

ST. THOMAS HARBOR, VIRGIN ISLANDS

LETTER

FROM

THE SECRETARY OF WAR

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, UNITED STATES ARMY, DATED APRIL 1, 1937, SUBMITTING A REPORT, TOGETHER WITH ACCOMPANYING PAPERS AND ILLUSTRATION, ON A PRELIMINARY EXAMINATION AND SURVEY OF ST. THOMAS HARBOR, VIRGIN ISLANDS, AUTHORIZED BY THE RIVER AND HARBOR ACT APPROVED AUGUST 30, 1935

APRIL 6, 1937.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration

WAR DEPARTMENT,
Washington, April 2, 1937.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am transmitting herewith a report dated April 1, 1937, from the Chief of Engineers, United States Army, on preliminary examination and survey of St. Thomas Harbor, Virgin Islands, authorized by the River and Harbor Act approved August 30, 1935, together with accompanying papers and illustration.

Sincerely yours,

HARRY H. WOODRING,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 1, 1937.

Subject: Preliminary examination and survey of St. Thomas Harbor, Virgin Islands.

To: The Secretary of War.

1. I submit for transmission to Congress my report, with accompanying papers and illustration, on preliminary examination and survey of St. Thomas Harbor, Virgin Islands, authorized by the River and Harbor Act approved August 30, 1935.

2. St. Thomas Harbor is a sheltered bay on the south shore of St. Thomas Island, the westernmost large island of the Virgin group. It is roughly $1\frac{1}{4}$ miles long and three-fourths mile wide, with an entrance 1,600 feet in width. The present controlling depths are 33 feet in the entrance channel, 20 to 40 feet in the southerly part of the harbor area, and 4 to 11 feet at the wharves at the town of St. Thomas on the north shore of the bay. No project for improvement of the locality has been authorized by Congress. St. Thomas Harbor lies close to the direct steamer lane between European ports and the Panama Canal, and is an important bunkering port. Prior to the acquisition of the Virgin Islands by the United States in 1917, the Danish Government expended \$269,000 in dredging the harbor; and a Danish corporation known as the West Indian Co. expended over \$1,000,000 in the construction of a bulkhead fueling wharf, 2,250 feet long, on the southerly shore of Long Bay, the easterly arm of the harbor, and in dredging the adjoining area to depths adequate for vessels of 31 feet draft. The mean range of tide is 0.8 foot. The improvements desired by local interests are the enlargement of the entrance channel and the removal of Scorpion Rock, a submerged shoal near the entrance range, to a depth of 36 feet, and the deepening of the vessel anchorage to 33 feet, chiefly to facilitate the important bunkering trade of the harbor; the construction of a bulkheaded fill between Rupert Rock, which lies in the harbor entrance, and the headland to the eastward, to afford greater protection during southerly storms to the inner-harbor area and create additional lands for municipal purposes; and the construction in the harbor of a large graving dock.

3. The town of St. Thomas is the seat of government of the Virgin Islands of the United States. It has a population of 7,037. The island is rocky and mountainous, and suitable only for the grazing of cattle and sheep. The inhabitants of the town are engaged chiefly in the manufacture of rum, bay rum, basket work, pottery, and other handiwork, largely from raw materials imported from nearby islands. Excluding fuel delivered to ships' bunkers, the commerce of the harbor has averaged 127,000 tons annually during the past $12\frac{1}{2}$ years, with receipts of 142,671 tons and shipments of 2,955 tons in the first 6 months of 1936. It consists chiefly of in-bound coal, fuel oil, and other petroleum products, sugar and other foodstuffs, textiles, building materials, and machinery, and shipments of rum, cattle, hides, and miscellaneous commodities. Vessel traffic in 1935 totaled 2,216 trips by steam, motor, and sailing craft, 64 of which were on drafts in excess of 28 feet. The number of ships bunkering at the harbor increased from 163 in 1932 to 348 in 1935, amounting to 243 during the first 6 months of 1936.

4. The most suitable plan of improvement is found by the reporting officers to be the removal of Scorpion Rock and the widening of the entrance channel to 600 feet, both at 36 feet depth, enlargement of the existing anchorage and maneuvering area by 125 acres at 33 feet depth, and the construction of a breakwater 700 feet long between Rupert Rock and the mainland to the eastward. This improvement is estimated to cost \$743,000 for new work and \$12,000 annually for maintenance. The resultant benefits to the general public are evaluated by the district engineer at over \$51,000 annually through reductions in hurricane damages and delays now suffered by large

boats, due to the restricted anchorage space, increased revenues to the local government, and reduced costs of bunkering coal to navigation.

5. The Board of Engineers for Rivers and Harbors, after considering the reports of the district and division engineers, and after affording local interests full opportunity to submit additional information to the Board, finds that the existing deep-water areas in St. Thomas Harbor are clearly inadequate for the increasing numbers of large commercial and passenger vessels bunkering at the West Indian Co. wharf or calling at the harbor for other purposes. The improvement proposed will facilitate existing commerce and increase the value of the harbor as a hurricane refuge, with general benefits commensurate with the expenditures required. Concurring with the reporting officers, the Board recommends the improvement proposed, provided local interests furnish necessary rights-of-way and spoil disposal areas, and release the United States from possible damage claims.

6. After due consideration of these reports, I concur in the views and recommendations of the Board. St. Thomas Harbor is an important fueling station with a well established and growing business. Improvement of the harbor as proposed will obviate delays and hazards to the existing commerce of the harbor and enable larger craft to enter with safety. The benefits to general navigation are commensurate with the expenditures required. I therefore recommend the improvement of St. Thomas Harbor, Virgin Islands, to provide an entrance channel 36 feet deep and generally 600 feet wide, the removal of Scorpion Rock to that depth, an anchorage area of 33 feet depth, and a breakwater 700 feet long between Rupert Rock and the mainland; generally as indicated on the accompanying map and at an estimated cost of \$743,000 for new work, with maintenance estimated at \$12,000 annually; provided local interests furnish, free of cost to the United States, necessary rights-of-way and suitable spoil disposal areas for new work and for subsequent maintenance as required, and release the United States from all claims for damages attributable to the work of improvement.

E. M. MARKHAM,
Major General,
Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

SYLLABUS

The Board recommends the improvement of St. Thomas Harbor, Virgin Islands to provide an entrance channel 36 feet deep and generally 600 feet wide, including the removal of Scorpion Rock to that depth, an anchorage area of 33 feet depth, and a breakwater 700 feet long between Rupert Rock and the mainland, at an estimated cost of \$743,000 for new work, with maintenance estimated at \$12,000 annually, subject to certain conditions of local cooperation.

[Second endorsement]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., March 15, 1937.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the reports on preliminary examination and survey of "Saint Thomas Harbor, Virgin Islands", authorized by the River and Harbor Act approved August 30, 1935.

2. St. Thomas Harbor is on the south shore of St. Thomas Island, the westernmost large island of the Virgin Island group. It is 76 nautical miles eastward from San Juan Harbor, Puerto Rico, 1,434 miles southerly from New York Harbor and 1,029 miles northeast of the Panama Canal. St. Thomas Harbor is a well-sheltered bay $1\frac{1}{4}$ miles long and three-fourths mile wide, with general depths of 20 to 40 feet in the southerly third of its area, decreasing to between 4 and 11 feet at the wharves along the frontage of the town of St. Thomas on the north side of the harbor. The main entrance on the south has a minimum width between headlands of 1,600 feet and a controlling depth of 33 feet; but navigation is somewhat obstructed by a submerged shoal, named Scorpion Rock, which lies close to the entrance range. No project for improvement of the locality has been authorized by Congress. Prior to the purchase of the Virgin Island group by the United States in April 1917, the Danish Government and local interests are reported to have expended \$269,000 in dredging the harbor; and between 1911 and 1912 the West Indian Co., a Danish corporation with headquarters in Copenhagen, constructed a bulkhead wharf 2,250 feet long on the southerly shore of Long Bay, the easterly arm of the harbor, and dredged the adjacent area to depths adequate for vessels of 31 feet draft. The cost of the latter work is reported at over \$1,000,000. Since 1931 a total of \$140,000 has been expended by the United States in the removal of a wreck from the west part of the harbor, the minor enlargement of a secondary channel of entry at the west end of the harbor to improve sanitary conditions, and the dredging of the slip adjacent to the West Indian Co. wharf to obtain materials for the reclamation of a malarial swamp at the head of Long Bay. The mean range of tide is 0.8 foot.

3. The town of St. Thomas, with 7,037 inhabitants, is the seat of government of the Virgin Islands of the United States. The island of St. Thomas and the nearby island of St. Johns are rocky and mountainous, and suitable only for the grazing of cattle and sheep. The inhabitants of the town are engaged chiefly in the manufacture of rum, bay rum, basket work, pottery, and other handiwork, largely from raw materials imported from nearby islands. St. Thomas Harbor lies on the direct steamer lane between European ports and the Panama Canal, and the bunkering of vessels at the West Indian Co. wharf constitutes the principal industrial activity of the locality. Excluding fuel delivered to ships' bunkers, the commerce of the harbor has averaged 127,000 tons annually during the past $12\frac{1}{2}$ years, with receipts of 142,671 tons and shipments of 2,955 tons in the first 6 months of 1936. It consists chiefly of in-bound coal, fuel oil, and other petroleum products, sugar and other foodstuffs, textiles, building materials, and machinery, and shipments of rum, cattle, hides, and miscellaneous commodities. Vessel traffic in 1935 totaled 2,216 trips by steam, motor, and sailing craft, 64 of which were on drafts in excess of 28 feet. The number of ships bunkering at the harbor increased from 163 in 1932 to 348 in 1935, amounting to 243 during the first 6 months of 1936. The recent substantial increase in this activity, which constitutes the principal source of revenue for the locality, is attributed by local interests to the suspension by the local government in 1932 of the former ship's dues for vessels discharging bunkering supplies.

4. Local interests request that the United States undertake the improvement of St. Thomas Harbor to provide for the removal of Scorpion Rock; the enlargement of the entrance channel to a depth of 36 feet over a width of 600 feet; the dredging of the existing anchorage and maneuvering area to a depth of 33 feet over an area of 140 acres; the bulkheading and filling of a triangular-shaped area between Rupert Rock, which lies in the harbor entrance, and the headland to the eastward thereof, with a basin or slip in the northwesterly face of the bulkhead; and the construction in the harbor of a graving dock capable of handling a ship 500 feet long and of 26 feet draft. The removal of Scorpion Rock and the deepening and enlargement of the entrance channel and anchorage basin are desired to reduce the existing hazards of navigation, avoid delays now experienced by vessels proceeding to or from the bunkering wharf when other large craft are anchored in the harbor, and enable large freighters and cruise boats to enter the harbor, with resultant increases in local revenues. The proposed bulkhead and fill at Rupert Rock would afford additional protection to the inner harbor areas and create new land for municipal use, and the proposed slip would provide berthing and storage space for vessels of the island and Federal Governments. It is claimed that the graving dock would attract additional vessels to the harbor and be of potential value to the United States Navy. Representatives of the local government offer to furnish necessary spoil disposal areas and releases from incidental damages, and have indicated that the St. Thomas Harbor Board would contribute financially to the extent of its ability toward the cost of bulkheading the Rupert Rock area; and the West Indian Co. offers conditionally to furnish an appropriate site for a graving dock adjacent to its wharf at the east end of Long Bay.

5. The district engineer estimates the cost of the improvements desired by local interests at \$82,000 for the removal of Scorpion Rock to a depth of 36 feet, \$49,000 for enlargement of the entrance channel, \$583,000 for dredging the anchorage area, \$240,000 for the Rupert Rock improvement, and \$1,047,000 for the graving dock. The latter is not considered a proper undertaking for this Department, and in the opinion of the district engineer should be provided wholly at the expense of the island government or local interests. The extensive bulkheaded fill and berthing slip at Rupert Rock are not warranted, since equal protection could be provided at lesser cost by the construction of a breakwater extending from the rock to shore, and the chief remaining benefit would be the creation of spoil disposal capacity in addition to that of the ample areas now available. A somewhat modified anchorage of only 125 acres would serve the needs of general navigation as well as the larger area suggested by local interests. The district engineer states that a constant ground swell runs at the entrance to St. Thomas Harbor and continues, though with diminished intensity, into the inner harbor. Each storm originating in the southerly quadrant, even though passing 75 to 100 miles distant, causes heavy seas which usually run for several days; and has a tendency to lower the general water surface as soon as the center of the storm has passed. With numerous coral heads on the bottom, it thus appears that the desired depths of 36 feet in the entrance and 33 feet in the anchorage area are the minimum necessary for the safety

of ships drawing 28 to 30 feet. The present entrance range lies just east of Scorpion Rock and at right angles to the prevalent easterly trade winds. To avoid this obstruction, vessels must maintain a relatively high rate of speed and run the risk of grounding on the westerly headland. The possibility also exists that the buoy marking the shoal might drift from its proper location during storms. The district engineer concurs in the opinions of the navigators frequenting the port that the removal of Scorpion Rock is necessary for safe navigation and should be included in any plan of improvement. While not of the opinion that the desired fill in the vicinity of Rupert Rock is necessary, the district engineer states that the construction of a breakwater between the rock and shore would undoubtedly increase the safety of the harbor. Available data indicate that four hurricanes of severe intensity have visited the islands since 1916, causing damages to shipping estimated at \$673,000. The probable benefits of the structure are believed commensurate with its cost, estimated at \$73,000. Local interests have submitted ample evidence to show that existing navigation is hampered by inadequate deep-water anchorage, resulting in numerous delays and the elimination of the harbor as a port of call by certain large tourist ships. A moderate enlargement of the anchorage area is therefore considered necessary. The district engineer accordingly presents a modified plan of improvement to provide for the removal of Scorpion Rock and the widening of the entrance channel to 600 feet, all at 36 feet depth, the enlargement of the existing anchorage and maneuvering area by about 125 acres at 33 feet depth, and the construction of a breakwater extending from Rupert Rock southeastward 700 feet to the mainland; at an estimated total cost of \$743,000 for new work and \$12,000 annually for maintenance.

6. The district engineer states that because of its strategic location on the direct steamer lanes between Europe and Central and South America, and between North and South America, St. Thomas is one of the most important fueling stations in the Atlantic Ocean. Despite adverse conditions of world trade and inadequate port facilities, the bunkering business of the harbor is assuming a definite upward trend. The climatic advantages and scenic beauties of the islands have attracted a considerable tourist travel, and the district engineer believes that both the bunkering and tourist trade will be of a substantial and lasting nature. The improvement proposed would permit more efficient handling of existing commerce and insure greater safety to shipping. It should enable the West Indian Co. to quote more favorable prices and lead to an increase of 100,000 tons in the annual sales of bunker supplies and of 200 in the average annual number of vessels bunkered. The tourist trade would be stimulated, with substantial benefits to the locality. The probable general benefits through reductions in hurricane damage and in time now lost by ships maneuvering in the restricted anchorage, increased taxes, larger government income from tourist and freight vessels and from port fees, and in the reduced cost of bunkering coal to navigation are evaluated at over \$51,000 annually. The island government is not self-supporting; and the increased revenues would serve to reduce the

direct Federal appropriations to the local government now necessary to meet current budgetary deficits. One of the reasons advanced for the purchase of the Virgin Islands from the Danish Government was the strategic location of St. Thomas Harbor as related to the defenses of the Panama Canal, and the district engineer considers the improvement now proposed to be of importance to the national defense. The division engineer considers the estimates of savings presented by the district engineer to be conservative but notes that a great proportion of the navigation savings would probably accrue to foreign interests. He doubts whether the prospective benefits to United States interests would justify the improvement, even though consideration is given to prospective local benefits of \$10,350 which would accrue to the harbor board from increased port fees and to local interests from increased sales to tourists. However, the benefits to commerce and navigation plus such intangible benefits as participation in world trade and the value of the island from the standpoint of national defense appear to justify the undertaking. He therefore concurs with the district engineer in recommending the improvement proposed by that officer, provided local interests furnish necessary rights-of-way and spoil-disposal areas and release the United States from claims for incidental damages.

7. Local interests were advised of the nature of the division engineer's conclusions and invited to present additional information to the Board. No communications were received.

IEWS AND RECOMMENDATIONS OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

8. The Board concurs, in general, with the reporting officers. The existing deep-water areas in St. Thomas Harbor are clearly inadequate for the increasing numbers of large commercial and passenger vessels bunkering at the West Indian Co. wharf or calling at the harbor for other purposes. The improvement proposed will facilitate existing commerce and increase the value of the harbor as a hurricane refuge, with general benefits commensurate with the expenditures required. The Board therefore recommends the improvement of St. Thomas Harbor, Virgin Islands, to provide an entrance channel 36 feet deep and generally 600 feet wide, including the removal of Scorpion Rock to that depth, an anchorage area of 33 feet depth, and a breakwater 700 feet long between Rupert Rock and the mainland, generally as indicated on the accompanying map, and at an estimated cost of \$743,000 for new work, with maintenance estimated at \$12,000 annually; provided local interests furnish, free of cost to the United States, necessary rights-of-way and suitable spoil-disposal areas for new work and for subsequent maintenance as required, and release the United States from all claims for damages attributable to the work of improvement.

For the Board:

G. B. PILLSBURY,
Brigadier General, Corps of Engineers,
Senior Member.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

SYLLABUS

The division engineer is of the opinion that improvement of St. Thomas Harbor, Virgin Islands, is justified to the extent of providing an anchorage area, 33 feet deep and covering about 125 acres, with an entrance channel thereto 36 feet deep and 600 feet wide, removal of Scorpion Rock to 36 feet, and construction of a breakwater from Rupert Rock to the mainland, at a cost of \$743,000, with \$12,000 annually for maintenance, provided that local interests furnish rights-of-way, disposal areas, and releases from claims for damages.

WAR DEPARTMENT,
OFFICE OF DIVISION ENGINEER,
NORTH ATLANTIC DIVISION,
New York, N. Y., February 17, 1937.

Subject: Survey report on St. Thomas Harbor, Virgin Islands.

To: The Chief of Engineers, United States Army.

1. *Authority.*—This survey report is submitted in compliance with instructions contained in Department letter dated March 24, 1936, and pursuant to authorization in section 3 of the River and Harbor Act approved August 30, 1935. The preliminary examination reports of the district engineer and the division engineer, dated February 13, 1936, and March 4, 1936, respectively, were reviewed by the Board of Engineers for Rivers and Harbors, which recommended a survey to determine the advisability and cost of improvement and the local cooperation to be required. The district engineer's survey report, dated January 12, 1937, is herewith. It is accompanied by a map showing the results of a survey of the locality (Dist. Engr. File No. PR-197).

2. *Description* (see map referred to above and U. S. Coast and Geodetic Survey Charts Nos. 920 and 933).—St. Thomas Harbor is located on the south shore of the island of St. Thomas, one of the Virgin Islands belonging to the United States. It is 1,434 nautical miles southerly of New York City, 1,029 miles from the Panama Canal, 1,611 miles from New Orleans, 3,574 miles from Liverpool, England, and on the direct steamer lane between European ports and the Panama Canal. St. Thomas Harbor is the most important commercial port in the Virgin Islands and is the only sheltered harbor in the group that can be entered by deep-draft vessels. It is 76 nautical miles easterly of San Juan, Puerto Rico, the nearest harbor improved by the United States.

3. The main channel leading from the ocean into the harbor enters between high headlands on the east and west. Scorpion Rock, about 14,000 square yards in area and with depth ranging from 23 to 27 feet, lies squarely in the entrance. While there is greater depth west of this obstruction, ships ordinarily enter straight on the marked range easterly of the rock, where 36 feet is available. The harbor, open to the south, is surrounded on the other three sides by high hills. It is roughly oval in shape and covers about 430 acres, of which 130 acres have a least depth of 30 feet, 100 acres have from 18 to 30 feet, and 200 acres have from 2 to 18 feet. The northerly part of the harbor adjacent to the town of St. Thomas is generally shoal, depths of 30 feet being from one-fourth to three-fourths of a mile offshore.

4. A secondary channel, the Sticks or Haulover, leading from the harbor to East Gregerie Channel and separating Hassel Island from the mainland, was improved for a length of about 400 feet and width of 100 feet to a least depth of 10 feet. Other than the hazard of Scorpion Rock, the only difficulty of navigation arises from the restricted areas and depths for maneuvering or anchoring large vessels. The mean tidal range is 0.8 foot. The prevailing wind is the easterly trade wind. No project has been previously reported on or adopted.

5. *Improvements.*—In 1864, and subsequently, the Danish Government spent \$169,000 for dredging in St. Thomas Harbor; in 1910 the island government expended \$100,000 for enlarging the anchorage basin; and in 1911–12, the West Indian Co. spent more than \$1,000,000 in the construction of a bulkhead wharf 2,500 feet long in Long Bay, on the east side of the harbor, and for dredging a slip alongside capable of accommodating ships up to 31 feet in draft. The United States Engineer Department, in 1931–32, removed the wreckage of a former drydock, at a cost of \$60,000, thereby increasing by about 12 acres the area available for deep-water anchorage. In 1935 the same Department dredged the slip alongside the West Indian Co.'s dock to depths of from 30 to 33 feet, using the material in the reclamation of the malarial swamp at the head of Long Bay, and dredged the Haulover to a width of 150 feet and a least depth of 8 feet for the improvement of sanitary conditions in the harbor, at a total cost to the United States of \$80,000. Local interests furnished a disposal area and gave releases from claims for damages.

6. *Tributary area.*—The immediately tributary area consists of the islands of St. Thomas and St. John and all of the adjacent islets and cays, having a total population of 10,634, in 1930. The American island of St. Croix, with a population of about 14,000, and the British Virgin Islands of Tortola, Virgin Gorda, and Anegada, with a total population of about 10,000, are within 40 nautical miles of St. Thomas Harbor and are indirectly tributary thereto. The islands of St. Thomas and St. John are mountainous and rocky, not adapted to agriculture. Grazing for stock is afforded but is somewhat uncertain, being dependent on the rainfall.

7. Bunkering of vessels constitutes the principal industrial activity of St. Thomas. Other pursuits consist of the native handicrafts, such as basketwork, woven fabrics, pottery, carved turtle shells, etc.; the manufacture of rum and bay rum; and the raising of some cattle and sheep. The raw materials used by the natives are mostly imported from nearby islands. The Virgin Islands National Bank, recently organized under the national banking laws of the United States, serves the American and the British Virgin Islands and is located at St. Thomas. Its report of June 30, 1936, showed a capital account of about \$175,000 and deposits of around \$1,500,000. Good roads connect the harbor front with the town and other parts of the island. Cable communication is available for commercial use.

8. *Commerce—Vessel traffic.*—The commerce of St. Thomas Harbor consists of raw materials received from adjacent islands for processing and subsequent export; the receipt and export of commodities grown and produced on nearby islands; receipts of food, clothing, building materials, machinery, coal, and fuel oil, and shipment of cattle, hides,

handicrafts, rum, bay rum, bay oil, and sundry manufactures. Receipts and shipments for the calendar years 1924 to 1935, inclusive, are tabulated in the following table:

Year	Receipts		Shipments	
	Short tons	Value	Short tons	Value
1924	158,741	\$1,448,424	2,540	\$140,675
1925	91,401	1,142,518	3,610	196,626
1926	137,367	1,717,090	3,570	191,322
1927	131,805	1,647,567	3,850	209,443
1928	137,417	1,733,197	3,300	182,791
1929	143,695	1,796,191	3,410	190,475
1930	118,074	1,475,927	3,760	185,163
1931	77,857	973,211	3,575	191,413
1932	57,354	716,928	2,725	141,630
1933	77,990	974,874	3,210	166,663
1934	127,634	1,447,774	4,275	218,741
1935	140,251	1,629,184	5,410	278,994
1936 (6 months)	142,671	1,387,384	2,955	152,270
Average per year	123,380	1,447,221	3,700	195,679

Shipments to the United States are now about 85 percent of the total, shipments of rum having greatly increased.

9. The most important commerce of St. Thomas Harbor pertains to bunkering of ships. During 12½ years prior to June 1936 this business averaged 112,220 short tons annually. The number of ships calling for bunkers decreased from a maximum of 397 in 1929 to 163 in 1932, and has since increased as shown in the following table:

Calendar year	Number of vessels	Bunkers taken (short tons)		
		Fuel oil	Coal	Total
1932	163	17,760	48,450	66,210
1933	208	10,090	85,470	95,560
1934	237	36,260	72,170	108,430
1935	348	67,724	73,650	141,374
1936 (January-June)	243	58,425	44,823	103,248

10. In the absence of other resources, the business of bunkering ships is regarded as most important to the economic life of the island. It is claimed that vessels drawing up to 33 feet cannot bunker direct from a wharf at any other port in the locality. Local interests believe that with a deeper and larger harbor the business of bunkering will continue to increase and with it will also increase incidental business in foodstuffs and articles of local manufacture. Suspension of ship's dues for vessels discharging bunkering supplies was started as an experiment in 1934 and is claimed to have resulted in a substantial increase in bunkering. A committee, appointed by the Governor to study the matter, has recommended the permanent abolishment of such dues.

11. During the last 6 years the number of vessels entering St. Thomas Harbor has averaged over 2,000 annually. During the same time the number of vessels drawing 28 feet or more has averaged 37 per year, with a marked increase in 1936, when they numbered 41 during the first 8 months.

12. *Improvement desired.*—Local interests desire improvement of the harbor by dredging an enlarged anchorage and maneuvering area of 140 acres to a least depth of 33 feet; by removing Scorpion Rock and clearing the entrance channel to a least depth of 36 feet; by construction of a bulkhead wall to enclose a triangular disposal area between Havensight Point, Rupert Rock, and the mainland, with a basin or slip of about 200 by 400 feet to be provided in the north-west face of the bulkhead; and by the construction of a graving dock. Local interests claim that dredging as requested would reduce the hazard of navigation and encourage more and larger vessels to use the harbor with a resultant increase in commerce; that construction of the desired bulkhead would protect the other works, reduce storm damages to roads and water-front structures, provide an area for the deposit of dredged materials, create new land of potential value to the municipality, and facilitate the later provision of additional docking facilities; and that construction of a graving dock would serve world shipping, be of potential value to the United States Navy, attract additional vessels to the harbor, and go far toward achieving a basis of self-support for the islands.

13. Statistics submitted by proponents of the improvement indicate that during 11 months of 1935, 220 ships of 5,000 tons and over lost a total of 6 days' time, estimated at \$500 per day and aggregating \$3,275 annually, as a result of the restricted maneuvering and anchorage areas. Information submitted by a committee appointed by the Governor shows that during 16 years four hurricanes visited the island, damaging shipping to the extent of \$673,000, or an annual average of \$42,000. Other benefits expected to result from increased vessel traffic are additional port fees, increased sales to tourists, and of provisions to vessels. It is claimed that improved business conditions will provide employment to such an extent as to make it unnecessary to continue the present subsidization of labor through manual bunkering of 25 percent of the coal loaded, and that this saving will be passed on to ship owners through reduced fuel costs. Expanded activities of the West Indian Co. are expected to provide extra revenue in the form of taxes.

14. Proponents of the improvement stress the fact that in the absence of other resources, the revenues derived from port activities are vitally necessary to the economic life of the islands of St. Thomas and St. John. Local revenues from all sources are inadequate to pay for the government of the islands and the deficit is met by the United States Treasury. Evidence of special treatment of the islands is found in the establishment of a tourist hotel in St. Thomas at Federal expense. Also the islands are exempted from restrictions of the coast-wise shipping law. The Federal Government is financing the sugar crop of the island of St. Croix as a means of rehabilitating the island and assuring a medium of future prosperity. The Governor believes that development of St. Thomas Harbor is justified on the same grounds.

15. The Harbor Board has \$20,000, funds in hand which possibly could be applied to the bulkhead desired. There is a remote possibility that, if legally permissible, the Harbor Board might acquire the land reclaimed and contribute toward the proposed improvement money raised by means of a bond issue. Local interests also offer to release the United States from all claims for damages, to provide

adequate disposal areas for dredged material, and to provide a site for a graving dock.

16. *Special subjects.*—No question of water-power development, flood control, or kindred subject pertains to the desired improvement. It is believed that the proposed improvements in the mouth of the harbor would have no appreciable effect on erosion or accretion for a distance of 10 miles on either side of the entrance.

17. *Views and recommendations of the district engineer.*—The district engineer finds three major arguments for Federal improvement of St. Thomas Harbor: First, that the harbor, located on important steamer lanes, is one of the principal fueling stations in the Atlantic Ocean and is a port of call for an increasing number of cargo and tourist ships; second, that the enhancement of commercial activity at the harbor will help the islands to become self-supporting and, in consequence, the deficit met annually by appropriation of Federal funds will be diminished; and third, that substantial general benefits will be derived from improved harbor facilities through reductions in time of maneuvering vessels, in the amount of hurricane damages, and in fuel costs and through increases in port fees, in tourist trade, in sales of provisions and supplies, and in the returns from taxation.

18. It is stated that many of the vessels using St. Thomas Harbor experience considerable difficulty in maneuvering in the turning basin and the entrance channel. In its present state St. Thomas Harbor does not compare favorably with the deeper and more commodious West Indian ports which are most frequented by tourist ships. Proponents contend that unless adequate harbor facilities are provided at St. Thomas, enabling the larger vessels to maneuver safely and without undue loss of time, such vessels will be attracted to the deeper and more commodious West Indian ports to the detriment of the commerce of the St. Thomas Harbor.

19. The district engineer believes a modified anchorage area of 125 acres would serve the general needs of navigation as well as the one outlined by proponents of the improvement, covering 140 acres. The modified area is arranged so as to provide sufficient maneuvering area and swinging room for three vessels, each 550 feet long. He considers a breakwater between Rupert Rock and the mainland would increase the safety of the port as a hurricane harbor, but that the addition of a bulkheaded enclosure and berthing slip northward of Rupert Rock, at an additional cost of \$167,000, seems unwarranted since the only purpose it would serve would be to provide a disposal area for material which could be disposed of otherwise. The district engineer believes that provision and operation of a graving dock at Federal expense is not a proper undertaking of the Department, so he does not include it in his plan. Because of the heavy ground swells at the entrance to the harbor, he considers a depth of 36 feet essential for the safe operation of the large vessels that will use the harbor. He holds that any plan of improvement should include removal of Scorpion Rock because of its location and the danger of grounding from the effect of cross winds during a storm or when conditions are otherwise unfavorable.

20. The plan for improvement as desired, and an alternate plan suggested by the district engineer, with estimates of costs, are listed as follows:

Description of improvement	Desired by local interests	Recommended by district engineer
Removal of scorpion rock to 36-foot depth.....	\$82,000	\$82,000
Entrance channel 36 feet deep, 600 feet wide.....	49,000	49,000
Anchorages and maneuvering area: 140 acres.....	583,000	583,000
123 acres.....		539,000
Bulkheads and sea walls, Rupert rock area.....	240,000	
Breakwater, Rupert rock area.....		73,000
Graving dock.....	1,047,000	
Total.....	2,001,000	743,000

21. In analyzing the prospective savings, should the harbor be improved in accordance with the alternate plan proposed by the district engineer, he arrives at the following tabulation:

<i>Annual saving</i>	
Time saved in maneuvering.....	\$3, 275
(During 11 months of 1935, 220 ships lost an aggregate of 6 days, at \$500 per day.)	
Reduced hurricane damage.....	21, 000
(Average damage during 16 years has been about \$42,000. District engineer considers 50 percent of damage would be eliminated due to breakwater.)	
Increase of port fees.....	7, 375
Port fees consist of pilotage, quarantine fees, and custom fees, and are charged against vessels of all classes. (Estimated income to the island government due to prospective increase in vessel traffic for additional bunkers.)	
Increased benefit from tourist trade.....	2, 975
(General benefit to island government from increased taxes and reduced relief outlays, estimated at 50 percent of the profit on the spendings of tourists from an increased number of ships which will be able to safely enter an improved harbor.)	
Benefit from increased sales of provisions to vessels.....	4, 000
Savings to navigation in fuel costs.....	7, 388
(Decreased cost of bunkering by mechanical means.)	
Increased taxes from West Indian Co.....	5, 000
Total.....	51, 013

22. With an estimated expenditure by the Department of \$743,000 for the alternate plan of improvement, and \$1,070 by the Lighthouse Department for aids to navigation, and assuming a 50-year life for the dredging and a 40-year life for the breakwater, and with interest at 4 percent, the district engineer computes total annual carrying charges of \$46,820, all of which would be Federal. The ratio of general benefits to Federal carrying charges in this plan is thus 1.1 to 1. The district engineer believes additional intangible benefits would result from the improvement and that an adequate harbor in the locality would be of strategic value to the Navy. He is of the opinion that St. Thomas Harbor is admirably situated to act as a fueling station and base of operations and that in an emergency a floating drydock could be established there on short notice. He considers that a graving dock would add materially to the revenue of the island government and would be of benefit to the American merchant marine. He believes it probable that the Navy Department would find a dock of service and that vessels of the Engineer Department, Lighthouse Department, and Coast Guard could use such a dock at substantial savings.

23. The district engineer calls attention to the fact that the islands are not self-supporting and that any increased revenues thereto would tend to reduce the Federal appropriations needed to meet annual budget deficits. In view of this dependence he believes it illogical to require of local interests a financial contribution toward the cost of the improvement.

24. The district engineer recommends that a project be adopted for St. Thomas Harbor, as shown on the accompanying map, to provide an entrance channel with a depth of 36 feet at mean low water, removal of Scorpion Rock to the same depth, an anchorage area with a depth of 33 feet, and a hurricane breakwater at Rupert Rock, all at an estimated cost of \$743,000, with \$12,000 for annual maintenance, provided that local interests furnish disposal areas, rights-of-way, and releases from claims for damages incidental to the work of improvement.

25. *Views of the division engineer.*—The division engineer considers that the prospective benefits from the improvement of St. Thomas Harbor, presented by the district engineer, are, in general, reasonable and conservative. However, the general benefits amounting to \$51,013 annually are greater than the annual carrying charges of \$46,820 by a very small margin. Analyzing such benefits it is found that navigation interests would save \$31,663, while the island government would benefit by about \$19,350. A great proportion of navigation savings would probably accrue to foreign interests, and it is exceedingly doubtful if the desired improvement can be justified by the prospective benefits to navigation and commerce of the United States and its citizens alone, even though consideration is given to prospective local benefits of \$10,350, not tabulated by the district engineer but which would accrue to the harbor board from increase in port fees, and to local interests from increased sales to tourists.

26. However, the fact remains that the United States has made a considerable investment in these islands which have never been self-supporting. To protect that investment and to partially relieve the Federal treasury of the burden thus imposed it may be advisable to make an expenditure such as ordinarily would be unjustified. The benefits to commerce and navigation nearly justify the improvement, and further intangible benefits, such as participation in world trade and the value of the island from the standpoint of national defense, offer additional justification. While these intangible benefits cannot be readily evaluated, nevertheless they are believed important. The combined prospective benefits appear to justify the improvement recommended by the district engineer.

27. *Recommendation.*—For the above reasons, the division engineer is of the opinion that the harbor of St. Thomas is worthy of improvement by the United States to the extent of providing an anchorage area 33 feet deep and covering about 125 acres, with an entrance channel thereto 36 feet deep and generally 600 feet wide, removal of Scorpion Rock to 36 feet, and construction of a breakwater from Rupert Rock to the mainland, at a cost of \$743,000, with \$12,000 annually for maintenance, provided that local interests furnish adequate rights-of-way and disposal areas and release the United States from all claims for damages incidental to the work.

E. D. PEEK,
Colonel, Corps of Engineers,
Division Engineer.

REPORT OF THE DISTRICT ENGINEER

SYLLABUS

It is considered that improvement of St. Thomas Harbor, to the extent of providing an adequate entrance channel, sufficient anchorage space, and a hurricane breakwater, at an estimated cost of \$743,000, with \$12,000 for annual maintenance, is justified in the public interest of the United States.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE, PUERTO RICO DISTRICT,
New York, N. Y., January 12, 1937.

Subject: Survey of St. Thomas Harbor, Virgin Islands.

To: The Division Engineer, North Atlantic Division.

1. *Authority.*—Section 3 of the River and Harbor Act of August 30, 1935, authorizing preliminary examinations and surveys, contained the following item:

St. Thomas Harbor, Virgin Islands.

2. The Chief of Engineers, United States Army, in letter dated September 13, 1935, to the Division Engineer, North Atlantic division, requested that a preliminary examination be made of this locality and a report thereon submitted. The preliminary examination was made as prescribed by law, and the report was submitted to the division engineer on February 13, 1936, and by the division engineer to the Chief of Engineers on March 4, 1936. The Board of Engineers for Rivers and Harbors, in an endorsement dated March 16, 1936, on the division engineer's report, recommended that a survey and estimate of cost be made. The survey was authorized by the Chief of Engineers in letter to the division engineer dated March 24, 1936, and the duty of making the survey was assigned to this office by the division engineer. The scope of the survey covers St. Thomas Harbor, including the entrance channel.

3. *Description.*—St. Thomas Harbor is located on the south shore of the island of St. Thomas, Virgin Islands of the United States. The town of St. Thomas, located directly on the shores of the harbor, is the seat of government of the Virgin Islands of the United States, which consist of the islands of St. Thomas, St. Croix, and St. John, and of several islets and cays. It is not only the most important commercial port in the Virgin Islands, but also the only sheltered harbor in the group which can be entered by deep-draft vessels; it is on the direct steamer lane from European ports to the Panama Canal and the ports of Central America. St. Thomas Harbor is 1,434 nautical miles south-southeast of New York City, 1,029 miles from the Panama Canal, and 1,611 miles from New Orleans; it is the United States harbor in the West Indies nearest to Europe, being only 3,574 nautical miles from Liverpool, England. The harbor is roughly oval in shape, about a mile and a quarter long in an east-west direction and about three-quarters of a mile wide. The total harbor area is 430 acres, of which an area of 130 acres has a depth of 30 feet and over, one of 100 acres has from 18 to 30 feet, and one of 200 acres has less than 18 feet. The main channel leading from the ocean into the harbor enters between Muhlenfels Point on the east and Cowell Point, at the southerly tip of Hassel Island, on the west. Scorpion Rock, with an area of about 3 acres and with depths ranging from 23 to 27 feet at mean low water, lies midway between these

headlands. While the greater depth is to the west of this obstruction, ships ordinarily use the channel to the east (36 feet deep at this point), entering on the marked range which is a straight reach from the sea to the inner harbor. This natural channel is about 500 feet wide, with a controlling depth of 33 feet at mean low water. The mean tidal range is 0.8 foot. The prevailing wind is the northeast trade.

4. The harbor, open to the south, is otherwise landlocked except for a canal about 400 feet long, known as the "Haulover." This canal, having a controlling depth of 10 feet at mean low water and a width of 100 feet, leads into East Gregerie Channel from the northwesterly part of the harbor between the mainland and Hassel Island. Other than this canal, no streams enter the harbor.

5. The nearest improved harbor in United States territory is San Juan, Puerto Rico, 76 nautical miles to the west.

6. No bridges cross the harbor or the entrance channels thereto. The harbor has not previously been reported upon.

7. The general location and details of the harbor are shown on United States Coast and Geodetic Survey charts nos. 3240, 920, and 933, and on map of survey, in one sheet, herewith.

8. *Tributary area.*—St. Thomas is the only town on the island of that name, and all of the water-borne commerce of the island is handled through St. Thomas Harbor. The population of the island of St. Thomas, including the several adjacent islets and cays, according to the United States Census of 1930, is 9,834, of which 7,037 are residents of the town. St. Thomas, with St. John, another island lying a few miles to the east, and having a population of about 800, constitutes the territory directly tributary to St. Thomas Harbor. The American island of St. Croix, with a population of about 14,500, and the British Virgin Islands of Tortola, Virgin Corda, and Anegada with a population of about 10,000, all lie within a radius of 40 nautical miles of St. Thomas Harbor and are indirectly tributary thereto.

9. Prior to May 1935, the Islands of St. Thomas, St. Croix, and St. John were served by the National Bank of the Danish West Indies. Under the terms of the treaty whereby the United States purchased the Virgin Islands group from Denmark in April 1917, the charter of that bank expired on April 30, 1935. On May 1 of that year the Virgin Islands National Bank was organized under the national banking laws of the United States and commenced operations with headquarters in St. Thomas. Branch banks are located in the towns of Christiansted and Frederiksted, on the island of St. Croix. This bank also serves the British Virgin Islands, where no commercial banking facilities are maintained. The statement published by the Virgin Islands National Bank, as of June 30, 1936, shows a total capital account of \$174,796.83, total resources of over \$1,640,000, and deposits of more than \$1,457,000.

10. The islands of St. Thomas and St. John are mountainous and rocky, unadapted to agriculture, and afford grazing for cattle and sheep only to the extent that the uncertain rainfall provides grass. On the other hand, the island of St. Croix is open rolling terrain, with fertile soil admirably adapted to the raising of sugarcane, vegetables, and fruit. The agricultural possibilities are limited only by the rainfall and the available markets.

11. The industries of St. Thomas consist of the manufacture of rum from raw products imported principally from St. Croix, the manufacture of bay rum from bay leaves imported from St. John and the nearby British Virgin Islands, and native handicrafts, such as basket work, woven fabrics, pottery, carved turtle shell, etc. Much of the raw material used in these handicrafts is imported from nearby islands. Some cattle and sheep are raised, mostly for local consumption. Turtles are raised, processed, and exported. A well-equipped marine fueling station, with adequate stocks of coal and fuel oil, attracts vessels for bunkers, and constitutes the principal industrial activity of the island.

12. The harbor front is connected with the town, and with the hinterland, by good roads. There are no railroads on the island. The Pan American Airways and the United States Marine Corps maintain airplane bases on the island.

13. Cable communication is maintained by the All America Cable Co. and by the West India & Panama Telegraph Co. The United States naval radio station handles commercial business under certain conditions.

14. *Local cooperation.*—This harbor has not been improved under a Federal project; therefore no work or improvements have been done by local interests under prescribed conditions of local cooperation.

15. *Other improvements.*—The first major dredging in St. Thomas Harbor was started by the Danish Government in 1864 and completed at a cost of \$169,000. The next recorded dredging by a government agency was in 1910. In that year the island government issued bonds in the amount of \$100,000, the proceeds of which were used to defray the cost of enlarging the anchorage basin. Between 1911 and 1912, the West Indian Co., stated by local interests to have been "encouraged" by the Danish State, constructed a bulkhead wharf 2,250 feet long in the easterly part of the harbor, known as Long Bay, dredged a slip alongside, capable of accommodating ships up to 31 feet draft, and established a modern bunkering station, stated to be "second to none in the West Indies." This work is reported to have involved dredging over half a million cubic yards of sand and rock. The total cost is said to have been more than \$1,000,000.

16. During 1931 and 1932, the United States Engineer Department, at a cost of about \$60,000, removed the wreck of a floating dry dock from the western part of the harbor, thereby increasing the area of the deep-water anchorage basin slightly more than 1 acre.

17. During the calendar year 1935, the United States Engineer Department, with funds allotted from the National Industrial Recovery Act, did some dredging in St. Thomas Harbor for purposes other than for improvement of navigational facilities, but which, nevertheless, resulted in some improvement of such facilities. The first work was done in connection with the reclamation of a malarial swamp at the head of Long Bay. Material for this fill was dredged from the slip of the West Indian Co. wharf, which resulted in cleaning up the existing slip to a depth of from 30 to 33 feet at mean low water, and in widening, to some extent, the flare of the slip at its westerly end. The second project was for the improvement of sanitary conditions in the harbor, and consisted of the enlargement of the Haulover.

The channel formerly had a controlling depth of 6 feet at mean low water, with a width of 40 feet. The dredging done has increased the width of the channel to 150 feet, with depths ranging from 8 to 18 feet at mean low water. For a 90-foot width along the center line of the channel there is a controlling depth of 10.5 feet at mean low water. This work, in addition to increasing the tidal flow to improve sanitary conditions in the westerly part of the harbor, has provided a channel adequate for the passage of launches and small sailing craft, reducing the distance between St. Thomas Harbor and points west by about 2 miles. The total cost to the United States of these two projects was about \$80,000. Local interests furnished free of cost an area for the disposal of material dredged from the Haulover, and in both projects gave releases whereby the United States was held free from claims for damages which might arise incident to the execution of the work.

18. *Terminal and transfer facilities.*—The only deep-water terminal in St. Thomas Harbor is located in the easterly part of the harbor, being owned and operated by the West Indian Co., Ltd., a Danish corporation with headquarters in Copenhagen, Denmark. This terminal was stated to be a public-service terminal available to all on equal terms. The terminal consists of a steel sheet pile and concrete bulkhead wharf 2,250 feet long, with depths alongside ranging from 30 to 33 feet at mean low water, except for the easterly 150 feet, where depths range from 15 to 28 feet. The slip along the face of the wharf is about 300 feet wide from the inner or easterly end, to a point about 800 feet west; thence it flares to a maximum width of 900 feet at a normal to the face of wharf at its westerly end. On this wharf are commodious warehouses and a large area available for open storage. Two electric gantry cranes insure the expeditious coaling of steamers and the discharging of receipts of bulk cargoes. An adequate supply of coal and fuel oil is on hand at all times for bunkers. Pumping facilities for the delivery of fuel oil to ships' bunkers are efficient. Fresh water connections may be had at the face of the wharf, and an adequate storage of water is maintained. The West Indian Co. operates the electric light and power plant for the town, and maintains a well-equipped machine shop. Both the powerhouse and the machine shop are located within the dock area. Light and power are available at the dock. The terminal is connected with the town by a good road. Although there are no railroads on the island, motor transportation is available for handling freight.

19. Numerous small wharves and quays along the north shore of the harbor serve as berths for the many small sailing vessels and motor launches plying an active trade between St. Thomas and nearby islands. These docks are owned both by private interests and by the municipality; several are equipped with hand cranes for handling heavy lifts; depth of water in the berths varies from 4 to 11 feet; all are connected to the island highway system by well-paved roads.

20. Existing freight-handling facilities are considered efficient and ample for the present and immediately prospective needs of the port. Should the need for additional terminals arise, sites owned by the municipality are available for their accommodation. One of these sites, situated at the head of Long Bay, affords room for the construction of two 1,000-foot piers, paralleling the wharf of the West Indian Co. Several sites along the shore of Hassel Island are available for

the development of terminals with bonded warehouses or of "free-trade zones." However, due to lack of road connections, such sites would not lend themselves to the development of terminals for the efficient handling of cargo for local consumption, or for the export of commodities of local origin.

21. *Improvement desired.*—A "harbor-improvement committee" was appointed by the Governor of the Virgin Islands, in December 1935, to present the case of local interests at the public hearing held on December 18, 1935, in the matter of the preliminary examination of St. Thomas Harbor. This committee has continued to function in behalf of local interests. By letter dated October 12, 1936, this office submitted to the committee, through Governor Cramer, several copies of the incomplete map of survey of St. Thomas Harbor, requesting that the improvement desired be indicated thereon. In the same letter information was requested as to what terms of local cooperation might be expected. Under date of October 13 the committee presented to Governor Cramer a map and description of the improvements desired, and by letter of October 14 to this office, answered questions which had been asked in the matter of local cooperation. These documents are enclosed as exhibit 1¹ (letter Oct. 13, 1936, from the harbor committee to Governor Cramer), and exhibit 3¹ (letter Oct. 14, 1936, from the harbor committee to this office). The information contained on the aforementioned map has been transferred to the survey map accompanying this report.

22. At the aforementioned public hearing, local interests submitted evidence to show that existing navigation is hampered by inadequate deep-water anchorage area in the harbor. Specifically, it was stated that there is no room for ships of the *Rotterdam* or *Reliance* class to swing safely at anchor. The *Reliance* is 590 feet long and draws 26 feet; the *Rotterdam* is 650 feet long and draws 28 feet. It was further alleged that with a ship of this class in anchorage area, the clearing of a vessel from the wharf of the West Indian Co. takes a half hour more than when the anchorage area is clear; also, that a similar condition prevails when two or more ships are berthed at the wharf—the clearing of the vessel at the easterly (inner) end of the slip being attended by delays and dangers. The necessity was seen for the enlargement of the anchorage grounds and the widening of the maneuvering area at the West Indian Dock. After deducting the minimum fairway requirements to afford reasonably safe passage between the entrance channel and the deep-water terminal operated by the West Indian Co., there remains for the anchorage of vessels an area measuring roughly 1,200 feet by 2,400 feet, with 30 feet depth—barely sufficient for the anchorage of two vessels of 450 feet in length. If one of the vessels exceeds 450 feet in length, then the anchorage preempted will encroach on the fairway and make difficult the movement of vessels to or from the wharf. Also, it was stated that when more than one vessel is berthed at the wharf, the vessel at the head of the slip (the easterly berth) has difficulty in getting away, due to the narrowness of the slip. The wharf affords 2,000 feet of dock space with 30 to 33 feet depth of water. The slip is about 300 feet wide at the easterly end of the wharf, which it parallels with this width for about 700 feet, then flares to about 900 feet width at the westerly end at its junction with the anchorage basin. Along the

¹ Not printed.

outboard edge of this slip the bottom rises sharply to a depth of 12 feet at the easterly end, and increases gradually to 26 feet at the westerly end. In this shallower water the West Indian Co. maintains maneuvering buoys to assist ships in breasting out from the wharf. It was stated also that Scorpion Rock at the entrance to the harbor is a menace to navigation. These handicaps, it was said, have a detrimental effect on the commerce of the port.

23. The improvements desired are listed by the committee as follows:

1. Removal of Scorpion Rock.
2. A clear channel from Scorpion Rock to the anchorage approximately 600 feet wide, with 36 feet depth.
3. Enlargement of the existing anchorage and maneuvering area by dredging an area of 140 acres to 33 feet depth. (Operations 1, 2, and 3 will provide about 225 acres of deep-water anchorage and maneuvering area.)
4. Enclosing by bulkheads a triangular area between Havensight Point and Rupert Rock, and filling this area with dredged material to an elevation of 8 feet; a basin or slip of about 200 by 400 feet to be provided to the northwest face of the bulkhead.

This reclaimed area will act as a sea wall to protect the dredged harbor and will provide berthing and storage space for vessels of the several Government activities (Virgin Islands and Federal) in the port.

5. Construction of a graving dock with capacity for a ship 500 feet long and 26 feet draft, to be located either at the head of Long Bay or at Careening Cove, Hassel Island.

24. By way of local cooperation in the execution of the above-listed improvements, the committee in letter of October 14, 1936 (exhibit 3),¹ offers the following:

(a) A financial contribution from the St. Thomas Harbor Board, to the extent of its ability, toward the cost of bulkheading the Rupert Rock disposal area. The amount of the board's contribution, it is stated, will be determined when the cost of the work is known.

(b) A promise to secure release of riparian rights to shore-front property in the Rupert Rock area.

(c) To furnish, free of charge, areas (in addition to the Rupert Rock area) suitable for disposal of dredged material.

(d) A promise to enact legislation releasing the United States from all claims for damages which may arise incidental to improving the harbor.

(e) Evidence that "ships' dues" on vessels discharging coal and oil to be used in bunkering vessels, have been suspended for a period to include June 30, 1937, and an opinion that such suspension will eventually be made permanent by legislation. (This suspension of the collection of ships' dues represents a temporary financial sacrifice on the part of the island government which it is expected will result in an increase in bunkering business, thereby increasing, ultimately, the public revenues.)

(f) Evidence that the West Indian Co., Ltd., of St. Thomas, Virgin Islands, will cede to the Federal or Island Government, under certain conditions, and free of charge, an appropriate site for a graving dock.

¹ Not printed.

25. With regard to the financial cooperation offered by the St. Thomas Harbor Board, it has been ascertained from informal discussions with members of the board, that \$20,000 is the maximum that may be expected, regardless of the cost of bulkheading the Rupert Rock area.

26. The foregoing evidence of local interests, confirmed to some extent by observation by personnel of this district, indicates that difficulties in navigation in the inner harbor are due primarily to two causes, viz: The restricted area for anchorage and maneuvering, and the obstructed nature of the entrance channel.

27. *Commerce.*—The commerce of St. Thomas Harbor consists of the receipt of foodstuffs, textiles, clothing, building materials, machinery, coal, fuel oil, and other petroleum products, and of the shipment of fuel in ships' bunkers, rum, cattle, hides, bay rum, bay oil, handicrafts, and other sundry manufactures.

28. Data on receipts and shipments for the fiscal year 1934, classified by commodities, and comparative total values for fiscal years 1935 and 1936, have been furnished by the United States Custom Service, at St. Thomas, as follows:

Receipts, by commodities

Commodity	Unit	Domestic		Foreign		Total	
		Quantity	Value	Quantity	Value	Quantity	Value
Cattle.....	Head.....	68	\$1,191	740	\$1,127	808	\$5,318
Livestock.....	Number.....	77	58	3,922	4,595	3,999	4,653
Dairy products.....			33,864		8,440		42,304
Fish products.....			17,731		2,690		20,421
Grains.....			92,738		25,935		118,673
Sugar.....	Pounds.....	32,870	672	1,089,800	18,358	1,122,670	19,030
Fruits and preparations.....			9,699		3,408		13,107
Vegetables and preparatives.....			32,869		4,406		37,275
Other foodstuffs.....			120,689		23,305		145,994
Liquor.....	Gallon.....			29,195	39,543	29,195	39,543
Tobacco products.....			35,480		291		35,771
Textiles.....			113,753		21,881		135,634
Footwear.....			44,795		2,732		47,527
Lumber.....	M feet.....	1,226	48,982	73	3,081		52,063
Steam coal.....	Ton.....	18,963	69,507	40,674	186,253	69,637	255,760
Fuel oil.....	Gallon.....	40,572	3,072	5,896,460	114,510	5,910,031	117,582
Charcoal.....	Ton.....			234	4,873	234	4,873
Cement.....	Barrel.....	1,068	2,332	3,889	153	4,957	2,485
Machinery.....			124,518		7,691		132,209
Iron and steel manufactures.....			215,065		4,632		219,697
Perfumery and toilet preparations.....			21,174		8,812		29,986
Paint.....			17,045		2,016		19,061
Motor cars.....	Number.....	72	38,537			72	38,537
Gasoline, kerosene, and lubricating oil.....	Gallon.....	492,534	79,806			492,534	79,806
Miscellaneous.....			260,794		23,374		284,168
Total, fiscal year, 1934.....			1,384,371		512,106		1,896,477
Total, fiscal year, 1935.....			984,107		682,898		1,667,005
Total, fiscal year 1936.....			1,267,036		1,047,050		2,314,086

Shipments by commodities

Commodity	Unit	Quantity	Value
Cattle.....	Head.....	473	\$8, 733
Horses and mules.....	Number.....	13	960
Hides.....	Pounds.....	27, 193	1, 247
Bay rum.....	Gallons.....	66, 276	38, 376
Handicraft.....	.....	.....	3, 877
Turtleshell.....	Pounds.....	576	1, 728
Rum.....	Gallons.....	2, 751	9, 057
Bay oil.....	Pounds.....	68	778
Miscellaneous manufactures.....	.....	.....	514
Returned drums and reshipped merchandise.....	.....	.....	92, 044
Total, fiscal year 1934.....	.....	.....	157, 314
United States ports.....	.....	.....	119, 767
Foreign ports.....	.....	.....	37, 547
Total.....	.....	.....	157, 314
Fiscal year 1935:	.....	.....	.....
United States ports.....	.....	.....	131, 043
Foreign ports.....	.....	.....	58, 154
Total.....	.....	.....	189, 197
Fiscal year 1936:	.....	.....	.....
United States port.....	.....	.....	282, 029
Foreign ports.....	.....	.....	46, 388
Total.....	.....	.....	328, 417

The exports to foreign ports consist mostly of reshipped United States and foreign foodstuffs, etc., and returned alcohol containers (to British Guiana). About half of the amount shown is taken by the Dutch West Indies. The Dominican Republic takes some fuel oil and England some turtleshell. Very little bay rum is at present shipped to foreign ports.

The increase in value of shipments to United States ports is a direct result of augmented shipments of rum.

29. From the same source have been obtained the following data on shipments and receipts for the calendar years 1924 to 1935, inclusive, and 6 months of 1936, classified by tonnage and value:

Receipts and shipments (domestic and foreign)

Year	Receipts		Shipments	
	Short tons	Value	Short tons	Value
1924.....	158, 741	\$1, 448, 424	2, 540	\$140, 675
1925.....	91, 401	1, 142, 518	3, 610	196, 626
1926.....	137, 367	1, 717, 090	3, 570	191, 322
1927.....	131, 805	1, 647, 567	3, 850	209, 443
1928.....	137, 417	1, 733, 197	3, 300	182, 791
1929.....	143, 695	1, 796, 191	3, 410	190, 475
1930.....	118, 074	1, 475, 927	3, 760	185, 163
1931.....	77, 857	973, 211	3, 575	191, 413
1932.....	57, 354	716, 928	2, 725	141, 630
1933.....	77, 990	974, 874	3, 210	166, 663
1934.....	127, 634	1, 447, 774	4, 275	218, 741
1935.....	140, 251	1, 629, 184	5, 410	278, 994
1936 (6 months).....	142, 671	1, 387, 384	2, 955	152, 270
Average per year.....	123, 380	1, 447, 221	3, 700	195, 679

30. The chief business of St. Thomas Harbor is the bunkering of ships. The incoming bunkering supplies (coal and fuel oil) are included in "receipts", but the sale of these supplies is not included in "shipments." Such sales, it is stated, for the 12½-year period 1924 to June 1936, amounted, in the aggregate, to 1,402,745 short tons, an

average yearly movement of 112,220 short tons, as compared with an annual average shipment of about 3,700 short tons of all other cargo during this same period.

31. The number of ships reported as calling for bunkers, decreased from a maximum of 397, in 1929, to a minimum of 163, in 1932. Since that date, the number has increased steadily to 243 for the first 6 months of 1936. The demand for oil is increasing, as will be seen from the following data, whereas sales of coal which, in 1933, increased almost 80 percent over the 1932 volume, and, since then, have remained more nearly uniform:

Sale of bunker supplies				
Calendar year—	Number of vessels	Bunkers taken (short tons)		
		Fuel oil	Coal	Total
1932.....	163	17,760	48,450	66,210
1933.....	208	10,090	85,470	95,560
1934.....	237	36,260	72,170	108,430
1935.....	348	67,724	73,650	141,374
1936 (January-June).....	243	58,425	44,823	103,248

32. In the absence of agricultural, mineral, and other resources, the traffic in ships' bunkers is regarded as a factor of paramount importance in the island trade. Local interests are of the opinion that the steady rise in this business, during the past few years, will continue in the future, and that the increase will be more pronounced if a deeper and more commodious harbor is provided. They believe that the increased number of vessels calling for bunkers will develop incidental business in foodstuffs and in articles of local manufacture. Early in 1934, to encourage the bunkering traffic, the island government suspended, for the fiscal year 1935, the collection of ships' dues from vessels discharging fuel for bunkers. Sales prices to ships calling for bunkers were reduced in the amount of the suspended dues. The temporary suspension of dues, started as an experiment, was claimed to have resulted in a substantial increase in the business of bunkering ships, which, in turn, has brought about a general improvement in the economic situation of the harbor and of the island community. The suspension has been continued for a further period of 2 years. A committee, appointed by the Governor to study this matter of suspension of ships' dues, has recommended that the collection of dues be abolished; it is expected that the colonial council will act favorably on that recommendation.

33. Based on United States customs statistics for the first 6 months of the year 1936, the following annual volume of tonnage was estimated as reasonably prospective:

	Short tons
Receipts.....	250,000
Shipments:	
Ordinary commerce.....	6,000
Bunker supplies.....	200,000
	206,000
Total.....	456,000

34. This estimate represents an expectation of a 90-percent increase in the yearly average of 239,300 short tons for the 12½-year period,

extending from 1924 to June 1936. No representation was made that the improvement of St. Thomas Harbor will operate to lower freight rates.

35. *Vessel traffic*.—The following data on vessel traffic for the calendar years 1931 to 1935, inclusive, and from January to June, inclusive, 1936, have been extracted from the December 1935 report of the harbor improvement committee, and supplemented by statistics furnished by the harbor master of St. Thomas, Virgin Islands.

Vessels entered and cleared at the port of St. Thomas, 1931-36

Year	Steam		Motor		Sail		Total	
	Number	Net tons	Number	Net tons	Number	Net tons	Number	Net tons
1931.....	384	932,407	271	267,693	1,360	9,646	2,015	1,209,746
1932.....	409	867,818	293	240,214	1,175	7,839	1,877	1,115,871
1933.....	420	916,651	273	168,235	1,212	7,646	1,905	1,092,532
1934.....	455	1,073,114	320	205,746	1,355	8,371	2,130	1,287,231
1935.....	517	1,371,583	295	232,266	1,404	7,685	2,216	1,611,534
1936 ¹	280	673,510	159	263,513	820	4,354	1,259	941,377
Average per year.....	448	1,060,924	293	250,485	1,332	8,280	2,073	1,319,689
Average per vessel.....		2,368		855		6		637

¹ January-June, inclusive.

36. It was stated that the following vessels, drawing 28 feet or more, entered the harbor during fiscal years 1931-36:

	Vessel
1931.....	39
1932.....	36
1933.....	38
1934.....	25
1935.....	30
1936 (8 months).....	41
Average per year.....	37

37. The office of the harbor master, St. Thomas, maintains a record of the arrival and departure of all vessels of more than 200 net registered tons. Tabulations of lengths and drafts of vessels below have been compiled from data furnished by that office.

Vessel trips (in-bound and out-bound) classified by lengths (steam and motor vessels of more than 200 net tons)

Length (feet)	Vessel trips per calendar year					
	1934		1935		1936 (8 months)	
	Number	Percent of total	Number	Percent of total	Number	Percent of total
601 to 700.....	12	2.6	28	6.3	24	3.6
501 to 600.....	10		32		10	
401 to 500.....	256	57.9	260	66.8	304	59.0
301 to 400.....	240		376		260	
201 to 300.....	316	39.5	256	26.9	318	37.4
200 and less.....	22				40	
Total vessel trips.....	856	100.0	952	100.0	956	100.0

Vessel trips (in-bound and out-bound) classified by drafts (steam and motor vessels of more than 200 net tons)

Drafts (feet)	Vessel trips per calendar year					
	1934		1935		1936 (8 months)	
	Number	Percent of total	Number	Percent of total	Number	Percent of total
Over 30.....	4	15	4	20	44	15
Over 28, and including 30.....	50		60		104	
Over 26, and including 28.....	76		118		142	
Over 24, and including 26.....	134	30	132	31	42	24
Over 22, and including 24.....	72		78		44	
Over 20, and including 22.....	50		92		44	
20 and under.....	470	55	468	49	580	61
Total vessel trips.....	856	100	952	100	956	100

38. It will be noted that trips of vessels of more than 500 feet in length, amounting to less than 3 percent of the 1934 total, increased to more than 6 percent in 1935, and dropped to 3.6 percent in the first 8 months of 1936; drafts over 26 feet, amounting to 15 percent in 1934, rose to 20 percent in 1935, and dropped back to 15 percent in the current year. Local interests explain this sharp rise in the larger vessel traffic during 1935, and the equally sharp drop in 1936, as being the result of an extensive advertising campaign. Due to this campaign, many of the large tourist ships were persuaded to make St. Thomas a port of call in 1935. It was found that the visits were a success, insofar as the tourists were concerned, but that the ship operators encountered many difficulties in handling vessels in the restricted deep-water area of the harbor. Consequently, the operators eliminated the port from the 1936 schedule.

39. Statistics submitted by the governor's committee show that after the slump in shipping, which started in 1930 and reached its lowest point in 1932, there has been a steady increase in the number of vessels calling for bunkers. This number increased from 163 in 1932 to 348 in 1935, and amounted to 243 for the first half of 1936.

40. These facts were the basis for local interests' claim that the port is attracting vessels of greater length and deeper draft than those formerly using the harbor, and for the expectation that this trend will continue. The proponents attempted to show that St. Thomas Harbor, if adequately improved, will attract, in increasing numbers, vessels engaging in the tourist trade, vessels calling for bunkers, and vessels delivering bunkering supplies. Tourist ships and ships carrying fuel supplies are invariably deep-draft vessels, usually exceeding 26 feet. The vessels calling for bunkers ordinarily are the larger deep-draft cargo carriers engaged in long voyages between European and South American ports, or in trips to ports on the west coast of the United States, via the Panama Canal and return.

41. For these reasons, local interests claimed that the development of St. Thomas Harbor is justified, in view of its peculiar geographical position; that it is essential for the preservation of the economic life of the island, due to the lack of agricultural, mineral, and other resources; and that such development is dependent upon a harbor of dimensions adequate to accommodate deep-draft vessels of more than

500 feet in length. This development, it was stated, can be brought about only by removing Scorpion Rock from the mouth of the entrance channel, by deepening the entire channel to 36 feet at mean low water, and by providing an adequate anchorage and maneuvering area in the inner harbor.

42. *Survey.*—A field survey of the locality was commenced in July 1936 and completed in October of the same year. The results are shown on map herewith, in one sheet, file no. P. R. 197. The survey included soundings over the entire area of the harbor. Shore-line features shown on an existing chart were brought up to date by topographical surveys. The harbor area proposed to be improved was probed in some detail to determine the character of material likely to be encountered. Case pipe wash borings were made on Scorpion Rock and at the site of the proposed graving dock.

43. *Plan of improvement.*—The improvements desired by local interests are shown on the accompanying map. There follow estimates of cost of such improvements. An overdepth allowance of 1 foot is included in the items for dredging.

(a) Removal of Scorpion Rock to a depth of 36 feet at mean low water:	
Excavation of about 12,000 cubic yards of sand and loose coral, at 50 cents per cubic yard	\$6, 000
Excavation of about 27,500 cubic yards coral rock, at \$2.50 per cubic yard	68, 750
Total	74, 750
Engineering and contingencies, about 10 percent	7, 250
Total	82, 000
(b) Dredging the entrance channel to a depth of 36 feet at mean low water, 600 feet wide for a length of 2,600 feet, then flaring to 1,400 feet width at its junction with the turning basin:	
Excavation of about 148,000 cubic yards of hard packed sand, at 30 cents per cubic yard	44, 400
Engineering and contingencies, about 10 percent	4, 600
Total	49, 000
(c) An enlargement of the existing anchorage and maneuvering area by 140 acres to a depth of 33 feet at mean low water:	
Excavation of about 2,120,000 cubic yards of mud and sand, at 25 cents per cubic yard	530, 000
Engineering and contingencies, about 10 percent	53, 000
Total	583, 000
(d) Enclosing by bulkheads a triangular area between Havensight Point and Rupert Rock, and filling this area with dredged material to an elevation of 8 feet; a basin or slip of about 200 feet by 400 feet to be provided in the northwest face:	
Steel sheet piles bulkhead with smooth face and rock back-fill, to form slip or basin, 1,150 linear feet, at \$87 per foot	100, 050
Rubble mound sea wall with steel sheet pile core, 1,200 linear feet, at \$75 per foot	90, 000
Rubble mound sea wall (without core), 350 linear feet, at \$60 per foot	21, 000
Total	211, 050
Engineering and contingencies, about 14 percent	28, 950
Total	240, 000

- (e) Construction of a graving dock with capacity for a ship 500 feet long and 26 feet draft, to be located either at the head of Long Bay or at Careening Cove, Hassel Island:

(NOTE.—The following estimate contemplates construction at the head of Long Bay, where test boring indicates ideal foundation conditions at the site offered to the Government without cost. The Hassel Island site is privately owned in part, is remote, and borings indicate poor foundation conditions.)

Graving dock with interior dimensions of 525 feet in length, 85 feet in width, and 30 feet in depth (26.5 feet over the sill), complete with an extra caisson gate, the necessary pumps, a traveling crane, all necessary buildings to house equipment and for storage of materials, but not including power plant and machine shop for ship repairs.....	\$900, 000
Slip or channel from proposed anchorage and maneuvering area (see item (c)), to give access to dock; excavation of about 172,000 cubic yards, of mud, sand and clay at 30 cents per cubic yard (based on the assumption that slip would be dredged by plant at the site for harbor dredging).....	51, 600
Total.....	951, 600
Engineering and contingencies, about 10 percent.....	95, 400
	<u>1, 047, 000</u>

RÉSUMÉ

(a) Removal of Scorpion Rock.....	82, 000
(b) Entrance channel.....	49, 000
(c) Anchorage and maneuvering area.....	583, 000
(d) Bulkheads and sea walls enclosing Rupert Rock area.....	240, 000
(e) Graving dock.....	1, 047, 000
Total cost of improvements desired.....	<u>2, 001, 000</u>

44. Of the foregoing improvements, items *c*, *d*, and *e* are open to question. With reference to item *c*, it appears that the anchorage area outlined by the proponents, covering 140 acres, would serve the general needs of navigation no better than one covering 125 acres and costing \$44,000 less. The area outlined on the accompanying map by the district engineer is designed to provide swinging room for three 550-foot vessels, with sufficient maneuvering area. An accompanying pencil sketch illustrates the proposed lay-out. In regard to item *d*, covering the bulkheading and filling a triangular area between Rupert Rock and Havensight Point, it is believed that the provision of a breakwater between Rupert Rock and the mainland would undoubtedly increase the safety of this port as a hurricane harbor. The improvement committee has submitted data to show that on four occasions since 1916 hurricanes of severe intensity have visited the Virgin Islands, and has listed in an enclosure the damage done on each occasion. In addition to these actual visitations, it appears that each year hurricanes pass south of the island and sufficiently close to cause large seas to roll into the harbor. Hurricanes whose centers pass to the north of the islands apparently do little damage. The estimated cost of the proposed breakwater, \$73,000, is believed to be commensurate with the benefits to be derived. However, the cost of adding to this structure a bulkheaded enclosure and a berthing slip, as advanced by the proponents, and at an additional cost of \$167,000, seems unwarranted, since the only purpose it would serve would be to provide a disposal area capable of holding 550,000 cubic yards of material. All material proposed to be dredged from the entrance channel could readily be pumped as a "beach" into the bight

formed by the breakwater and Havensight Point, strengthening the breakwater structure. Other nearby disposal areas requiring no expensive preparation are available for the reception of material proposed to be dredged from the inner harbor. In regard to item *e*, covering a drydock, the proponents considered the provision of a floating or graving dock, preferably the latter, a desirable adjunct to a port of the character of St. Thomas. A site at the head of Long Bay, near existing machine-shop facilities and electric-power plant, and close to, but not obstructing, the only deep-water terminal in the harbor, is offered to the Government (island or Federal) by the West Indian Co., free of charge. During the survey of the harbor, a wash boring was made at this site, which indicated suitable foundation conditions. Patronage for the dock is assured by the many vessels of 500 feet length and under regularly calling at St. Thomas or nearby Puerto Rican ports. Climatic conditions in St. Thomas throughout the year are ideal for painting vessels in dock. It is reasonable to suppose that vessels now going north to the continental United States for this service would be attracted to St. Thomas. By the same token, vessels in the north could have such work done here during the winter months. Local interests feel that the Navy Department would be vitally interested in a graving dock at this point. It is a fact that there are no drydocking facilities in the American West Indies. However, it is not considered proper for the Department to undertake the erection, maintenance, and operation of a graving dock or floating drydock. It is believed that such facilities should be provided wholly at the expense of the island government or local interests.

45. It may be well to mention here the reasons for advocating a 36-foot entrance channel and a 33-foot anchorage. As in the case of all West Indian ports, there is a constant ground swell running at the entrance to the harbor. Frequent storms of varying degrees of intensity occur in this locality. All storms originating in the southerly quadrant, although passing 75 to 100 miles distant, produce heavy seas rolling into St. Thomas Harbor. These seas usually run for several days after the storm has passed. The channel bottom consists of coral in numerous spots, and for ships drawing 28 to 30 feet, a depth of 8 feet of water under the keel is the least that can be had with any degree of safety. For these reasons, and in view of the number of deep-draft ships that will frequent the harbor, it is considered that the depth of the entrance channel should be not less than 36 feet. The existing project for San Juan Harbor is 38 feet. It is believed the anchorage area should have a depth of at least 33 feet. The previously mentioned swells in the entrance channel continue on into the inner harbor. Also, the aforementioned storms have a tendency to draw the water down as soon as the center of the storm has passed by. The surface of the water in St. Thomas Harbor has been known to have dropped several feet a number of times. On these occasions loaded vessels have been severely strained from resting on the bottom.

46. It is considered that any plan of improvement should include the removal of Scorpion Rock. It will be noted from the accompanying map that this obstruction to the entrance to the harbor consists of a coral shoal with a least depth of about 23 feet. This obstruction lies midway between Cowell Point and Point Knoll. At present, vessels entering the harbor pass to the east of this obstruction.

However, such a course results in a vessel heading cross wind, having to maintain a relatively high rate of speed, and running the risk of grounding on Frederick Point. Once the reach between Frederick Point and Rupert Rock is passed and the inner harbor entered, the speed can be reduced without losing steerage way. There is also the possibility that in bad weather the buoy marking this shoal may drift from its proper location. According to the opinions of the navigators frequenting this port, the removal of Scorpion Rock is of paramount importance for the safety of vessels entering the harbor. The cost of the removal of this hazard to navigation is little more than 10 percent of the cost of the entire improvement. It is considered that the elimination of Scorpion Rock should be included in whatever plan of improvement is ultimately adopted.

47. Upon eliminating certain features of item *c* and all of items *d* and *e* from the desired plan of improvement, the following alternate plan of improvement appears reasonable:

(a) Removal of Scorpion Rock to a depth of 36 feet at mean low water:	
Excavation of about 12,000 cubic yards of sand and loose coral, at 50 cents per cubic yard.....	\$6, 000
Excavation of about 27,500 cubic yards of coral rock, at \$2.50 per cubic yard.....	68, 750
Total.....	74, 750
Engineering and contingencies, about 10 percent.....	7, 250
Total.....	82, 000
(b) Dredging the entrance channel to a uniform depth of 36 feet at mean low water, 600 feet wide for a length of 2,600 feet, then flaring to 1,400 feet width at its junction with the turning basin:	
Excavation of about 148,000 cubic yards of hard-packed sand, at 30 cents per cubic yard.....	44, 400
Engineering and contingencies, about 10 percent.....	4, 600
Total.....	49, 000
(c) An enlargement of the existing anchorage and maneuvering area by about 125 acres to a depth of 33 feet at mean low water:	
Excavation of about 1,960,000 cubic yards of mud and sand, at 25 cents per cubic yard.....	490, 000
Engineering and contingencies, about 10 percent.....	49, 000
Total.....	539, 000
(d) Construction of a breakwater extending from Rupert Rock east-southeasterly about 700 feet to the mainland:	
Placing about 700 linear feet of rubble-mound sea wall, with steel-sheet-pile core, at \$95 per foot.....	66, 500
Engineering and contingencies, about 10 percent.....	6, 500
Total.....	73, 000

RÉSUMÉ OF ALTERNATE PLAN

(a) Removal of Scorpion Rock.....	82, 000
(b) Entrance channel.....	49, 000
(c) Anchorage and maneuvering area.....	539, 000
(d) Rupert Rock breakwater.....	73, 000
Total cost of alternate plan.....	743, 000

48. *Discussion.*—In reviewing the arguments and data presented by the local interests purporting to justify Federal improvement of St.

Thomas Harbor, it appears that the case rests on three major premises: First, that the location of St. Thomas renders the harbor desirable as a fueling station and as a port of call for tourist ships; second, that fostering commercial activity of the harbor will enable this island possession to become self-sustaining; and third, that substantial general benefits will be derived from improved harbor facilities.

49. As to the location of St. Thomas, it is a fact that this island is situated on the direct steamer lanes between Europe and Central and South America and between North and South America. This location has resulted in this port becoming one of the most important fueling stations, not only in the Caribbean Sea but also in the Atlantic Ocean.

50. Under adverse conditions of world trade and with lack of proper port facilities, the volume of bunkering business carried on in this port has continued to be substantial. Due to financial concessions made by the port authorities, consisting of the elimination of ships' dues, this business is assuming a definite upward trend. The location of St. Thomas likewise results in natural advantages of climate. This feature, together with the scenic beauties of the region, has attracted tourist travel to a considerable degree. It is considered that the bunkering and tourist trade will be of a substantial and lasting nature. Statistics presented on the tourist and bunkering business of the port are from reliable sources and have been verified by an examination of the United States customhouse records. Data on length and draft of vessels were compiled from records of the St. Thomas harbor master. The data presented on vessel traffic of the harbor show a substantial number of deep-draft steamers having lengths above the average, a class of shipping ordinarily encountered only in the larger harbors of the world. These large vessels are of two classes: tourist ships, and colliers and tankers. It has been observed that many of the vessels using St. Thomas Harbor are of greater dimensions than those ordinarily using the other harbors of the American West Indies. These vessels experience considerable difficulty in maneuvering the relatively small turning basin in this harbor. The West Indian ports frequented most by tourist ships are Havana, San Juan, Cristobal, Kingston, Curacao, Fort de France, and Martinique. These ports have deep, commodious harbors suitable for the accommodation of large tourist ships. In its present state, St. Thomas Harbor compares unfavorably with these ports. Unless adequate harbor facilities are provided at St. Thomas, larger vessel traffic will be attracted to the aforementioned West Indian ports. The proponents contend that unless the harbor is made safe for the accommodation of these large vessels, and facilities provided, enabling these vessels to maneuver without undue loss of time, this harbor will cease to have the volume of commerce that it now has.

51. Consideration of the improvements leads to the question of the desirability of encouraging commercial activity of this harbor in order to enable this island possession to become self-sustaining. The proponents stress the fact that in the absence of all other resources, the revenues derived from port activities are vitally necessary to the economic life of the islands of St. Thomas and St. John, and it would appear reasonable to suppose that fostering such facilities is a solution to the problem of supporting these islands. It was pointed out that local revenues from all sources are inadequate to pay for the government of the Virgin Islands and that the Federal Treasury is obliged to meet annual deficits by direct appropriations of funds. Evidence

of the peculiar relation between the Virgin Islands and the Federal Government, and of the special treatment found necessary by the Federal Government to maintain these islands, is found in the establishment of a tourist hotel in St. Thomas at Federal expense, the activities of the Virgin Islands Corporation, and the exemption of St. Thomas, by Executive order, from restrictions of the coastwise shipping law. Local interests believe that these precedents of unusual consideration for the locality by the Federal Government might well be extended to include the development of a harbor at St. Thomas which would assist in enabling the island to finance its own government. In further substantiation of this point, it is contended that an expansion of the commerce of this port, resulting from an improved harbor, would increase revenues of the local government, thereby relieving the Federal Treasury of appropriations of national funds. The Governor of the Virgin Islands considers the harbor of St. Thomas comparable with the sugarcane industry on the neighboring island of St. Croix. The Federal Government is financing the sugar crops as a means of rehabilitating St. Croix and of assuring a medium of future prosperity for that island. The Governor believes that development of St. Thomas harbor by the Federal Government is justified on the same grounds.

52. In connection with the revenues inuring to the island government, attention is invited to the fact that the St. Thomas Harbor Board collects all port fees. One-half of the amount collected is turned over to the island government. As previously stated, the Federal Treasury has had to contribute some \$90,000 annually to make up the deficit of the island government. It thus appears that any harbor works constructed with Federal funds tending to increase the commerce of the harbor results in increased port fees. Any increase in these fees results in a national benefit by reducing the amount contributed by the Treasury toward the maintenance of the functions of the island government.

53. A further manner in which the economic life of these islands can become self-sustaining, is found in the tourist business. As previously stated, a tourist hotel has been established in St. Thomas with Federal funds. A large part of the native income is derived from the sale of handiwork consisting of basketwork, woven fabrics, carved shell, etc. The benefits to be derived from this activity are discussed further in the report.

54. In analyzing the data submitted by the proponents, and in considering the facts obtained by investigation, it was found that a substantial amount of general benefits would accrue from a reasonable improvement of the harbor. These benefits may be divided into the following classifications:

- (a) Reduction in delays of maneuvering vessels.
- (b) Elimination of hurricane damages.
- (c) Increment of port fees.
- (d) Increment of tourist travel.
- (e) Increased sales of provisions and supplies.
- (f) Reduction in sale price of fuel and increased return from taxation.

55. With reference to delays to vessels, statistics have been submitted to show that during 11 months of 1935, about 220 ships of 5,000 tons and over, lost time in maneuvering, as a result of the existing restricted areas. The total time aggregated 6 days. The approximate delayed charter value of this class of vessel was given as

\$500. It was claimed, therefore, that an inadequate harbor has caused navigation interests a total loss of \$3,000 during that period. On an annual basis this figure would be \$3,275. This same rate of lost time is understood to have continued to date.

56. It is obvious that improvement of St. Thomas Harbor would result in greater safety to vessels. The proposed improvement would not only facilitate the maneuvering of vessels within the limits of the harbor but would also render this port suitable as a hurricane harbor. As previously stated, four hurricanes have visited the islands in the past 16 years. The total estimated damage to shipping from these hurricanes has amounted to \$673,000, an annual average of about \$42,000, according to the Governor. While it is obviously unreasonable to expect that the proposed improvement would eliminate all future damage to vessels from hurricanes, it is considered that 50 percent of this amount, or \$21,000, would be a fair basis on which to discuss the economic advantages to be derived.

57. As previously stated, an increase in port fees would result in a reduction in the annual Federal appropriations for the maintenance of the island government. Between February 19, 1934, and March 31, 1935, additional revenue of \$10,347 was derived by the Harbor Board from an increase of 40,524 tons in the amount of oil bunkered. The total bunkering is expected to reach 200,000 tons annually if the harbor is improved or 59,000 more than that done in 1935. By applying the same ratio, an increase of \$14,750 in port fees may be expected. One half of this amount, or \$7,375, would be the amount by which the receipts of the island government would be increased. Any increase in the commerce of St. Thomas Harbor, whether from receipts or sales of fuel or from tourist ships, will be in the form of large deep-draft vessels. Advance arrangements have been made with vessel operators for the arrival of seven tourist ships during the 1937 season. It is fully expected that arrangements will be made for additional visits by these vessels as the schedules of the operating companies develop. The number of vessels calling for refueling should steadily increase due to the favorable prices the West Indian Co. is able to quote. Inviting attention to paragraphs 35, 36, and 37 of this report, there is no reason to believe that the increasing numbers of deep-draft vessels, as listed therein, will not continue.

58. With reference to the benefits to be derived from increased tourist traffic, data were submitted to show that a further increment of St. Thomas' income would accrue through increased tourist traffic. It was stated that 20 tourist ships carrying 8,000 passengers had spent about \$80,000 on the island, and that four additional ships had been unable to enter the harbor. Sales by the native cooperative store alone amounted to \$12,750. Sales of native goods in other stores brought this total up to \$25,000. The income from the sale of handiwork results in almost all profit to the natives, say 75 percent or \$18,750. Assuming a normal profit of 20 percent on the remaining tourist business, a figure of \$11,000 results, the local benefit from the present tourist trade accordingly amounts to \$29,750. Had the four ships previously mentioned been able to enter an improved harbor, this amount would have been increased by 20 percent, or \$5,950. In view of the fact that the harbor constitutes the sole source of revenue of the population of St. Thomas, the island government would gain at least 50 percent of \$5,950 in the form of taxation and reduced relief outlays, or \$2,975.

59. The elimination of harbor dues has already diverted commerce to St. Thomas from Curacao. Between January 1, 1934, and May 1, 1935, 64 ships of the Compagnie General Transatlantique bunkered at St. Thomas, an average of 4 ships a month. Each of these ships spends on an average of \$200 per month for provisions, etc. At this rate, 48 ships would spend \$9,600 annually in this port, amounting to \$200 a year for each ship. As previously stated, 463 vessels called during 11 months in 1935, or about 505 on an annual basis. If the number of vessels increases, as claimed, to 700 annually, and each of the additional 200 vessels spent \$200 annually for provisions, the revenue of this nature would amount to \$40,000 annually on the increased business. It is reasonable to assume that at least 10 percent of this amount, or \$4,000, would be of general benefit.

60. By agreement with the island government, the West Indian Co. pays an excess of 40 cents per ton for the manual bunkering of 25 percent of the total coal bunkered, as a means of providing employment. Since 1932, an average of 73,877 tons of coal are bunkered annually on which an average of \$7,388 has been paid by the company for manual bunkering. It is claimed that the increased demand for labor in other forms of harbor activity will result in the elimination of this subsidization of labor, and, in view of the competitive nature of the bunkering trade, it would be likely that the West Indian Co. would pass this saving on to general navigation in order to increase its business.

61. Another source of income to the island government is the payment thereto of taxes by the West Indian Co. In 1932, with total sales of bunker supplies of 66,210 tons, no taxes were paid. In 1933, \$2,108 was paid on the basis of sales of 95,560 tons; in 1934, \$6,096 on 108,430 tons. If, as is claimed, improvement of the harbor will result in increased annual sales of 100,000 tons, additional taxes to the extent of \$5,000 may be paid.

62. A recapitulation of the foregoing annual general benefits follows:

Lost time in maneuvering.....	\$3, 275
Hurricane damage.....	21, 000
Increased island government income from port fees.....	7, 375
Increased island government income from tourist vessels.....	2, 975
Increased island government income from freight vessels.....	4, 000
Savings to navigation in cost of bunkering coal.....	7, 388
Increased taxes from West Indian Co.....	5, 000
Total.....	51, 013

63. An economic analysis of the justification follows:

(a) Federal investment:

(1) Estimated expenditure by Engineer Department for new work.....	\$743, 000
(2) Estimated expenditures by other Federal departments (Lighthouse Service).....	1, 070
(3) Total Federal first cost.....	744, 070
(4) Interest during construction.....	0
(5) Total Federal investment.....	744, 070

(b) Federal annual carrying charges:	
(1) Interest (4 percent item (a) (5))	\$29,763
(2) Amortization of obsolescence and depreciation:	
Dredging, \$650,000 with 50-year life, at 4 percent=	
0.66 percent	4,290
Breakwater, \$73,000 with 40-year life, at 4 percent=	
1.05 percent	767
(3) Increased cost of maintenance and operation	12,000
(4) Total Federal carrying charges	46,820
(c) Nonfederal investment	0
(d) Nonfederal carrying charges	0
(e) Total carrying charge:	
Item (b)	46,820
Item (d)	0
Total	46,820

64. As stated in paragraph 62, annual general benefits of \$51,000 would accrue if the proposed improvement were undertaken. As shown in paragraph 63 (e) the total carrying charges would be \$46,820. The ratio of general benefits to Federal carrying charges is thus 1.1:1.

65. In addition to the foregoing general benefits, there are the intangible and imponderable benefits. There is to be considered the substantial improvement of the harbor already accomplished. The total cost of the dredging that has been done in the harbor, at local expense, amounts to \$1,269,000. In addition, \$140,000 of Federal funds have been expended for the removal of a wreck and dredging for the improvement of sanitary conditions. A tabulation of that data follows:

Dredging by Danish Government in 1864	\$169,000
Dredging by Government of Virgin Islands in 1910	100,000
Dredging by West Indian Co. in 1911-12	1,000,000
Removal of floating drydock by United States	60,000
Dredging for fill along slip of West Indian dock and in Haulover	
Channel with Federal recovery and relief funds	80,000
	1,409,000

It thus appears that the amount already expended by local interests is nearly twice the amount necessary to render St. Thomas Harbor capable of accommodating the substantial commercial navigation on this waterway. To indicate the size of vessels in this traffic, the following comparison of vessel movements in St. Thomas and San Juan harbors is shown for the year 1934:

Draft	St. Thomas	San Juan
Over 24 feet	151	37
Over 28 feet	29	1
Over 30 feet	6	0

66. In addition to both the self-supporting aspect and intangible benefits of this project, there is the strategic value to the Navy of having an adequate harbor provided at St. Thomas. It will be recollected that one of the reasons advanced for the purchase of the Virgin Islands from the Danish Government, was its strategic position as related to the defenses of the Panama Canal. If St. Thomas Harbor is improved, as proposed, it would be admirably suited not only as a

fueling station, but a base of operations as well. In an emergency, a floating drydock could be established on short notice. With very little dredging, sufficient depth of water could be made so as to dock vessels drawing up to 30 feet. Thus the greater cost of a graving dock could be saved. For obvious reasons, representatives of the Navy Department are loath to make statements relative to national defense that are likely to be made public in a congressional document. Accordingly, there is no statement herein recording the views of naval officers.

67. The local interests promise cooperation in any improvement undertaken, to the extent of releasing the United States from all claims which may arise incidental to the execution of the project, and of furnishing, free of cost, adequate disposal areas for dredged material. Further, if a graving dock is to be built and operated by a Government agency, a suitable site is promised, free of cost. The proponents mention the possibility of a financial contribution from the treasury of the harbor board, without naming a definite sum. Through informal discussions it has been learned that such contribution could not exceed \$20,000 and might well be less, and that the promise of this contribution was based on the expectation that a filled area and berthing slip would be constructed at Rupert Rock, for the use, primarily, of the harbor board. This item of improvement is not included in the plan recommended by the district engineer. The proponents regard local cooperation as a sacrifice already made of ships' dues on tankers and colliers discharging bunkering supplies, on the grounds that such a premium was necessary to induce the long, deep-draft vessels in this trade to use the existing limited harbor facilities.

68. *Water power.*—St. Thomas Harbor is tidal, therefore the question of water power is not pertinent.

69. *Other special subjects.*—Land reclamation could be combined with the improvement, but probably would not reduce the cost to the United States. Protection from floods is not pertinent. The improvement would have no erosive effect on the shore line. The local superintendent of lighthouses has been consulted as to the improvements herein recommended, and he concurs in the proposed location thereof. He estimates \$1,070 as the cost of the additional buoyage involved.

70. *Conclusions.*—Local interests, during the preliminary examination, made claims that the improvement of St. Thomas Harbor would permit more efficient handling of existing commerce, and would ensure greater safety to shipping. Such claims, which then appeared justifiable, are believed to have been confirmed by the survey. This confirmation is found, as previously shown, in the fact that the annual general benefits amount to \$51,000, and that the ratio of such benefits to the carrying charges is 1.1:1. Such improvements should take the form of a clear entrance channel of 36 feet controlling depth, an adequate maneuvering and anchorage basin 33 feet deep, and a breakwater to protect existing and proposed harbor works from injury by southerly storms of hurricane force which occasionally visit the island. Scorpion Rock, midway between the harbor headlands, is a hazard to navigators entering the harbor. In a storm there is the probability that this rocky shoal would be a real danger, particularly if the buoy should shift or go adrift. If the spot were removed, it is believed the port authorities could dispense with compulsory pilotage, with a resulting saving to navigation interests of considerable proportions.

The cost of the removal of this hazard to navigation is little more than 10 percent of the cost of the entire improvement. It is considered that the elimination of Scorpion Rock should be included in whatever plan of improvement is ultimately adopted.

71. A graving dock would add materially to the revenue of the island government. Such a structure at this port would be of great benefit to the American merchant marine. It is probable, as local interests claim, that the United States Navy Department would find the dock of service. Certainly vessels of the Engineer Department, the Lighthouse Department, and the Coast Guard Service, in this district, could be docked there at substantial savings to Federal appropriations. As previously stated, however, the provision of such docks is not a proper undertaking of the Department.

72. The cost of bulkheading a triangular area in the vicinity of Rupert Rock, with provision for a slip or basin for berthing small vessels, is considered disproportionate to the benefit to be derived by the United States from the use of the enclosure as a spoil area.

73. It appears that the island government is not self-supporting; budget deficits, amounting to nearly \$100,000, have to be met annually by direct appropriations of Federal funds. Increased revenues resulting from harbor improvements would serve to reduce these annual appropriations. It is considered, therefore, that the creation of a permanent improvement tending to place this locality on a self-supporting basis, is one of national benefit. In view of the dependence of the locality on grants of public money to meet operating expenses, it would appear illogical to require of local interests a financial contribution toward the cost of improvements. The strategic value of St. Thomas Harbor from the standpoint of national defense has been given much thought and study by the district engineer in forming his conclusions and recommendations.

74. *Recommendation.*—It is recommended that a project be adopted for St. Thomas Harbor, as shown on the accompanying map, to provide an entrance channel with a depth of 36 feet at mean low water, including the removal of Scorpion Rock to the same depth, an anchorage area with a depth of 33 feet, and a hurricane breakwater at Rupert Rock, all at an estimated cost of \$743,000, with \$12,000 for annual maintenance, provided, that the work shall not be undertaken until the following conditions are satisfied:

(a) That local interests furnish free of cost to the United States suitable disposal areas for the retention of dredged material;

(b) That perpetual easements, satisfactory to the Secretary of War, be furnished free of cost to the United States, to whatever lands necessary for the construction and maintenance of the breakwater; and

(c) That local interests give assurances that the United States will be held free from any damages which may arise from the execution of the project.

75. In order to secure the most economical and advantageous prosecution of the work, one initial allotment of \$743,000 should be made available.

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