. Open-channel improvement by dredging and wing dams the estimates would cost $860,000,

with $40,000 annually for maintenance for the first three years and $116,000 annually thereafter. An improvement of this character is, however, based on an assumption of a minimum low-water flow in the river of from 1,700 to 2,000 second-feet. Such a flow can not be counted on even under natural conditions, and the natural flow has been so reduced by withdrawals for irrigation in the upper river that in September, 1924, there was actually no running water whatever in the Feather at a point about 10 miles above its mouth. In view of the impracticability of obtaining sufficient water for adequate open-channel improvement, and the large cost of canalization, the district engineer does not recommend the adoption of either plan.

The district engineer next considers the possibility of increasing the low-water flow of the Feather by reservoirs. He finds that while a number of reservoirs now exist on the river, the purposes for which they were constructed are such that they could not be adapted to river regulation to an extent that would materially improve the situation. Adequate regulation by new reservoirs would cost at least $6,000,000, and probably much more. The district engineer also discusses the possibility of restrictions on irrigation, but comes to the conclusion that the deleterious effect on agriculture would far outweigh the benefits to navigation derived from an increased flow of the river.

The valley of the Feather is a rich and prosperous agricultural section with large annual freight movements. Practically all freight is carried by the railroads which parallel the river on both banks, and at the present time are giving adequate service. The district engineer believes that under these conditions the growth in the near future of a large commerce on the Feather would be unlikely, even if the large expenditures were made which would be necessary to secure a permanent channel suitable for light-draft vessels. He points out, however, that railroad congestions, which have occurred in the past and may occur in the future, are likely to have a serious effect on the prosperity of the valley, notably at the time of peak movement when crops are being marketed. He considers that for this reason the Feather River, while not now carrying any commerce, is a valuable potential asset to the valley. In the event that commerce should reestablish itself, even on a small scale, he feels that the Chief of Engineers should have authority to undertake such limited work in the way of snagging, minor dredging, and temporary regulating works as would facilitate the movement of vessels at favorable river stages. He therefore recommends the establishment of a project looking to an annual expenditure not exceeding $10,000, and for the present not exceeding $5,000, no work to be undertaken unless in the opinion of the Chief of Engineers it will be helpful to navigation. He further recommends that the unexpended balance of the sum contributed by local interests under the provisions of the act of July 27, 1916, be returned to them.

The Board of Engineers for Rivers and Harbors concurs with the district and division engineers in the view that the cost of an improvement of the river by any means which would insure a year-round channel even 3 or 4 feet deep would be entirely out of proportion to resulting benefits. It points out, however, that the Sacramento River, into which the Feather flows, is an unusual example of a stream where not only is there a large water-borne commerce in the

lower stretches but where the limited depths in the upper section are extensively utilized. The project depth in the Sacramento up to Colusa is only 4 feet at low water. Nevertheless, a commerce of between 100,000 and 200,000 tons now moves on this section of the river, and advantage is taken of the higher stages to the extent that vessels drawing as much as 8 feet then go to Colusa. This utilization of a very limited channel in the Sacramento River leads the board to believe that there is a possibility of a similar utilization of the Feather Channel either for small regular movements or as temporary relief if the rail congestions which have occurred in the past should occur again. Its report contained in House Document No. 1460 was unfavorable to a limited improvement of the river on account of its belief that improvement was requested primarily for a purpose not of stimulating water-borne commerce, but of regulating rail rates. Changes in the rate situation since that time have eliminated this objection. The board believes that the Chief of Engineers should have authority to undertake minor works of improvement on the Feather River up to Marysville if and when it appears that these would result in a stimulation of water-borne commerce. The exact extent of the necessary work can not be foreseen, but it is believed that an annual expenditure of $10,000 would be sufficient. The board therefore recommends the improvement of Feather River, Calif., from the mouth to Marysville, to provide such depths as may be practicable at an average annual cost not in excess of $10,000, and that no local cooperation be required in addition to the contribution already made by local interests in accordance with the requirements in the act of Congress of July 27, 1916. This recommendation does not contemplate that the unexpended balance of that contribution, $3,840.10, be returned to local interests.

After due consideration of the above-mentioned reports, I concur in the views of the board.

SAN FRANCISCO HARBOR, CALIF.

Islais Creek is a small tidal stream, not under improvement by the United States, which enters San Francisco Bay from the west, north of Hunters Point. Local interests have rectified and improved the creek and reclaimed some of the adjoining marsh land. A section along the creek is owned by the State of California, which has built terminals and has an additional unit under construction as part of the general water-front facilities of the city of San Francisco. Other adjoining areas are owned by private interests, which desire that they be reclaimed and developed for industrial use. Channelward of the pierhead line in front of the creek is a shoal, extending into San Francisco Bay, which has limiting depths of 34 feet or less over an area of about 300 acres. Request is made that this shoal be dredged to 34 feet and the spoil deposited on neighboring marshlands.

The district engineer states that the water-borne commerce of Islais Creek increased from 98,000 tons in 1921 to 431,000 tons in 1925. The principal items in the latter year were barley, lumber, and petroleum products, handled in foreign, coastwise, and internal trade. He believes that full development of the commercial possi-

bilities of the locality requires dredging channelward of the pierhead line. He proposed to dredge initially a flared channel, designated on the map as "e," to a depth of 34 feet, thus providing an approach to Islais Creek; and at the same time to adopt a project for the removal of the remainder of the shoal, to be carried out when further terminal development along the bay front, which is now being considered, shall be undertaken. The cheapest method of dredging is by seagoing hopper dredge, the material being dumped in deep water in the bay. The use of a hydraulic pipe-line dredge would permit of dumping the material on shore and reclaiming land, but would be considerably more expensive. The district engineer submits a number of estimates for different items, or combination of items, of work, of which the most important are as follows:

Work	Cost by hopper dredge	Cost by hydraulic pipe line	Annual maintenance
Dredging area "e"	$65,000	$168,000	$17,000
Dredging portion of shoal south of area "e"	81,000	232,000	13,000
Removal of entire shoal	186,000	419,000	27,000

On account of the local benefits involved the district engineer believes that the United States should meet half the cost of doing the initial work by the cheaper method, namely, by hopper dredge. Local interests should meet the other half; and if they desire the material pumped ashore for land reclamation, they should also meet the entire additional cost involved in using this method. The first cost to the United States on this basis would be $33,000 for the work to be immediately undertaken and an additional $76,000 for work to be undertaken later.

The division engineer concurs in general with this recommendation, except that he believes that the United States should meet the entire first cost of the work on the flared approach channel by the cheapest method, one-half the first cost of the remaining work by the cheapest method, and one-half the cost of maintenance.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board believes that the United States should dredge the flared approach channel as soon as there is assurance that the creek channel will be deepened to 34 feet and should remove the portion of the shoal south of the flared channel as soon as further developments render this advisable; and that the United States should meet the entire first cost by the cheapest method and the entire maintenance cost. Local interests, if they desire the material pumped ashore, should contribute the entire additional cost involved.

After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. The growing commerce of the port of San Francisco is tending to force an extension of terminal developments to the south. The State of California, foreseeing this need, has expended considerable sums in improving Islais Creek and building terminals thereon.

Additional developments are now under way, and still further construction is contemplated, involving a series of piers and slips fronting on the bay near the mouth of the creek. As a result of the work already done, the water-borne traffic of the locality has increased fourfold in the past four years, and now represents a material addition to the general commerce of the port. The provision of a suitable approach channel to Islais Creek by the United States is justified by the magnitude of the commercial interests involved, and there will be a similar justification for dredging the shoal area south of this approach channel when further terminal developments make it appropriate.

No present necessity appears to exist for dredging the portion of the shoal north of the approach channel. The expenditure of the United States should not exceed the sum needed to do the work by the method most economical to the Government, namely, by hopper dredge, and if local interests desire that the more expensive method, involving a hydraulic pipe-line dredge, be used in order that their land may be filled, they should meet the entire excess cost involved. It is understood that the State proposes to dredge the creek to 35 feet, thus providing a satisfactory anchorage at extreme low water for the largest vessels, notably grain ships, which now call or in future may call at the creek. It is probable that a depth somewhat less than 34 feet in the approach channels might prove to be satisfactory, but the saving involved by a slight reduction in depth would be very limited, and in view of the large amount of work done by the locality I consider the proposed depth to be justified. I therefore report that modification of the existing project for San Francisco Harbor, Calif., is deemed desirable so as to provide for the removal to a depth of 34 feet at mean lower low water of that portion of the shoal channelward of the United States pierhead line near the mouth of Islais Creek, including an approach channel "e" as shown on the inclosed map, and the area adjacent to and immediately south of it, at an estimated first cost of $146,000 if done by seagoing hopper dredge, and with estimated annual maintenance of $25,000; provided that no work shall be done on area "e" until the Secretary of War and the Chief of Engineers receive satisfactory assurances that the State will dredge to at least 34 feet the Islais Creek Channel from the United States pierhead line to the vicinity of the existing State terminals; that no work shall be done on the remainder of the project until such time as, in the opinion of the Secretary of War and the Chief of Engineers, it is rendered necessary by additional terminal developments along the bay front; and that local interests, if they desire the work done by hydraulic pipe-line dredge and the material deposited ashore, shall contribute the entire excess cost involved in dredging by this method above the estimated cost of doing the work with a seagoing hopper dredge, and shall furnish, without cost to the United States, suitable dumping grounds for the dredged material and all necessary levees, bulkheads, drainage canals, sluiceways, or other structures required therefor. The first element of the work undertaken will probably be the deepening of the flared approach channel; the amount of $65,000, which represents the Federal contribution thereto, should be made available in a single appropriation.

UMPQUA HARBOR AND RIVER, OREG.

The Umpqua River flows into the Pacific Ocean about 165 miles south of the mouth of the Columbia River. The United States, in cooperation with local interests, is building a jetty on the north side of the entrance, the projected length being 7,500 feet, with a view to improvin the depth over the bar. The work thus far accomplished has been insufficient to produce any important results. The purpose of the improvement is to afford a water outlet for the lumber produced at the mills in Gardner and Reedsport, about 10.5 miles above the mouth. Natural depths in the river between these communities and the mouth were limited to about 9 feet. Recently, however, the port of Umpqua has dredged a channel to a depth of 16 feet. The range of tide between mean lower low water and mean higher high water is 6.7 feet. It is the desire of interested parties that the United States take over the work on the river, including the entire cost of any additional jetty construction, and maintain a 16-foot channel to Reedsport, and also provide for the ultimate construction of a south jetty.

The district engineer reports that some ten to twelve billion feet of timber may be considered as tributary to the Umpqua River. The five mills located at Reedsport and Gardner have a total daily capacity of about 500,000 board feet. The water-borne commerce in 1922 and 1923 was about 20,000 tons, and in 1924, 31,000 tons. The principal item is outbound lumber, carried on vessels which load to drafts of 13 to 16 feet.

Believing that the large potential commerce justifies further expenditure by the Federal Government, the district engineer discusses the changes which he thinks should be made in the existing project. He would extend the north jetty to a length of 8,000 feet, 500 feet farther than now authorized. While he feels that this structure, together with a reasonable amount of dredging, may produce a dependable entrance channel, he recommends that a south jetty be authorized, though its construction should be deferred. For the river he would provide a channel 16 feet deep and 200 feet wide up to Reedsport. The cost of these items is estimated to be as follows:

North jetty to 8,000 feet	$1, 253, 500
Dredging ocean bar	16, 000
Dredging in river channel	209, 900
Subtotal for portion of project recommended for immediate completion	1, 479, 400
South jetty	1, 200, 000
Total	2, 679, 400

In the above tabulation the estimate for the north jetty includes the actual cost of all work heretofore done by the United States or local interests. The estimate for dredging in the river channel includes $109,900 which local interests have heretofore spent thereon in actual dredging. It also includes an item of $100,000, the district engineer's estimate of the present value of a 15-inch hydraulic dredge which local interests bought for the purpose, and the actual first cost

of which was $100,000. The estimated cost of annual maintenance is $27,000 for the bar and river channels and $30,000 to $50,000 for each jetty, the latter accumulating over a period of 10 to 20 years. First cost would be $34,000 less if the river channel followed the northerly route along the Gardner front.

The subject of local cooperation is discussed at length by the district engineer, who finds that, based upon the valuation of December 31, 1923, and the bonding limit fixed by law, the port district would be able to contribute $113,200, in addition to its previous contributions which he estimates at $431,800, as follows:

Useful work on the north jetty	$173,500
Useful work in river channel	36,900
Cash now on deposit by tripartite agreement	103,000
First cost of dredging equipment	115,000
Funds now on hand	3,400
Total	431,800

The district engineer thinks credit might be given for a local expenditure of $261,000 for useful work on the jetty, as that represents the present value rather than the $173,500 given in the table above. With this allowance, and a possible additional contribution due to increased taxable valuation, he reaches a figure which is about 46 per cent of the estimated cost of the proposed work.

The district engineer recommends that the work outlined above be undertaken, provided that local interests contribute 40 per cent of the estimated cost, or $591,800, including credit for useful work previously done and contributions already made. Should the locality be unable to raise this amount, he would limit the work on the north jetty to what can be accomplished with a total expenditure of which the local contribution would be 40 per cent, provided that in no case should such contribution be less than $545,000. On the basis proposed, the work now to be undertaken by the United States would cost $611,000 in excess of the funds now available.

The division engineer concurs as to the length of the north jetty, but thinks its alignment should be modified. He considers that the improvement of the entrance should be limited to the provision of a channel for vessels of about 18 feet draft. His recommendation is for a north jetty 8,000 feet long, built on a line to be determined by the Chief of Engineers, at a total cost of $1,253,000, or $700,000 in excess of the amount now authorized, with $30,000 to $50,000 annually for maintenance, provided that local interests will dredge and maintain the river channel to a depth commensurate with that secured over the bar. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, concurring in the recommendation of the division engineer.

After due consideration of the above-mentioned reports, I concur in the views of the division engineer and the Board of Engineers for Rivers and Harbors. The very large stands of timber naturally tributary to the Umpqua River are a potential source of a heavy commerce. The present development of the lumber industry at the Umpqua ports is not very extensive, probably due partly to the

inadequate depth of water at the entrance. At the time the existing project was recommended for adoption the benefits which seemed likely to result appeared to justify the improvement only on a basis of an equal division of cost between the United States and the locality. The present study of the case, which has followed a detailed plan proposed by the Board of Engineers for Rivers and Harbors, has developed that a suitable water outlet would result in an increased value of the Federal timber holdings which would justify a larger contribution by the United States. Due to the configuration of the entrance the construction of a south jetty may not be required to provide adequately for the immediately prospective needs of navigation.

Developments which appear probable in the near future are not such as to justify the Government, even on a contingent basis, in committing itself to the large expense of constructing an additional jetty. In view of the extensive interest of the United States on account of its timberlands, and because of the potential tonnage of commerce, the Federal Government would be justified in assuming the entire additional cost, estimated at $700,000, of completing the north jetty.

I therefore report that modification of the existing project for the improvement of Umpqua River, Oreg., is deemed advisable, so as to provide for the extension of the north jetty to a total length of approximately 8,000 feet, at a total estimated cost of $1,253,000, or $700,000 in excess of the amount now authorized, with annual maintenance estimated at $50,000, provided local interests give assurances satisfactory to the Secretary of War and the Chief of Engineers that they will undertake the improvement and maintenance of the river channel to a depth commensurate with that secured over the bar. Attention is invited to the probable increase of $100,000 over the above figures in the cost of completing the jetty if work is not undertaken while the wharf and tramway are still in usable condition.

OLYMPIA HARBOR, WASH.

Olympia Harbor is located near the head of Puget Sound. It has been improved by the United States under a project for channels on the east and on the west side of the harbor, each 12 feet deep at mean lower low water and 200 feet wide. The port of Olympia has constructed a fill for terminal development in the harbor on the east side of the east Government channel, in connection with which work it has dredged a portion of that channel, and of adjoining areas in the inner harbor, to a depth of 30 feet or more. Range of tide between mean lower low water and mean higher high water is 14.8 feet. Request is now made that the Government provide a channel 30 feet deep from the outer harbor to the section in the inner harbor dredged at local expense.

In 1924 the water-borne commerce of Olympia was 692,000 tons, principally floated logs, lumber products, sand, and gravel. The hinterland of the port contains large stands of timber, estimated at 25,000,000,000 board feet. Thirty lumber mills, five shingle mills, and a veneer plant are in operation in this territory, of which a group of the larger ones has a total annual output of over 600,000,000 board

feet. Much of their production seeks water shipment. Due to the limited depth in Olympia Harbor, it is in general necessary to send such material to Tacoma, or other neighboring deep-water ports, by rail or barge, for transshipment to ocean-going vessels. Local interests estimate that if large vessels could load at Olympia there would result a saving in transportation costs of $200,000 annually. The district engineer, who is also the division engineer, considers that this figure is somewhat high, but that, nevertheless, the saving would be very large. He believes that the depth of 30 feet requested by local interests is unnecessary, in view of the large range of tide. After an analysis of tidal conditions, he concludes that a 22-foot channel would be adequate for the present needs of the port, but that any lesser depth would be insufficient. He recommends such a channel, with a bottom width of 150 feet, suitably widened at a bend, at an estimated cost of $70,000. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district engineer

After due consideration of the above-mentioned reports, I concur in the views of the district engineer and the Board of Engineers for Rivers and Harbors. Olympia is the center of a large and growing lumber industry, much of the products of which seek shipment by water. Extensive use is being made of the channels already provided, but the limited depths make it exceedingly difficult, if not impossible, to build up a thriving traffic in ocean-going vessels. The provision of a suitable channel should result in a large movement to and from the port of commodities which must now be transshipped elsewhere and handled to or from Olympia by rail or barge at additional expense. The port has displayed commendable enterprise in providing terminal developments, and in connection with these has undertaken dredging in the inner harbor which facilitates the task of furnishing a suitable approach channel. The large range of tide at Olympia makes it unnecessary at the present time to provide a greater depth than 22 feet, which, as shown by the district engineer, would furnish satisfactory access for any vessel likely to call at the port in the near future. I therefore report that modification of the existing project for Olympia Harbor, Wash., is deemed advisable to the extent of providing a channel 22 feet deep at mean lower low water, and 150 feet wide, suitably widened at the bend, from deep water in the outer harbor to a point opposite the entrance to the so-called "west side waterway," in general along the lines proposed by the district engineer, at an estimated cost of $70,000, with $2,000, annually for maintenance. The entire amount of the estimated first cost should be made available in the initial appropriation.

TOLOVANA RIVER, ALASKA

The Tolovana River drains part of the area between the Yukon and Tanana Rivers, and flows into the latter about 120 miles below Fairbanks. There is no Federal project for its improvement. The river is navigable for small boats from the mouth to Trappers Cabin, a distance of about 157 miles, except at a log jam about 120 miles from the mouth, which blocks through navigation. Above this

obstruction there are many snags in the stream, and below it an old beaver dam and a rock slide partially close the channel.

Local interests desire a cleared channel below the log jam as part of a through summer route to Livingood, a mining center lying about 13 miles morth of Trappers Cabin, which produces about $200,000 worth of gold annually. In winter a sled road supplies necessary communication with this community. The present summer route, which, due to the impassability of the roads, is necessarily by the Tolovana, is less satisfactory. Transfer of freight between vessel and tramroad at each end of the log jam and again at Trappers Cabin results in delays and high rates.

The Alaska Road Commission has arranged to construct a through tramroad between Livingood and the log jam, provided the river below the latter point is improved. It expects that this water and rail route will result in reducing the cost of moving freight between Nenana, on the Tanana River, and Livingood, from the present rate of $140 per ton to $60. The district engineer gives as a minimum 200 tons of summer freight, the annual saving on which would be $16,000. Adequate water facilities can in his opinion be provided by widening the channel an additional 10 feet at the rock slide and cutting a 30-foot channel through the old beaver dam, with a depth of 4 feet at both places, at an estimated cost of $29,000 with nominal maintenance. He considers the work justified by the great need of an isolated country for dependable transportation, the resulting stimulation of its development, and by the extensive cooperation of the Territory in its proposed purchase and operation of the tramway.

This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, agreeing with the district engineer.

After due consideration of the information presented, I concur in the views of the district engineer and the Board of Engineers for Rivers and Harbors. The full possibilities of Alaska can be made of value to the country only by the provision of dependable transportation facilities. The Alaskan Railroad, which has been built by the United States to aid in this development, now connects points on the Tanana River with the coast. The improvement of Tolovana River in connection with the territorial tramroad will give access to a considerable area and induce development of the natural resources. In view of the cooperation proposed by the Alaska Road Commission, which removes the objection on which the unfavorable report of 1918 was based, I am constrained to reverse the previous recommendation printed in House Document No. 1065, Sixty-fifth Congress, second session. I therefore report that Tolovana River, Alaska, is deemed worthy of improvement by the United States from its mouth to the log jam by snagging, and by widening the channel at the rock slide and the beaver dam and providing at both places a depth of 4 feet at low water, at an estimated cost of $29,000, with nominal maintenance provided satisfactory assurances are given that the Alaska Road Commission will provide and operate a public tram from the lower end of the log jam to Livingood.

KAHULUI HARBOR, HAWAII

Kahului Harbor is the principal port of the island of Maui. It has been improved by the United States under a project providing for two converging breakwaters, and for dredging an area in the lee of the east breakwater to a depth of 35 feet at mean lower low water. The distance between the ends of the breakwaters is 1,600 feet. Range of tide between mean lower low water and mean higher high water is 2.4 feet. Request is made for extension of the breakwaters and for additional deep water in the harbor.

Maui is the second largest island of the Hawaiian group. Its present population is estimated at 43,500. The principal products of the island are sugar and pineapples, the production of which is considerable and is increasing. Most of the island's commerce is handled through Kahului, which is the only improved port. Its traffic for the 10 years previous to 1924 averaged 230,000 tons. In 1924 it was 304,000 tons, and estimates for 1925 indicate a further increase. Of the 1924 commerce, 90 per cent was trans-Pacific, the remainder being interisland.

Local interests and the Territorial government have spent to date $1,290,000 for dredging in the harbor, for breakwater work undertaken before the commencement of Federal improvement, and for terminals. Terminal facilities include one thoroughly modern wharf with railroad connections, transit sheds and mechanical handling facilities. The Territory has appropriated $600,000 for another terminal unit, and plans have been made for further work at an additional cost of $750,000.

The area of the harbor, and the distance from the entrance to the terminals are very limited. The harbor entrance faces north from which direction at certain seasons heavy seas enter the harbor, and create considerable disturbance within, making it difficult to maneuver vessels. When, in 1910, the investigation was made which resulted in the construction of the present east breakwater, the Board of Engineers for Rivers and Harbors expressed the belief that further extension of the breakwater would probably be desirable, but preferred in the interest of economy to build it only to the present point, additional work to be postponed until experience had demonstrated its necessity. The west breakwater was subsequently built with its end opposite that of the east breakwater.

During the winter of 1924–25 the district engineer kept a careful record of conditions in the harbor. He reports that the weather was more favorable than is usual at that season, but that nevertheless there were a number of cases where steamers were unable to enter the harbor, or could not remain moored to the Territorial wharf or make use of the handling facilities, or where a dredge operating in the harbor was damaged or unable to work. These conditions were directly attributable to wave action caused by the excessive width of the opening between the ends of the breakwaters. It is estimated that the losses during the winter arising from this cause were $40,000, exclusive of indirect losses resulting from the lack of safety and facility in handling shipping.

The district engineer points out that each of the four principal islands of the Hawaiian group has one harbor improved at Federal expense. The expenditure which the United States had made, or

to which it is committed, by the existing project at Kahului is $783,000. At the harbors of Hilo, Honolulu, and Nawiliwili, on the other three major islands, the corresponding figures vary from $2,144,000 to $3,808,000. The expenditures at Kahului have thus been far less than those at the major harbors for the other three large islands, in spite of the fact that weather conditions at Kahului are peculiarly unfavorable, and that its commerce is practically equal to that of Hilo and much greater than that of any other Hawaiian port except Honolulu. The district engineer believes that further improvement is justified. He considers three alternative plans for further improvement. The one he prefers is an extension of the breakwaters along their present axes so as to leave an entrance channel 600 feet wide; together with an increase of the dredged area within the harbor, as shown on the attached map, to facilitate the maneuvering of vessels and provide additional anchorage which is much needed when no berthing space is available. The estimated cost of the work is $1,270,000, with $10,000 annually for maintenance. The division engineer concurs.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith agreeing with the district and division engineers.

After due consideration of the above-mentioned reports, I concur in the views of the district and division engineers and the Board of Engineers for Rivers and Harbors. It is considered proper that the United States should furnish an adequate harbor, suitably protected, at each of the major islands of the Hawaiian group. This policy has been followed in the case of the islands of Hawaii, Oahu, and Kanai. In the case of Maui, it was deemed advisable to undertake initially an improvement on a rather limited scale, which it was hoped might prove adequate for the needs of commerce, though doubt was expressed at the time by the department as to whether this would prove to be the case. Subsequent developments have clearly shown that an extension of the breakwaters is necessary to provide a safe and adequate harbor. The cost of doing this, added to expenditures already authorized, will still leave the total cost to the United States of the Kahului improvement less than that of the other ports in question; and the existing and prospective commerce, and the benefits which will result to this commerce, amply justify the work. I therefore report that modification of the project for the improvement of Kahului Harbor, Hawaii, is deemed advisable by extension of the breakwaters along their present axes so as to leave a clear opening 600 feet at the entrance, and by dredging to a depth of 35 feet at mean lower low water within the area ABCDE shown on the attached map, in general as proposed by the district engineer, at an estimated cost of $1,270,000, with $10,000 annually for maintenance. The initial appropriation should be $400,000, followed by two annual appropriations of approximately equal amounts.

PURCHASE OF THE CAPE COD CANAL PROPERTY

The first section of the bill provides for ratification by Congress of the contract or agreement dated July 29, 1921, executed by the Boston, Cape Cod & New York Canal Co., and which is printed in House Document No. 139, Sixty-seventh Congress, second session,

upon one condition, namely, that the canal company shall file with the Secretary of War its consent in writing that paragraph 8 of such contract be amended so as to eliminate all claims of any nature whatsoever it may have against the President, the Director General of Railroads, or the United States; and so as to eliminate any claims or demands the Director General of Railroads may have against the company growing out of Federal control. It is understood that the canal company now has a claim for compensation for the use of the canal during the period it was under Federal control, amounting to approximately $1,000,000. Under paragraph 8 of the contract above referred to the company, in the event of purchase by the Federal Government of the canal property, would still have the right to prosecute this claim. It is understood also that the Government has a claim against the canal company for "deferred maintenance" and for capital expenditures during the same period amounting to approximately $550,000. Under the terms of the bill both these claims, as well as all other claims that the canal company may have against the Government, are to be settled by waiver and release, as provided in a new paragraph of the contract to be substituted for the paragraph numbered 8 in the contract as originally drawn. Section b of the bill provides that the sum of $5,500,000 is authorized to be appropriated for the acquisition by purchase of the Cape Cod Canal and other property referred to in paragraph 1 of the contract. Section c provides that when certain certificates by the Secretary of War and the Attorney General have been filed to the effect that the necessary consent has been given to the modification of the contract provided in section 1 and that the title to the property has passed to the United States, the Secretary of the Treasury is authorized to pay at maturity the principal of the bonds referred to in the contract, and also all interest coupons thereon falling due after the passage of this act. The Secretary of the Treasury is also authorized to pay before maturity as provided in the contract, the face value of the bonds, amounting to $6,000,000, or any part thereof.

The committee held three hearings on this subject, printed records of which are available for the members. In this record there is reprinted the contract which it is proposed to ratify by this provision (Appendix D); letter from Hon. Herbert C. Hoover, Secretary of Commerce, and his testimony before the Committee on Interstate and Foreign Commerce in 1922; House Documents No. 1812, Sixty-fifth Congress, third session; No. 68, Sixty-sixth Congress, first session; and No. 139, Sixty-seventh Congress, second session, containing letters from the Secretaries of War, the Director General of Railroads, the Director General of the Budget (Hon. Charles G. Dawes), a list of the lands owned by the Cape Code Construction Co., and testimony of witnesses appearing at the hearings. The committee also considered testimony heretofore given before the Committee on Interstate and Foreign Commerce of the House and the Committee on Commerce of the Senate.

All the testimony adduced at these hearings strongly indorsed the proposed purchase and emphasized particularly the commercial importance of this new link in the chain of Atlantic intercoastal waterways. No opposition whatever to the proposed bill was voiced at these hearings.

Action by Congress authorizing the foregoing negotiations and contract is contained in the rivers and harbors act, approved August 8, 1917 (40 Stat. L. 250), in which the following provision is found:

Waterway connecting Buzzards Bay and Cape Cod Bay, Mass. The Secretary of War, the Secretary of the Navy, and the Secretary of Commerce are hereby authorized to examine and appraise the value of the works and franchises of the Cape Cod Canal, Mass., connecting Buzzards Bay and Cape Cod Bay, with reference to the advisability of the purchase of said canal by the United States and the construction over the route of the said canal of a free waterway, with or without a guard lock, and having a depth and capacity sufficient to accommodate the navigation interests that are affected thereby. This investigation shall be conducted under the direction of the Secretary of War and the supervision of the Chief of Engineers in the usual manner provided by law for making preliminary examinations and surveys, except that the Secretary of War shall call upon the Secretary of the Navy and the Secretary of Commerce for such data and evidence as these Secretaries may wish to have incorporated in the report of the survey; and further, that the final report of the investigation, with its conclusions upon probable cost and commercial advantages in military and naval uses of the said canal, shall be submitted to the Secretary of War, the Secretary of the Navy, and the Secretary of Commerce for their action before it is transmitted to Congress.

If the said Secretaries are all in favor of the acquisition of the said canal, the Secretary of War is hereby further authorized to enter into negotiations for its purchase, including all property, franchises, and appurtenances used or acquired for use in connection therewith or appertaining thereto; and he is further authorized, if in the judgment of the Secretary of War, the Secretary of the Navy, and the Secretary of Commerce the price for such canal is reasonable and satisfactory, to make contracts for the purchase of the same at the option of the United States, subject to future ratification and appropriation by the Congress; or in the event of the inability of the Secretary of War to make a satisfactory contract for the voluntary purchase of said Cape Cod Canal and its appurtenances, he is hereby authorized and directed, through the Attorney General, to institute and carry to completion proceedings for the condemnation of said canal and its appurtenances, the acceptance of the award in said proceedings to be subject to future ratification and appropriation by Congress. Such condemnation proceedings shall be instituted and conducted in, and jurisdiction of said proceedings is hereby given to, the District Court of the United States for the District of Massachusetts, substantially as provided in an act to authorize condemnation of lands for sites for public buildings and for other purposes, approved August 1, 1888, and the sum of $5,000 is hereby appropriated to pay the necessary costs thereof and expenses in connection therewith.

The Secretary of War is further authorized and directed to report the proceedings hereunder to Congress.

Under the foregoing authority an investigation was made of the so-called Cape Cod Canal property under the direction of the Secretary of War and the supervision of the Chief of Engineers, and a report made of the survey and investigation, with conclusions upon probable cost and commercial advantages and military and naval uses of said canal. The report indicated that the then Secretaries of War, Navy, and Commerce were all in favor of the acquisition of said canal, and thereupon negotiations were intered into with the officials of the canal company looking to the acquisition of this property by the Government. In the meantime a complete audit of the books of the Boston, Cape Cod & New York Canal Co. and the Cape Cod Construction Co., which latter company had done the actual work of construction, was made at the request of the Government by Messrs. Price, Waterhouse & Co., of New York. This audit was completed January 5, 1918. Negotiations for the purchase of the property by the Government resulted in an offer by the then Secretary of War, Hon. Newton D. Baker, of $8,250,000 for the purchase of the property. This offer was refused by the officials of the canal company and a counter proposition made of $13,000,000. On Januray 26, 1919, Mr. Baker notified

Mr. Wilson, the vice president of the canal company, that his offer previously made of $8,250,000 would not be increased, and stated that he was referring the entire matter to the Attorney General with a request that he act under the statute and start condemnation proceedings. Such condemnation proceedings were commenced by petition in the District Court of the United States for the District of Massachusetts on April 1, 1919. A jury trial was had and a verdict rendered by the jury November 18, 1919, of $16,801,201.11, from which was to be deducted $150,000, an amount found by the jury to be due the United States for "deferred maintenance," so called, consisting largely of dredging, etc., done by the United States while the canal was under Federal control. On writ of error the circuit court of appeals for the first district, on February 16, 1921, set aside the judgment of the district court based upon the verdict referred to and granted a new trial for errors in the admission of testimony and in the court's instructions. (Fed. Rep., vol. 271, p. 877.) Thereupon, the Secretaries of War, Navy, and Commerce opened negotiations for a compromise, which resulted in the agreement between the Secretary of War and the Boston, Cape Cod & New York Canal Co. of July 29, 1921, whereby the price agreed upon for the purchase of the canal company's property, including 932 acres of land outside the canal's location and not included in Secretary Baker's offer, was $11,500,000.

The canal was under Federal control and in the possession of the Government at the time condemnation proceedings were begun. It had been taken over on July 25, 1918, by proclamation of the President issued July 22, 1918 (40 Stat. L. 1808). This action of the President was taken under authority of a provision in section 1, Army appropriation act, approved August 29, 1916 (39 Stat. L. 645). The canal property remained under Federal control until March 1, 1920, when it was sought by the Government to return it to its owners. This action was resisted by the officials of the canal company, who took the position (1) that institution of condemnation proceedings in the Federal court at a time when the property was already in the possession of the Federal Government constituted in law a "taking" of the property by the Federal Government; and (2) that there was no provision in the law under which the canal property was taken over or in the proclamation of the President by which it was to be returned to its owners. An arrangement was finally made by which the canal was operated by the general manager of the Cape Cod Canal, Capt. H. L. Colbeth, "for whom it might concern." This status continued from March 1, 1920, to July 29, 1921, the date of the contract or agreement between the canal company and the Secretary of War, ratification of which is asked for by this bill. Since July 29, 1921, the company has been operating the canal in accordance with paragraph 4 of said contract.

The question of constructing a canal between Cape Cod Bay (Massachusetts Bay) and Buzzards Bay has been considered at various times since the early history of the Plymouth Colony. In 1776 General Washington, recognizing the military value of a canal at this point, ordered his engineer, Thomas Machin, to investigate the locality in order, as stated, "to give greater security to navigation and against the enemy." The general interest felt in a canal to cross the narrow isthmus between Cape Cod Bay and Buzzards Bay,

extending over the entire period of the existence of the United States as a Government, is shown from the following chronological table:

1791: John Hills and James Winthrop make survey.
1798: James Sullivan and others petition legislature to build.
1803: Committee appointed by legislature to interest people in project.
1808: Gallatin, Secretary of Treasury, advocated it as "useful in time of war."
1812: Isthmus used by small boats to avoid capture by enemy.
1818: Israel Thorndyke and Thomas H. Perkins employed Loammi Baldwin to survey route; 5,000 ships rounding cape; United States Senate made survey for a canal sufficient to admit vessels of war.
1824: United States, under resolution of Senator Lloyd, ordered Major Perault to make survey; various Army officers reported route practicable.
1825: Further surveys made under Government orders until 1827.
1828: Government board reports on canal 36 feet wide, 8 feet deep, to cost $669,522.
1844: Lieut. G. S. Blake, United States Navy; survey.
1860: Renewed interest by Massachusetts and Government. Surveys by Brig. Gen. J. G. Totten; Prof. A. D. Bache, Superintendent Coast and Geodetic Survey; Commander C. H. Davis, United States Navy; and Lieut J. Wilkinson, United States Navy. Report on 18-foot canal to cost $10,000,000.
1870: Charter to Cape Cod Ship Canal Co. to Alpheus A. Hardy and others; Maj. Gen. J. G. Foster, United States Army, examining route under orders, reports on practicability of 23-foot canal without locks.
1880: Charter granted to Cape Cod Canal Co.; Henry M. Whitney and others interested; some work done but project abandoned.
1882: Gen. G. K. Warren, United States Army, Engineers, reports to Government on canal and cost of approaches.

Subsequent to the latter date various companies were formed for the construction of this canal; but no action resulted until June 1, 1899, when a charter was granted by the Commonwealth of Massachusetts to DeWitt C. Flannigan and others under the name of Boston, Cape Cod & New York Canal Co. (Ch. 448, Laws of Massachusetts, 1899, as amended July 17, 1900.) This charter is perpetual, except only as the right is reserved by the State after 20 years from the date of opening the canal to acquire by purchase all of the property of the canal by paying therefor such sum as will reimburse it for the amount of capital paid in with a net profit thereon of 10 per cent a year from the time of the payment thereof by the stockholders. The cost of the work was fixed by the railroad commission of Massachusetts, after submission to public letting, at $12,000,000. The charter gives the company the right to charge and collect tolls, build and operate wharves, and do other business in connection with the operation of the canal. It provides that the canal shall be constructed at a minimum depth at mean low water of 25 feet and a minimum width on the bottom of 100 feet.

8. February 6, 1907, bids were invited for the work of constructing the canal. The Cape Cod Construction Co. being the lowest bidder, the contract was entered into with this company on March 27, 1907. May 21, 1907, the joint board for the State of Massachusetts approved the plan of the location and the plan for the construction. Actual work was begun on June 19, 1909. The work of construction was performed under supervision of the Joint Board of Railroad and Harbor Commissioners of Massachusetts. Every dollar of expenditure passed under the scrutiny of this board. The canal was opened for traffic for vessels drawing not over 12 feet July 30, 1914. September 15, 1914, vessels of 15 feet draft were allowed to pass through; in April, 1915, vessels of 18 feet draft; on October 1, 1915, vessels of 20 feet draft; May, 1916, the full depth of 25 feet was attained.

There were certain conditions in the charter still to be performed, and it was not until January 25, 1918, that the Waterways and Public Lands Commission of the State of Massachusetts declared the canal completed in substantial accord with the provisions of the charter.

The following is a description of the canal and its engineering features:

Length of breakwater in Cape Cod Bay	feet	3,000
Length of canal	miles	8
Depth at mean low water	feet	25
Depth at mean high water at east end, or Cape Cod Bay	do	35
Depth at mean high water at west end, or Buzzards Bay	do	30
Bottom width, Cape Cod Bay approach	do	300
Bottom width, 1,500 feet at easterly end of canal	do	300
Bottom width, next 5,000 feet	do	200
Bottom width to Buzzards Bay railroad bridge (about 6 miles)	do	100
Bottom width, Buzzards Bay railroad bridge westerly for 2,000 feet	do	150
Steepest side slope, 1 vertical on 2 horizontal.		
Highway bridge over canal at Sagamore from easterly end	do	2.25
Highway bridge over canal at Bourne from Sagamore bridge	do	4.25
Railroad bridge over canal at Buzzards Bay station from Bourne bridge	do	.75
Distance of railroad bridge from western entrance of the canal	do	.75
The clearance between the fenders of all bridges is	do	140
The clearance from extreme high water to underside of—		
Sagamore bridge	do	30
Bourne bridge	do	30
Buzzards Bay railroad bridge	do	2.5

White electric lights on poles, opposite one another, placed at high-water mark, every 500 feet apart through the canal.

Mooring piles at each end of the canal and on both sides of the three bridges.

Distance saved by canal route over route around cape, 66 miles.

The canal runs through the 8-mile shoulder of "the bare, bended arm of Massachusetts," through a natural valley from Buzzards Bay to Barnstable Bay.

15,000,000 cubic yards of material were excavated.

700 boulders, weighing, in the aggregate, 3,500 tons, were removed.

326,456 tons of stone were placed in the 3,000-foot breakwater at the eastern end of canal.

9,192 tons of stone were placed in a smaller 1,000-foot breakwater at the eastern end of the canal south of the entrance. This breakwater was constructed to prevent the sand from the bay drifting into the canal.

144,397 tons of stone were placed on the banks of canal from 6 feet below low water to 6 feet above high water, for slope protection.

A 5-mile approach channel in Buzzards Bay, from Wings Neck to the western entrance of canal, was dredged. This channel is in Government waters.

The highway bridges were placed across the canal. These are the Sherzer double-lift steel bridges.

One double-track railroad bridge of the Bascule type enables the New Haven Road to cross the canal at Buzzards Bay.

6.3 miles of single track was laid, and 1.2 miles of side track, due to the relocation o fthe New Haven Road.

4.4 miles of new highways were made to connect the roads.

In its present condition the canal is not capable of rendering maximum service. It should be deepened and widened. The evidence shows that a considerable proportion of the traffic now going around the cape would unquestionably use the canal if this improvement was made. Indeed, it appears probable that practically all the big lines, like the Mallory, the Clyde, and the Merchants & Miners' Transportation Co., would send their boats through the canal, thereby saving a substantial amount both of time and of money if the recommendations of the Chief of Engineers and of substantially all of the

experts who have examined this waterway were carried out. These recommendations involve deepening the canal from 25 to 35 feet and increasing its width at the bottom from a minimum of 100 feet to a minimum of 200 feet. This result would more certainly follow if in addition to the improvements referred to the canal were operated free from toll charges. The cost of making the improvements above referred to under present conditions is estimated by Col. Edward Burr, of the Corps of Engineers of the War Department, at $9,800,000, or approximately $10,000,000, on the assumption that the canal would be closed to traffic while the work was being done; and $11,500,000 on the assumption that the canal is left open to traffic while the work is being done. Colonel Burr also testified that the estimated cost of constructing from the beginning a canal in this locality without locks, 35 feet deep at mean low water and 200 feet wide at the bottom, based on general and contract prices existing at this time, is $24,500,000.

Captain Colbeth, general manager of the canal company, gave the following statistics showing the traffic using the canal each year since it was opened:

Year	Number of vessels	Gross tons	Year	Number of vessels	Gross tons
1914 (canal opened July 29)	582	62,787	1919	7,452	5,172,714
1915	2,689	746,238	1920	8,140	4,707,735
1916	4,635	3,619,883	1921	7,013	4,215,696
1917	3,330	2,641,091	1922	7,180	4,093,773
1918	4,738	3,665,504	1923	6,771	4,051,869

Toll charges in the canal, which were not changed during the period of Federal control, vary from 3 cents a gross ton applying to bulk cargo carrying vessels, as for instance vessels in the coal trade, to 10 cents a gross ton, applying to passenger steamers of the type operated by the eastern steamship lines. Extensive studies made by Mr. Robert A. Lesher, a transportation and traffic expert of wide experience, who at the request of the War Department had occupied a period of about one year with a number of assistants in surveying the entire field of commercial statistics as found in Government records and many private corporate enterprises, apparently established the following facts:

(1) Vessels will save some considerable distance by using this canal from a point as far south and east as the mouth of the Amazon River on the northern coast of South America; also as far north as the mouth of the St. Lawrence.

(2) The main function of this canal is to handle traffic on the Atlantic seaboard. Coal is the principal commodity moved and originates in the American South Atlantic fields, leaving tidewater principally at Norfolk, Baltimore, Philadelphia, and New York, proceeding north for the most part, but principally to Boston, much of it being then distributed to other New England points north of Cape Cod. General merchandise, stone, petroleum and its products, lime, fertilizer, lumber, cement, sand, and cotton also appear in substantial quantities in the traffic using this canal. It is therefore a utility extremely vital to the commerce and the welfare not only

of New England and of the Atlantic seaboard but of the entire country.

(3) The total traffic in 1920 that passed Cape Cod was 22,718,971 gross tons. The number of voyages was 16,978.

(4) Of this total of 22,718,971 gross tons, there passed through the canal 4,707,735 gross tons, or 20.8 per cent. These figures include a number of cruisers, torpedo-boat destroyers, and submarines, but this is a very negligible proportion of the total.

(5) The amount of gross tonnage the draft of which is such that it could use the canal but did not use it in 1920 is 10,949,168, or 48.9 per cent of the total. This represents 7,479 voyages.

(6) In 1920 there were 7,061,888 gross tons that had to take the outside route around the cape. This was 31 per cent of the total The number of voyages was 1,359.

(7) The probable increase of traffic passing Cape Cod either going around the cape or going through the canal for the decade between 1920 and 1930 will be approximately 21 per cent and for the succeeding decade 18 per cent. Applying these percentages, the probable traffic passing Cape Cod in 1930 will be between thirty and thirty-five million gross tons and in 1940 between thirty-five and forty million gross tons. These estimates are based upon statistics covering growth of population and production in New England over a period as far back as 1890, but principally for the years between 1897 and 1916, inclusive.

During the year 1920—

1,913,196 tons of cargo passed through the canal; the estimated value of this cargo is	$303, 421, 328
The estimated value of the 4,707,735 tons of vessels which passed through is	616, 132, 575
Total	919, 553, 903

During the year 1921—

The estimated value of the 1,372,875 tons of cargo on board vessels passing through the canal was	$307, 128, 688
The estimated value of 4,215,696 gross tons of vessels was	478, 748, 840
Making a total of	785, 877, 528

During the year 1922—

1,238,712 tons of cargo passed through the canal; the estimated value of this cargo is	386, 453, 727
The estimated value of 4,093,773 tons of vessels which passed through is	742, 625, 450
Making a total of	1, 129, 079, 177

During the year 1923—

1,389,457 tons of cargo passed through the canal; the estimated value of this cargo is	432, 687, 787
The estimated value of the 4,051,869 tons of vessels which passed through is	789, 801, 540
Making a total of	1, 222, 489, 327

The number of passengers on vessels carried through the canal during the year 1920 was 119,088, during the year 1921, 112,731; during the year 1922, 113,318, and during the year 1923, 116,309. Following is a tabulation showing comparison of traffic, etc., between the Cape Cod and other canals during the early years of operation:

Comparative statistics covering general characteristics, number of vessels, and tonnage of vessels passing through five of the principal canals of the world

GENERAL CHARACTERISTICS

	Cape Cod Canal	Manchester Canal	Kiel Canal	Suez Canal	Panama Canal
Work begun	1909	1894, opened	1887	1869, completed	1904.
Original length	13 miles	35½ miles	61 miles	90 miles	44 miles.
Original depth	25 feet	26 feet	29½ feet	26 feet	41 feet.
Original width	100 feet	120 feet	72 feet	72 feet	300 feet.
Cubic yards excavated	16,000,000	45,000,000	100,000,000	80,000,000	195,323,379.
Original cost	$12,000,000	$75,000,000	$40,000,000	$95,000,000	$375,000,000.

NUMBER OF VESSELS WHICH PASSED THROUGH CANALS

First year of operation	[1] 582	[2] 4,551	[3] 16,834	[4] 10	[5] 1,088
Second year of operation	2,689	4,761	19,960	486	787
Third year of operation	4,635	5,156	23,108	765	1,876
Fourth year of operation	3,330	5,132	25,816	1,082	2,130
Fifth year of operation	4,738	5,809	26,279	1,173	2,107
Sixth year of operation	7,452	5,182	29,045	1,264	2,478
Seventh year of operation	8,140	5,362	30,161	1,494	2,892
Eighth year of operation	7,013	5,008	32,010	1,457	

TONNAGE OF VESSELS WHICH PASSED THROUGH CANALS

First year of operation	[1] 62,787	[2] 720,425	[3] 1,505,983	[4] 10,557	[5] 5,416,787
Second year of operation	746,238	879,204	1,848,458	654,915	3,595,529
Third year of operation	3,619,883	1,094,837	2,469,795	1,142,200	8,530,821
Fourth year of operation	2,641,091	1,139,733	3,117,840	1,744,481	9,371,339
Fifth year of operation	3,665,504	1,350,428	3,488,767	2,085,072	7,876,703
Sixth year of operation	5,172,714	1,395,702	4,282,094	2,423,672	11,057,819
Seventh year of operation	4,707,735	1,492,320	4,285,301	2,940,708	14,522,415
Eighth year of operation	4,215,696	1,454,999	4,573,834	3,072,107	

[1] 1914. [2] 1894. [3] 1896. [4] 1869. [5] 1915.

Owing to conditions incident to the World War, it is believed that the canal has never had a fair opportunity to demonstrate its real earning power. General operation of the canal began in 1916, but it was not officially declared to be completed in accordance with the terms of its charter until January 25, 1918. During this period practically everything that could sail in deep water was engaged in trans-Atlantic service. Six months after completion it was taken over by the Federal Government. Just prior to its being taken over its toll charges upon coal were reduced. This was done at the suggestion of the Director General of Railroads. Very substantial increases in operating expenses were imposed upon this property during the 20 months it was under Federal control and yet no increase in any toll charges was made during this period. To cite a single example, it was thought necessary to engage in certain extensive dredging operations in the canal and its approaches. A large dredging machine was leased for this purpose at a rental of $1,000 per day. It took 40 days to make repairs upon this machine before it was ready to begin operations. The cost of these repairs amounted to $67,000, which added to the rental of $40,000 made a total cost of $107,000 on account of this dredging machine before it was able to do any work at all. This entire cost was charged up as a part of the operating expense of the canal property during Federal control and forms a part of the claim of the Government for "deferred maintenance," heretofore referred to. Exhibit 1, appended hereto, shows that both

before and after the period of Federal control the canal, with the exception of the first year of its operation, was yielding a revenue more than sufficient to pay all of its operating expenses. Evidence before the committee seemed to establish the fact that during the first six months of the year 1918, prior to taking over this canal by the Federal Government, it had been receiving revenue at a rate sufficient to pay all its operating expenses and fixed charges.

During the period between March 1, 1920, and July 29, 1921, when the canal, was being operated by Mr. Colbeth "for whom it might concern," it yielded a revenue sufficient to pay all operating costs and maintenance charges and had in the Treasury at the end of this period a surplus of approximately $200,000. Evidence of present earning capacity of the canal was to the effect that sufficient revenue is being produced from tolls at the present time to meet all operating costs and maintenance charges. By paragraph 4 of its contract with the Secretary of War the company has guaranteed that it will operate the canal until the agreement is ratified and title passes to the United States; also that it will pay all operating and maintenance expenses arising after the date of the contract, interest accruing thereafter, administration charges arising thereafter, and leave a balance in the company's treasury from revenues received by it subsequent to the date of the contract which balance it will turn over to the United States at the time title passes amounting to at least $100,000.

The cost of constructing the Cape Cod Canal is stated in the report of Messrs. Price, Waterhouse & Co., international chartered accountants, who were specially engaged by the United States Army engineers to make a complete examination of the accounts of the Boston, Cape Cod & New York Canal Co. and the Cape Cod Construction Co. They reported the combined expenditures of both companies to August 31, 1917, as follows:

Cash expenditures for direct and overhead costs	$8, 265, 743. 04
Payments with securities in lieu of cash for engineering and other services	400, 000. 00
Payments with securities for franchise rights and 70 per cent of land required for right of way	1, 660, 000. 00
Cost of providing capital to proceed with work and to complete construction of canal	1, 006, 250. 00
Expenditure of working capital in development up to Aug. 31, 1917	1, 527, 198. 42
Contingencies as of Aug. 31, 1917	806, 887. 04
Sundry working assets	97, 526. 85
Total investment on Aug. 31, 1917	13, 763, 605. 35

From August 31, 1917, to the present time the companies have had the burden of carrying the property during the war, and as no compensation for the use of the property for the 20 months while under the United States Railroad Administration has been paid or allowed, the additional cost to the companies has been $1,616,590.39, making a total of $15,380,195.74, and it is estimated that the cost of the proceedings to the company for the condemnation of the property, including services of its attorneys and other legal obligations, amount to at the present time $750,000, making a grand total cost at the present time of $16,130,195.74. Evidence before the committee shows that in addition to the six million first-mortgage bonds, its present cash obligations aggregate $8,500,000, so that the actual loss

to the company under the terms of the proposed purchase will be approximately $3,000,000. (The statement in this paragraph was made as applying at the time of the hearings in the early part of 1922, and is substantially correct at the present time.)

The strategic importance of this canal from a military and naval standpoint has been emphazised by Maj. Gen. William M. Black, Chief of Army Engineers, in his report to be found in the hearings; also in testimony of Hon. John W. Weeks, Secretary of War, and Hon. Edwin Denby, Secretary of the Navy. Perhaps no stronger argument of the importance of the canal from the standpoint of national defense can be urged than the fact that the next day after a German submarine appeared off the coast of Cape Cod and shelled a tug and coal barges, the President of the United States by special proclamation dated July 22, 1918, took over the control and operation of this waterway from and after July 25, 1918, placing it under the jurisdiction and control of the Director General of Railroads. In this proclamation the President used the following language in the preamble:

> Whereas it has now become necessary in the national defense to take possession and assume control.

During this menace from the German submarine the port of Boston was closed, and only vessels routed via the Cape Cod Canal were permitted to leave port.

The maintenance of the Cape Cod Canal is also of prime importance from a humanitarian standpoint. There is probably no place on the whole coast line more to be dreaded by the mariner than Cape Cod on account of the frequent storms, winds, strong currents, shoals, and the prevalence of thick fogs. It is one of the most treacherous places in the world. Ships not passing through the canal are frequently tied up in Vineyard Haven and other harbors anywhere from one day to two weeks, lying at anchor waiting for a chance to get over the shoals. The records show over 1,000 marine disasters to ships and boats going around the cape between 1880 and 1903. It also appears in evidence that from July 1, 1907, to June 30, 1917, a period of 10 years, casualties to vessels passing Cape Cod, including Nantucket Shoals, Nantucket Sound, Marthas Vineyard, and Vineyard Sound, involved vessels to the number of 326 of a total tonnage of 190,105 and of property valued at $12,761,920. Of this total property involved $1,653,770 in value was lost. During the same period the lives of 3,900 persons on board these vessels were also involved, of which the records show that 32 were lost. The Government of the United States has long recognized the extreme danger to navigation in this locality. For many years it has maintained 13 life-saving stations between Monomy Bay and Wood End, Cape Cod, a distance of about 40 miles. During the fiscal year ended June 30, 1920, the assistance rendered by United States Coast Guard cutters and stations from Callyhunk to Provincetown involved the saving of life and property, and shows the value of vessels in jeopardy at $16,477,000.

From the testimony taken by the committee it is apparent that this canal is of paramount value to the shipping interests not only of the Atlantic and Gulf coasts but also of the Pacific, whose use of this waterway is now made possible by the successful operation of the Panama Canal.

Considering all the investigations as to value, including original and reproduction costs and allowing for abnormal conditions existing during the period of the World War, the lack of opportunity for the canal to demonstrate its full earning capacity, the great amount of traffic, actual and potential, the very large value of the canal from the standpoint of national defense as well as from an economic and humanitarian standpoint, as a safeguard against the perils of the sea, your committee believes that the purchase of the waterway at a price of $11,500,000, as provided in the contract hereinbefore referred to, is clearly in the public interest, and that the agreement entered into by the Secretary of War on behalf of the Government should be ratified by the Congress of the United States.

Table showing the estimated cost of the projects herein adopted:

Thames River, Conn	$350, 000
Waterway connecting Gravesend Bay with Jamaica Bay	2, 000, 000
Great Kills, Staten Island, N. Y	62, 000
Passaic River, N. J	858, 000
Appomatox River, Va., up to Petersburg	91, 000
Channel from Old Point to Newport News, Va	714, 000
Shallotte River, N. C	7, 000
Neuse and Trent Rivers, N. C	50, 000
Charleston Harbor and Cooper River, S. C	314, 000
Savannah Harbor, Ga	1, 510, 000
Apalachicola Bay, Fla. (modification).	
Amite River and Bayou Manchac, La	5, 000
Bayou Bonfouca, La	16, 500
Mississippi River, La., between Baton Rouge and New Orleans (modification).	
Intracoastal waterway from the Mississippi River at or near New Orleans, La., to Corpus Christi, Tex	7, 000, 000
Sabine-Neches waterway, Texas	654, 000
Rock Island and Moline Harbors, Ill	40, 000
Mill Creek and South Slough, at Milan, Ill	67, 000
Ohio River ice piers	110, 000
Youghiogheny River, Pa	35, 000
Duluth-Superior Harbor, Minn. and Wis	8, 000
Illinois River, Ill	1, 350, 000
St. Marys River, Mich	4, 921, 000
Buffalo Harbor, N. Y	22, 000
San Joaquin River and Stockton Channel, Calif	2, 407, 500
Sacramento River, Calif	161, 000
Pinole Shoal and Mare Island Channel, Calif	480, 000
Feather River, Calif	10, 000
San Francisco Harbor, Calif	146, 000
Umpqua Harbor and River, Oreg	700, 000
Olympia Harbor, Wash	70, 000
Tolovano River, Alaska	29, 000
Kahului Harbor, Hawaii	1, 270, 000
Cape Cod Canal	11, 500, 000
Combined navigation and water power surveys under section 7	500, 000
Total	37, 558, 000
Reduction in cost of completing project heretofore adopted for Charleston Harbor, S. C., by the modification authorized herein	4, 000, 000
Total	33, 558, 000

MODIFICATION OF PROJECT FOR THE INLAND WATERWAY FROM DELAWARE RIVER TO CHESAPEAKE BAY

When this waterway was purchased by the Government, there were a number of bridges across it which had been built prior to the time the canal was acquired. The enlargement of the canal under the

project adopted involved the reconstruction of those bridges. It devolved upon the United States to reconstruct the bridges, because the United States was the encroaching party. One bridge near the western end of the waterway (known as the pivot bridge) remains to be constructed. The War Department has, however, made an agreement with the county authorities whereby the United States is to construct the roadways from Chesapeake City to the Bethel Road, and from Back Creek to Bethel, the bridge across Back Creek, and the construction and maintenance of a ferry across the waterway, provided that the proper authorities of the State of Maryland, and of Cecil County, in said State, shall release the United States from all obligations to reconstruct the pivot bridge. The estimated cost of reconstructing this bridge (which would have to be a bascule bridge) is $279,000, and its maintenance cost is estimated at from $7,500 to $10,000 per year. The estimated cost of constructing the roads, small bridge, and the ferry is $185,000. The annual cost to the United States for operating and maintaining the ferry is estimated at around $4,000. In addition to the saving accruing to the United States by this agreement, the fact that the bridge will not be constructed will be of benefit to navigation, to which bridges across navigable waterways are all more or less obstructions. When the roads are constructed, they will be turned over to the county and the United States will be relieved of any obligation as to maintaining them.

EMPLOYMENT OF EXPERTS IN THE SEVERAL ARTS AND SCIENCES

It has been the practice for many years, in connection with river and harbor work, and work incidental thereto, such as the construction of particular types of bridges and hydroelectric developments, to employ experts who are in civil life. This was done recently in connection with the construction of four bascule bridges over the Chesapeake & Delaware Canal. The cost of the bridges was around $1,200,000. The department agreed to pay the consulting engineer employed the sum of $20,000 for his services. The Comptroller General would not allow the payment of this sum to be made. Bridges of this type are very seldom constructed by the department and the Chief of Engineers testified that it would take two years to organize a force to do such work, and that the designing of such a bridge by an inexperienced engineer would add 10 per cent to the cost of the construction. The committee is unanimous in the belief that this claim should be allowed, and that the department, when technical and expert questions in engineering arise, as they necessarily will from time to time, should have the authority to employ experts and specialists in such matters.

PURCHASE OF PERSONAL EQUIPMENT FOR EMPLOYEES

This provision authorizes the Chief of Engineers, in prosecuting river and harbor projects, to purchase such personal equipment for employees as, in his opinion, are essential for the efficient prosecution of the works.

It has been the practice of the department and has been the practice with all contractors to provide for special work which requires the use of rubber boots, oilskins or slickers, and hats. In the work

on the Mississippi River, in sinking mattresses, it becomes absolutely necessary that the employees have boots, as, when the mattresses go down, the employees have to wade in water up to their knees, and they will not work under those conditions unless they are supplied with boots. The Comptroller General has ruled that these are articles of special equipment, and that the men shall buy them themselves. The Chief of Engineers testified before the committee that the class of labor secured for doing this work is indifferent; that they will not work unless boots are furnished them by the Government, and that unless this provision is adopted it will be impossible to secure men to do such work. The boots are only used occasionally by the men, are returned to the Government after each day's use, and remain the property of the Government until worn out. Disallowances have and are being made by the Comptroller General also against the purchase of slickers, oilskins, and waiters' aprons. It is the opinion of the Chief of Engineers that if the Government were to increase wages to cover the cost of these articles, the cost to the Government would be many times the expense which is entailed under the existing practice.

ALLOWING CREDIT TO DISBURSING OFFICERS FOR REIMBURSEMENT OF CERTAIN SUBSISTENCE EXPENSES

This provision provides that all payments heretofore made by disbursing officers of the Corps of Engineers, as reimbursement of subsistence expenses incurred on journeys on official business under proper orders, commencing after 8 o'clock a. m. and completed not later than 6 o'clock p. m. of any day, when said expenses are not in excess of those authorized by existing Army Regulations, shall be allowed and credited by the General Accounting Office.

SALE OF A PARCEL OF LAND TO THE TOWN OF WESTPORT, CONN.

Section 5 authorizes the sale by the Secretary of War of a parcel of land situated in the town of Westport to that town. It is the desire of the town of Westport to use this land for road purposes. A bill authorizing the sale of this parcel was referred to the Secretary of War, and the following is his report and recommendation thereon:

WAR DEPARTMENT,
Washington, February 3, 1926.

Hon. S. WALLACE DEMPSEY,
Chairman Committee on Rivers and Harbors,
House of Representatives.

MY DEAR MR. DEMPSEY: 1. I have the honor to reply to your letter dated January 20, 1926, requesting my views on House bill No. 7277, to authorize the sale of a parcel of land in the town of Westport, Conn.

2. In the act of Congress approved July 4, 1836, making appropriations for the improvement of certain harbors, provision was made for improving Westport Harbor agreeably to a plan which contemplated the cutting of a canal through what is locally known as "Great Marsh," to connect the Saugatuck River with Long Island Sound. The canal was dug during the years 1836–1838 and had a length of about 1,350 feet, a width of 68 feet, and a depth of 4 feet, being designed for the passage of small boats. In connection with this work a strip of marsh land about 1,350 feet long and 108 feet wide was acquired by purchase at a cost of $100, but title was not vested in the Government until 1841, subsequent to the completion of the canal. This is the land mentioned in the bill under consideration, and the location is shown on the accompanying map.

3. The canal appears to have been little used from the beginning, and in course of years filled up and deteriorated to such an extent that in 1873 it was reported as being practically dry at low water. During the more than 50 years since then no effort has been made to maintain it and at present the lower end is completely blocked with sand and débris. The restoration of the canal would serve no useful purpose, and no reason is seen for the Government's retaining ownership of land.

4. It is understood that the authorities of the town of Westport desire to improve and use the strip of land as a road to a shore development on Long Island Sound, and as this is a public purpose, it would seem appropriate to dispose of it to them. I therefore recommend favorable consideration of the bill.

Sincerely yours,

DWIGHT F. DAVIS, *Secretary of War.*

EXCHANGE OF GOVERNMENT LAND LOCATED AT LONG POINT, COINJOCK, N. C.

This provision authorizes the Department of Commerce to transfer a piece of land now under the Lighthouse Bureau to the War Department for use in connection with the inland waterway from Norfolk, Va., to Beaufort Inlet, N. C. In exchange the War Department is giving control to the Lighthouse Bureau of a small piece of a military reservation which is now occupied by the Lighthouse Establishment. The land is all owned by the Government and the exchange will be made by letters passing between the heads of the two departments.

GRANT OF RIGHT OF WAY OVER PUBLIC LANDS ON THE FOX RIVER TO THE CITY OF KAUKAUNA, WIS.

The provision authorizes the Secretary of War to grant to the city of Kaukauna an indeterminable easement for a right of way over public land located on the Fox River in this city. A bill authorizing this grant was referred to the Secretary of War for his views as to the advisability of enacting its provisions into law, and the following is his report and recommendation thereon:

WAR DEPARTMENT,
Washington, February 25, 1926.

Hon. S. WALLACE DEMPSEY,
Chairman Committee on Rivers and Harbors,
House of Representatives.

MY DEAR MR. DEMPSEY: I refer to your letter of the 8th instant, requesting the opinion of this department on the advisability of enacting House bill No. 8467, to authorize the Secretary of War to grant easements in and upon the public lands and properties at Canal Bridge, on the Fox River, in Kaukauna, Wis., to the city of Kaukauna for public-road purposes.

For many years in the past the city of Kaukauna has maintained a swing bridge across the United States canal along the Fox River, and a fixed bridge across the river itself, the two structures forming a part of a public highway. It becoming necessary to reconstruct the bridges at a slightly changed location, plans for their reconstruction were approved by the War Department September 4, 1924. Between the river and the canal is a strip of land about 50 feet wide, and between the canal and the nearest city street is a strip of the same width, both of which are owned by the United States. In order to connect the bridges with the public street system, it will be necessary to extend a street across these two strips of land, and the bill under consideration is intended to authorize the Secretary of War to grant the city a right of way for this purpose.

As such a grant would be of great benefit to the local public, and would not be prejudicial to any interest of the Government, I recommend favorable consideration of the bill.

Sincerely yours,

DWIGHT F. DAVIS, *Secretary of War.*

PRELIMINARY EXAMINATIONS AND SURVEY

Section 6 carries authorizations for 112 preliminary examinations and surveys. The committee endeavored to confine these authorizations to such localities as were prospectively valuable. The average number of similar items carried in the last 13 river and harbor acts was 157.

COMBINED NAVIGATION, WATER POWER, FLOOD CONTROL, AND IRRIGATION SURVEYS

Section 7 authorizes surveys to be made of certain streams enumerated in the bill with a view to the formulation of plans for the most effective improvement for the purposes of navigation, development of water power, control of floods, and the needs of irrigation, and limits the amount to be expended thereon to the sum of $500,000.

CONTROL OF FLOODS OF THE ILLINOIS RIVER

Section 8 authorizes the Secretary of War to allot from any funds hereafter appropriated for controlling the floods of the Mississippi River, and subject to the limitations proposed by the flood-control act approved May 1, 1917, such sums as he may deem equitable for the construction of flood-control works and levees upon any part of the Illinois River between its mouth and the mouth of the Des Plaines River in such manner as in his opinion shall best improve navigation and promote the interest of commerce and protect said levees at all stages of the river; and further provides that the funds so allotted shall be expended under the supervision of the Chief of Engineers.

REGULATIONS REGARDING THE ACCEPTANCE AND APPROVAL OF BIDS FOR LABOR AND MATERIALS

Section 9 provides that when bids are received by the Chief of Engineers in response to invitation by advertising or otherwise, subject to the right to reject any or all bids for reasons deemed by the purchasing or contracting officer to be sufficient, award shall be made to the lowest responsible bidder for the best and most suitable article, material, or service; that the determination by the purchasing or contracting officer as to the propriety of rejecting any or all bids, or as to what constitutes the most advantageous and acceptable bid or bids in any case, when heretofore or hereafter approved by the Chief of Engineers, either specifically or by the approval of the money accounts in which payments for the work, articles, materials, or services are included, shall be final and conclusive on the accounting officials of the Government.

MINORITY REPORT

The undersigned members of the Committee on Rivers and Harbors concur in the proposed bill as introduced, with the exception of two projects, as follows:

First, Illinois River (p. 6): The adoption of the project for the improvement of the Illinois River, based on the letter from the Chief of Engineers, transmitting a report of the Board of Engineers (Doc. No. 4 of the Rivers and Harbors Committee) involves the much controverted question of diversion or abstraction of water from Lake Michigan into the Mississippi River Basin through the Chicago Drainage Canal.

At the present time there are cases pending before the Supreme Court of the United States testing the question of whether or not diversion of water from one watershed into another watershed is lawful; testing the question of whether or not the Secretary of War has authority to grant diversion or abstraction from Lake Michigan to the Mississippi River watershed; testing the right of Congress to grant authority to divert or abstract water from Lake Michigan into the Mississippi watershed. In fact all of the basic legal questions involved in the ownership and control of the waters of the Great Lakes are raised and put squarely before the court of last resort for settlement.

To include the present project in this bill is unnecessary, since the proposed work of the Government can be done in two years, while that contemplated by the State of Illinois can not be done in less than three years. Congress can therefore very properly wait until the Supreme Court has decided the cases above referred to, which are set for hearing in the approaching October term of the Supreme

Court of the United States and presumably will have been decided before the next Congress is well under way with its legislative program, certainly before the next bill dealing with rivers and harbors can be considered in the House. To include this proposition in the present bill is entirely unnecessary and confuses the issue involved in the suits above referred to, which now present a simple question.

Congress will, if it adopts the project, approve the taking of water from the Great Lakes, to the great detriment of the shippers who use them, and divert it into another basin, ostensibly for the purpose of navigation, but really, so far as present use is concerned, for purposes of sanitation.

If the Supreme Court shall decide that there is a proprietary right to the water of this Great Lakes Basin in the States bordering thereon or in the Federal Government, and that Congress does not have the authority to divert water from one watershed to another, and in the meantime this Congress approves the engineers' report on the Illinois River project, the Congress will be spending money that can not possibly be of value. For in this report the engineers have specifically said that there is not sufficient water in the Illinois and Des Plaines Rivers to furnish navigation in these said rivers without additional water from Lake Michigan.

While the report of the engineers does not deal specifically with the amount of abstraction to be authorized at Chicago from the waters of Lake Michigan, and the engineers' report expressly says that the improvements recommended can be used with any diminishing flow, nevertheless the adoption of this project at this time will in fact be claimed to be a legislative recognition of the right long asserted by the State of Illinois to abstract water from Lake Michigan. The right claimed by the State of Illinois, and in her behalf, has varied from time to time. Engineers employed by the lower river interests have even gone so far as to assert that 45,000 cubic second-feet should be abstracted from the Great Lakes system to enrich the levels of the Mississippi. This abstraction would mean the lowering of the level of the Great Lakes about 27 inches, which added to the periodic drop in the Great Lakes would practically destroy the utility of every channel this Government has made in improving the Great Lakes. The State of Illinois, in its legislation creating the sanitary district, directed that district to increase the outflow from Lake Michigan in proportion to the increase of Chicago's population until an ultimate abstraction of 14,000 cubic second-feet had been reached. For a long period of years the city of Chicago, while claiming to operate under the authority of the order of the Secretary of War authorizing the diversion of 4,167 cubic second-feet, defiantly abstracted approximately 10,000 cubic second-feet, and until stopped by a decree of the Supreme Court at the end of a period of 12 years from the institution of the suit by the United States, both the sanitary district and the State of Illinois denied and defied the authority of the Government of the United States to place any limit on their abstraction of water from the Great Lakes system.

It is conceded by all parties that the diversion at Chicago has lowered the levels of the Lakes 6 inches. It is also conceded that this is at an annual cost to the shippers on these waters of at least $3,000,000.

The following statement was made by Congressman McLaughlin, of Michigan, who was authorized to speak for the entire delegation from that State:

> You have no idea of the damage to the Great Lakes, how the channels in innumerable harbors are shallow, making it difficult and dangerous, if not impossible, to get in and out of them. The docks and the wharves and the landing places are away up in the air, many of them have had to be reconstructed. Some of them are of no value whatever and can not be used, because they are so high above the water.

In Michigan there is not a holder of lake shore line who has not suffered in actual cash damages from the effects of the Illinois diversion. There is not one summer resort on the State's coast line which is not losing thousands of dollars because of the diversion and which is not spending thousands more to cope with it.

The waters have receded and left piers, wharves, and slips high and dry. Beaches have lost their value. Launches and yachts can no longer approach the shores. Even in the deeper shipping harbors the waters have gone down so far that only lightly loaded boats can efficiently dock. In many cases it has been necessary to do untold dredging.

At the present time the diverted water from Lake Michigan is used to dispose of the domestic and commercial sewage of Chicago and vicinity.

The report of the Chicago Sanitary District of December, 1923, on page 24, as shown in the testimony before the Committee on Rivers and Harbors of the House, page 439, says:

> The population which they should care for is 3,213,000 people; stockyard wastes equivalent to 1,030,000; corn products waste equivalent to 380,000; miscellaneous waste equivalent to 150,000 people, making a total of 4,773,000 people.

Thus, to state the proposition in concrete terms, one-third of the diversion of water out of Lake Michigan at Chicago is to take care of private commercial sewage that these big corporations in any other location would be required to dispose of at their own expense and in their own disposal plants.

Mr. Baker, the former Secretary of War, told the committee, and it was not disputed, that one-third of the water abstracted is used solely for the disposal of the refuse and sewage of the Chicago stockyards and the packing houses. On the basis of an abstraction of 10,000 cubic feet a second it appears, then, that considerably over 3,000 cubic feet would be for the sole advantage of these industries. In other words, on the basis of the Army engineers' own study and finding, the shippers of the Great Lakes would have to lose an extra million dollars; in fact, they are losing it now, on their own shipping in order to provide a sewer for the packing houses.

All of the estimates presented on behalf of the sanitary district in previous years have related to the amount required for sewerage purposes. It is now evident that the Illinois and Chicago representatives have suddenly become interested in navigation for the purpose of obtaining that same water for sewerage that they were unable to obtain for that purpose. In other words, they failed to get permission to take this water for the purpose of washing out the packing-house sewage, and now they are seeking it under the guise that it is

necessary to keep open navigation on a barge canal which will move only an amount of tonnage which is absolutely conjectural.

All this has been done in the interest of an archaic and improper method of sanitation for the city of Chicago; a method which merely carries the sewage of that city away from it to lay it in the front yard of others and spreads its destructive effect through the great valley of the Illinois. Whatever necessities there may be with regard to the sudden cessation of this abstraction at Chicago we may assume will be properly dealt with by the court. Clearly, Congress has no right to impair the navigability of the Great Lakes in the interest of Chicago's sanitation.

There is also involved in this legislation questions between this Government and that of Canada. Treaty rights are at issue, as well as property rights, and both are now pending negotiation.

The property rights involved in this diversion run into millions of dollars, far beyond the power of computation. The navigation rights involved in this diversion run into sums that are fabulous.

According to the latest statistics the amount of tonnage moved on the Great Lakes waterway system is 160 times as great as that on the Mississippi River, on either of the two divisions, that from the mouth of the Missouri to Cairo or that from the mouth of the Missouri to Minneapolis; and further the length of the haul on the Great Lakes is many times as great as on the Mississippi River. This shows the comparative importance for navigation of the two waterway systems.

We believe that the matter here involved is of tremendous importance to vast present and future interests. If the Supreme Court of the United States shall decide that the Congress has the power to authorize the transfer of water from the Great Lakes to the Mississippi Valley then Congress should face the exercise of that power in a solemn mood and should proceed upon complete inquiry to determine how far the improvement of the Illinois or any other stream would be profitable at the expense of diminishing the navigability of the Great Lakes. It should then set rigid and unescapable limits which would warn not Illinois only, but all other States not to project public works which depend upon the abstraction of lake waters in excess of the maximum determined by Congress to be available without prejudice to lake navigation.

By including this project in the present bill we are undermining the foundations of commerce on the Great Lakes. Should the bill pass in this form no State will know whether Congress means to maintain navigation on the Great Lakes in the highest form of efficiency or intends from time to time to nibble further into this foundation in the interest of scattered minor projects here and there throughout the country.

We believe that a project so controversial as the proposed improvement of the Illinois River, with its far-reaching implications as to policy and its possible use as a precedent for the further impairment of the navigable capacities of the Great Lakes should, if adopted at this time, be provided for in a separate bill, so that it could be considered on its own merits by the House of Representatives, unembarrassed by the natural interest which the entire House has in the continuance of the approved projects coverd by the general rivers and harbors bill.

We recognize in the Great Lakes the greatest inland waterways of the world; we believe the present industrial supremacy of the United States has been caused by, and will depend upon, the facilities that this system affords for the manufacture of iron and the transportation of the farm products of the Northwest cheaply to the seaboard; we can not believe that Congress would ever knowingly impair this most valuable national asset and we protest against this indirect assault upon the navigable capacity of the Great Lakes, both as a dangerous precedent and an unnecessary action to be taken at this time.

Therefore, for the above reasons, and others not herein set forth, such legislation is believed to be against the best interests of the people, contrary to public policy, and that the Chicago abstraction is without constitutional warrant.

Second, New York waterways (p. 21): The provision in the bill for an appropriation of $100,000, or any other sum, to the Board of Engineers for another survey of a route across the State of New York connecting Lake Erie and Lake Ontario with the Hudson River is unnecessary and unwaranted at this time.

In the syllabus of the report of the Board of Engineers for Rivers and Harbors, House Document No. 288, page 5, they say:

> On the basis of specific data now available it appears that the annual cost of the proposed waterway across New York would exceed the savings on freight which it is estimated would move on it * * * The board recommends that a project for such a waterway * * * be not adopted at this time.

In paragraph 4, House Document No. 288, page 6, the report further says:

> Routes along the general lines proposed have been investigated several times by the department; recent reports have been unfavorable.

In paragraph 20, House Document 288, page 11, the board says:

> The board further points out that when the report of the joint board of engineers on the St. Lawrence River becomes available, the technical, commercial, and other aspects of the two routes can be compared with and checked against each other; and the exceedingly important question of a deep-water connection between the Great Lakes and the seaboard can be given a fuller measure of consideration than it can now receive, due to the limited time available and the absence of data on the alternative St. Lawrence route.

The board then end their report (H. Doc. No. 288, p. 11) by saying:

> In compliance with the law, the board report that there are no questions of terminal facilities, water power, or other subjects which could be coordinated with the project proposed in such a manner as to make it evident that the improvement is advisable in the interests of commerce and navigation.

In House Document 288, page 3, paragraph 6, General Taylor says:

> Even without taking into consideration the last three items in the above table it seems that the annual charges for either a 20-foot or a 25-foot channel would not materially exceed the estimated annual savings. The special board therefore concludes that the project would be economically unsound and recommends against the construction of the waterway.

In paragraph 8, page 3, House Document No. 288, General Taylor says:

> After due consideration of the above-mentioned report, I concur in the views of the Board of Engineers for Rivers and Harbors.

In paragraph 15, House Document No. 288, page 5, General Taylor says:

> For the present, no funds in addition to those regularly appropriated for examination, surveys, and contingencies and which are available for this work are necessary.

The commission appointed by President Coolidge, commonly called the Hoover Commission, at the present time are making economic studies of the freight available for a deep-water connection between the Great Lakes and the ocean. These economic studies will be as available for the New York route as for the St. Lawrence route. This report will cover the whole economic subject and will be ready, we are informed, about July 1, 1926.

In 1919 a survey of the St. Lawrence River was asked and granted by Congress. At the same time a survey across the State of New York was asked and granted by Congress. Both of these reports were in due time filed.

The engineers reported that the St. Lawrence route was feasible and practicable and recommended its construction. The report of the engineers in the survey across New York was unfavorable.

In 1925 another and more elaborate survey and report was asked on the St. Lawrence River. This was granted. At the same time provision was made for another survey across the State of New York. This was granted. This report was due to be filed not later than May 15, 1926. This report (H. Doc. No. 288) is filed, and therein the Board of Engineers for Rivers and Harbors and the Chief of Engineers, General Taylor, say that the cost of a channel connecting Lake Ontario with the Hudson River would be $506,000,000; that the upkeep on the channel from Oswego to the Hudson would cost annually $30,000,000. They do not report on the cost or the upkeep of a canal connecting Lake Erie with Lake Ontario. The Board of Engineers for Rivers and Harbors and General Taylor recommend that it is not economical and the facts do not warrant the building of a canal across New York State at the present time.

The 1925 engineers' report on the St. Lawrence has not been filed, but in all probability will be filed about July 1, 1926.

There have been more than 20 surveys made by the Federal Government across the State of New York. The State of New York itself has made some four or five surveys; all of the data and information in these reports are available. All the engineering and economic facts are now available that can be necessary upon which the engineers would base an opinion on the feasibility or practicability of the route across New York State.

It is conceded by all the engineering reports that any outlet from the Great Lakes to the ocean must be either down the St. Lawrence or from Oswego to the Hudson River, so the purpose of further engineering information, if it can have a purpose, is for a comparison of the two routes.

The 1920 engineering report advises that the total cost of a 30-foot channel in the St. Lawrence River would be $270,000,000; in this there will be only 33 miles of confined channel and seven locks in three flights. This cost is to be borne by the two Governments, Canada and the United States.

House Document No. 288 (just filed by the engineers) on the canal from Oswego to the Hudson River says that this canal will cost $506,000,000. In former reports by the Federal engineers they show that there will be some eighty-odd bridges over this canal, some 28 locks, and that there is a lift of 512 feet; and 159 miles of restricted channel.

The prime purpose of a deep canal permitting vessels drawing from 25 to 30 feet of water between the Great Lakes and the ocean is to give relief to the territory adjacent and tributary to the Great Lakes and to give to the Great Lakes ports, such as Duluth, Milwaukee, Chicago, Detroit, Toledo, Cleveland, and all other ports the benefit of the ocean base in freight charges. Further, the purpose is to furnish to the Great Lakes territory, where a major portion of the food products of the Nation are grown, cheaper transportation rates on their export products.

At the present time the eastern part of the United States is served by the Atlantic Ocean, the southern part is served by the Gulf of Mexico, and the western part is served by the Pacific Ocean. The interior portion of the country, described as the Great Lakes territory, is the part that does not now have the advantage of the ocean as a base for its freight charges.

The Federal Government, through the expenditure of money from its Treasury, has developed ports and transportation on the ocean and Gulf shore line above described. Also Federal money built and maintains the Panama Canal, which is beneficial to the entire coast line of the country, but at the present time and under present shipping conditions is a serious handicap to the territory described as Great Lakes or northern Mississippi Valley territory.

The report of the engineers just filed gives the total maximum capacity of the New York Canal as 45,000,000 tons, 22,500,000 outbound and 22,500,000 inbound. The statistics gathered from various governmental reports show that the Great Lakes territory in 1925 had a total export tonnage of more than 27,000,000 outbound freight which will seek and use this channel. So, if the New York Barge Canal was now in operation it would not, if it could carry to its full capacity, serve the territory that is asking for and entitled to relief at the present time.

On the canal from Oswego to the Hudson there are some 80 bridges, 14 of them railroad bridges. At the present time in the barge canal there is only 15 feet of clearance between the water and the bridges. It is an engineering fact, established in the reports, that for a channel of 20 or 25 feet there must be a minimum clearance of 130 feet. That means that these eighty-odd bridges will all have to be "swing" bridges or the grade will have to be raised a very considerable amount in order to enable vessels to pass under. If these bridges all have to be opened, either the boat traffic in the canal or the wheel traffic on the bridges over the canal, either or both, will be greatly retarded, and this is especially true in the case of the railroads. As stated above, there are 14 railroad bridges over this proposed canal. To raise the grade to permit free passage of the boats under the bridges would run into many millions of dollars for first cost. With 80 bridges and 28 locks it means a retardation about every 1½ miles,

and this means that boats could not navigate under their own control but would have to be towed or navigated with a tug.

There is available all and every engineering fact that is necessary upon which to base a conclusion as to the feasibility, practicability, and usability of the New York route.

Further appropriation of $250,000 or any other sum at this time would be a waste of public money and could have only the effect of delaying a comparison of the two routes.

The granting of this appropriation and authority for further survey, without fixing a time limit when the report is to be made, would delay comparison of the two routes—the St. Lawrence and the New York—and could have no beneficial result, for there is available information sufficient upon which to base an opinion.

Time is essential if relief is to be granted. There is available ample data on which to base an opinion.

In view of the above facts the undersigned desire to register their opposition to the provision of the bill for an appropriation for another survey of a route for a canal across the State of New York.

W. W. CHALMERS.
JOHN B. SOSNOWSKI.
CHARLES A. MOONEY.

VIEWS OF MR. MORGAN

I concur in the above minority report so far as relates to the consideration in separate bills of the two projects, one for the survey across New York State and the other for the improvement of the Illinois River. I should favor diversion of not to exceed 2,000 cubic feet from Lake Michigan for the benefit of navigation on the Illinois River, provided such diversion is held to be legal by the Supreme Court and it further appears that it is necessary for navigation. I am opposed to any permanent diversion for sewerage purposes.

W. M. MORGAN.