3. To give an additional width to the channel opposite stations 14 and 16, making it about 100 feet in width.
4. To remove the point and the large stump thereon at stations 18 and 20.
5. To excavate a channel about 100 feet wide through the shoal opposite stations 20 and 22.
6. To excavate a channel or cut-off, about 80 feet wide, through the point of land opposite the farm of Dighton.
7. To excavate a channel about 80 feet wide between Partnership Island and the mainland.
8. To remove the shoal and stone ballast between stations 55 and 57.
9. To excavate a channel between Mobile Island and the north river bank, about 130 feet wide.
10. To excavate a channel above station 61, between the shoal and the south river bank, to a width of about 130 feet.

Total amount of excavation about 35,000 cubic yards, but this may be increased or diminished, if the prices justify or require.

All excavations to be to a depth of 7 feet at mean low-water. The approximate positions of the points where work is to be done are shown on a map in the United States Engineer Office in Baltimore, which will be exhibited to bidders, *but all bids will state whether the bidder has made an examination of the portion of the river to be improved.*

The material consists of sand with drift-wood intermixed at intervals, at one point a deposit of small stone ballast, all underlaid by a thin deposit of mud. The material in the cut-off is mud and sand, thickly interlaced with roots of small and larger timber. The dredged material will be deposited on the adjacent flats, not nearer than 120 feet to the nearest edge of the cutting, except whenever it may be convenient to deposit it on the bank, in which case it must be placed far enough beyond the line of growing timber to prevent its running back into the channel.

The tide rises 2 feet and 2 tenths. The location of the work is sheltered.

Before work is begun under item 6, a written consent of the owner of the soil must be furnished to the United States engineer by the contractor, containing a guarantee that no claim for compensation of any kind whatever will ever be made against the United States, and that no interruption to the work shall be made by the owner of the soil or any agent, heir, or assign.

All machinery to be used must be of approved make and in good repair, and together with scows to be sound and tight and maintained in good working order all the time.

The material will be measured *in situ* before work begins, or in scows or barges whose capacity shall be determined by the engineer in charge or his agents. The duty of determining full loads or otherwise shall devolve upon inspectors appointed by the engineer, and the decision of said inspectors, acting under orders of the engineer, as to the amount of material excavated and removed, as well as to its location and deposit, shall be final and without appeal. Should it be decided to pay for the work as measured in place, the quantity will be determined from accurate cross-sections before and after completion of the work.

Lump bids for the whole work will be considered.

Bidders will state carefully what method of measuring material is contemplated in their bids.

The price paid for excavation will cover all costs of removing timber, stumps, and roots, and all clearing and cutting of growing timber.

METHOD OF WORKING.

The precise location of the work to be done shall be fixed by the engineer in charge or his assistants. The lines shall be plainly marked by stakes, and a register of tides provided by the engineer; and the contractor will be responsible for the care and preservation of the line, stakes, and gauges. He shall pay for all loss or delay arising from the loss or injury of any of the said marks or gauges occurring through the action of his employés or agents, and shall not be paid for any excavation done beyond the limits assigned him. An allowance of $\frac{1}{2}$ foot will be made for the unavoidable filling in behind the bucket, and all excavation below this depth, as well as any deficiency in the depth of seven (7) feet as before mentioned, shall be deducted from the amount of excavation as allowed by count of "scow loads" or such other method of measurement as may be determined upon. Said excess or deficiency shall be determined by examinations made by the engineer or his assistants at suitable intervals behind each dredge. Furthermore, in the event of a deficiency in depth being found, the contractor shall, upon notification, redredge the bottom until the required depth is obtained.

A copy of this advertisement and specifications will be attached to the contract, and form a part of it. All questions arising under these specifications or the contract will be decided by the engineer without appeal on the part of the contractor.

The right to reject any or every bid is reserved.

WM. P. CRAIGHILL,
Major of Engineers.

This project having been approved by the Chief of Engineers, a contract was made with Mr. D. Constantine, of Baltimore, dated January 24, 1879, the work to be completed June 30, 1879. Ice and bad weather having caused delay, the time for completion has been extended to August 31, 1879. The map herewith shows the condition of the river when surveyed by Mr. Parsons, the extent of the work required by the contract of Mr. Constantine and the amount done up to the 30th of June, 1879.

The Pocomoke is in the collection-district of Crisfield, and the nearest light-house is that of Watt's Island.

Money statement.

July 1, 1878, amount available	$10,000 00	
Amount appropriated by act approved March 3, 1879	2,500 00	
		$12,500 00
July 1, 1879, amount expended during fiscal year	6,592 81	
July 1, 1879, outstanding liabilities	630 00	
		7,222 81
July 1, 1879, amount available		5,277 19

Proposals for dredging Pocomoke River, Maryland, opened at 12.5 p. m., December 18, 1878.

No.	Name.	Residence.	Time. Commence—	Time. Complete—	Price per cubic yard, &c.	Remarks.
1	Geo. C. Fobes & Co.	Baltimore	Jan. 1, 1879	.....	$130 per day.	
2	Daniel Constantine	....do	Feb. 1, 1879	June 30, 1879	*$0 23	Measured in scows.
					*26	Measured in situ.
3	George W. Parsons.	Salisbury, Md.	2d Mond. in Jan., 1879.	Nov. 1, 1879	24†	Material to be measured in situ.§
					33‡	
4	E. W. Ferris	Baltimore	Feb. 15, 1879	June 30, 1879	30	Measured in scows.
					35	Measured in situ.

Contractor, Daniel Constantine, at $9,000.

*Lump bid $9,000. †Except item 5. ‡For item 5.
§Lump bid $9,200, machinery to be towed to proximity of work.

REPORTS OF MR. GEORGE W. PARSONS, ASSISTANT ENGINEER.

1.

SALISBURY, MD., *October* 3, 1878.

COLONEL: I respectfully submit the following report of an examination of Pocomoke River, together with a survey and map of that part of the stream extending from the iron bridge at Snow Hill to a point 5.28 miles below, in accordance with your instructions of 16th of July.

Pocomoke River rises in Great Cypress Swamp, a section of country partly in Delaware and partly in Maryland, over 100 square miles in extent, which is covered with timber growing, for the most part, out of soft mud. Thousands of acres of the surrounding black alluvial soil are drained by ditches, which empty into that swamp, the watershed of the entire area finding an outlet through the Pocomoke. It is subject to annual freshets, which cause a rise in the river of from 1 to 5 feet above ordinary tide level. These freshets (and indeed every heavy rain-fall) carry with them more or less of fine mud that is held in suspension and moved along the length of the river by the out-flowing current until it reaches a wide estuary of Tangier Sound, into which the river empties; there the current loses its force, and the mud is deposited on the bottom. Here the accumulations of years have extended, over an area 4 miles wide and 4 miles long, to an average depth of 20 feet.

This deposit, called the "muds," has upon it at low-tide a nearly uniform depth of from $4\frac{1}{2}$ to 5 feet water. These "muds" are a barrier to vessels of deep draught which

otherwise would find a sufficient depth of water in the river to enable them to navigate it to within a few miles of Snow Hill.

To construct and maintain a channel across these "muds" would be an expensive work—one, in my opinion, not justified by the existing or prospective demands of commerce.

At present the class of sailing-vessels and steamers carrying the trade of the river pass over the "muds" with slight detention from calms and low tide, being able, with good winds for the sailing craft, to made headway, with their keels dragging through from 1 to 1½ feet of its slight consistence. These vessels and steamers seem ample for all the needs of trade.

The survey has, therefore, been confined to the upper part of the river, wherein shoals, bars, and other obstructions exist, rendering its navigation a matter of great difficulty.

Snow Hill, the county seat of Worcester County, is a thriving town of 1,400 inhabitants. It is situated on the line of the Worcester Railroad, and has daily communication with Baltimore, Philadelphia, and New York. It also has semi-weekly steamers to Baltimore, and is the center of a large lumber, grain, and general merchandising trade. At present navigation terminates there, the river at that point being spanned by a stationary iron bridge of 121 feet span. The inhabitants propose to substitute a drawbridge for the stationary structure, which will open to navigation nearly a mile of good depth of water, free from obstructions, and also afford eligible sites for building wharves, facilities for the extension of which are now rather limited. Alongside the wharves at the town, below the bridge, the channel is from 100 to 140 feet wide, 7 to 12 feet deep.

The first obstruction to navigation is a bar below the town, lying in an abrupt bend of the river, with barely enough water in a narrow, crooked channel to allow loaded vessels to cross at high-tide. It is with difficulty they are able to cross at any time, and if the wind blows they are detained from two to three days. This bar requires dredging in depth and width, and the point below, at stations 11 and 13, should be removed, to afford easy curves and better navigation.

Below Robbins' Wharf are a bar and shoal, a projecting point opposite stations 17 and 19, on which is a large stump, 10 feet in diameter, near the edge of the channel, barely covered at low-water, a shoal and bar opposite stations 27 and 29, all known as Hough's Shoals. To improve this section of the river, a channel 7 feet deep, from 120 to 150 feet wide, should be deepened along the north and west side of the bars and shoals, and the point and stump removed.

The narrow channel southeast of Partnership Island should be widened to 120 feet, 7 feet deep, and the point at station 41 cut off. This will shorten the distance, making a channel easy to navigate, and protect vessels from contact with the ragged and dangerous shore of Horseshoe Bend.

A shoal between stations 55 and 57, formed around a nucleus of stone ballast thrown overboard at that point years ago, requires entire removal. The bar north of Mobile Island and the bar south of Nassawango Creek should have a channel widened and deepened upon their northwestern edges.

A sunken tree projects into the channel just below station 64. It is dangerous to vessels and requires removal.

Shabroon Point and the bars at Upper and Lower Islands are troublesome obstructions. The bar at Upper Island has been partially formed around deposits of stone ballast. These bars require dredging upon the north and west, and 100 feet cut off of Shabroon Point.

A mud bar has formed below Shad Landing. Its removal is not considered necessary, as ample depth and width of channel are found to the south of it.

No other obstructions to navigation are known to exist in the channel of the river below this point to its mouth, having a depth of 14 to 25 feet.

At several bends along that portion of the river included in the survey the channel runs close in to the timber growth, its edge being thickly studded with ragged stumps and the peculiar ninepin growth firmly imbedded in the bottom. Their sharp protruding points endanger passing vessels, and instances of their sinking sailing vessels and damaging the paddle-wheels of steamers are not rare. Fender-piles have been provided at the worst of the places.

Fifty additional fender-piles, firmly driven at the most exposed points, would be an economical and efficient protection.

All the dredging proposed is to a depth of 7 feet, and to widths of from 120 to 150 feet, except on the bar below the town, where greater width is required for an easier curve, and is considered sufficient for the present and prospective needs of the commerce of the town.

The material to be removed is sand, gravel, and mud, with stone ballast at the points named and at Hough's Shoals intermixed with sunken saw-logs and trunks of trees. It can be deposited on the adjacent flats, out of the way of freshets, or towed and dumped into deep water below Shad Landing. The location is perfectly sheltered.

The survey was determined by triangulation, from stations erected as near low-water mark as the growth along the shore would admit. These stations are preserved by numbered stakes driven into the bottom; they are located and numbered on the map. About two-fifths of the soundings taken are shown upon the map. They are placed 21 feet apart on the cross-section lines, expressed in feet and hundredths, and refer to mean low-water as determined from daily observations of the tides from August 14 to September 3; average rise of tide, 2.21, feet.

Two graduated tide-gauges were set, one at each end of the iron bridge at Snow Hill. A check was made upon the gauge at the northwest end of the bridge by driving two large spikes in a line at 1 foot above zero.

I desire to express my thanks to Capt. William E. Timmons, a public-spirited citizen of Snow Hill, for valuable assistance and information. To him belongs the honor of navigating the first steamer to Snow Hill. My thanks are also due to Capt. William Thompson and Capt. J. H. Wilson of the Eastern Shore Steamboat Company for valued information.

I append an estimate of the cost of the proposed improvement.

Respectfully, your obedient servant,

GEO. W. PARSONS.

Col. WM. P. CRAIGHILL,
Major of Engineers, U. S. A.

ESTIMATE FOR IMPROVEMENT OF POCOMOKE RIVER.

	Yards.
For dredging a channel and turning ground on the bar below Snow Hill, including dredging the point at stations 11 and 13	6,628
For dredging Hough's Shoals and the point at stations 18 and 20	6,581
For widening and deepening the channel southeast of Partnership Island, including dredging the point at station 41	6,685
For dredging the bars and removing shoal at Nassawango Creek	1,029
For dredging Shabroon Point and the bars above and below	9,702
	30,625

30,625 yards dredging, at 25 cents	$7,656 25
Furnishing and driving 50 piles, at $2.50	125 00
Removing stumps at stations 18 and 20	50 00
Removing sunken tree near station 64	20 00
	7,851 25

GEO. W. PARSONS.

2.

BALTIMORE, *November* 8, 1878.

SIR: Since I submitted to you my report of the survey of Pocomoke River, certain modifications in the plans then suggested for the improvement of that stream have been more thoroughly considered after a supplementary survey of October 30 and 31, and are hereby submitted.

I have abandoned for the present the excavation above and below and at Shabroon Point itself. A better channel exists there than can be obtained above that point with the present appropriation. A less width of channel is also recommended than at first proposed. The amount from these sources I propose to be used in excavating a cut-off or channel through the point of woodland opposite the farm of Dighton, in the same line as the channel excavated between Partnership Island and the south river bank. This will afford a straight channel, shorten the distance, and get rid of two of the most difficult and abrupt bends in this part of the river.

The proposed cut-off and lines to which the existing channel should be dredged are shown upon the map in dotted black lines.

I also append a table of areas of cross-sections of the river at five of its narrowest points, from which may be determined the width of channel it will safely bear.

I also add an estimate of the quantity and cost of excavation at the various points named.

Very respectfully, your obedient servant,

GEO. W. PARSONS.

Col. W. P. CRAIGHILL,
United States Engineers.

ESTIMATES FOR DREDGING POCOMOKE RIVER.

	Cub. yds.	
Dredging a cut 650 feet below and in front of the wharves at Snow Hill	811	
Dredging the channel opposite Fishing Battery, 1,100 feet long, 122 feet wide, 7 feet deep	3,354	
Dredging point, stations 11 and 13, 140 feet in length	114	
Dredging channel opposite stations 14 and 16 to width of 100 feet, 7 feet deep, 660 feet in length	303	
Dredging point and removing stump, 18 and 20	721	
Dredging shoal between 20 and 22, length 500 feet, width 100 feet, to 7 feet depth	1,480	
Dredging channel through point opposite Dighton, 80 feet wide, 624 feet long, 7 feet deep		14,791
Dredging channel through Partnership Island, 950 feet long, 80 feet wide, 7 feet deep	9,074	
Dredging bar and stone ballast, 360 feet long	1,450	
Dredging opposite Mobile Island to the width of 130 feet, 420 feet long, 7 feet deep	1,412	
Dredging channel above 61, 600 feet, 130 feet wide, 7 feet deep	1,659	
	20,378	14,791
	.25	.33
	$5,094 50	$4,881 03

Sectional areas, Pocomoke River.

	Width on surface.	Square feet.
Line of soundings above stations 1 and 2	160	1,079.20
Between 5-foot curves	120	977.40
Between 7-foot curves	80	705.60
Line of soundings, 10 to 13	200	1,741.62
Between 5-foot curves	155	1,579.52
Between 7-foot curves	145	1,507.42
Line of soundings, 30 to 33	200	1,591.00
Between 5-foot curves	150	1,385.00
Between 7-foot curves	110	1,208.00
Line of soundings, 48 to 51	160	1,813.70
Between 5-foot curves	120	1,601.49
Between 7-foot curves	110	1,566.54
Line of soundings, 60	220	2,727.00
Between 5-foot curves	180	2,550.00
Between 7-foot curves	170	2,478.00

F 8.

IMPROVEMENT OF ONANCOCK HARBOR, VIRGINIA.

The law of June 18, 1878, directed an examination or survey of this harbor, which is in Accomac County, on the eastern shore of Chesapeake Bay.

The duty was performed under the supervision of Capt. C. B. Phillips, Corps of Engineers, between November 26 and December 3, 1878. His report, dated January 24, 1879, is appended hereto, having been previously printed separately in House Ex. Doc. No. 68, Forty-fifth Congress, third session, pages 10, 11, and 12. A map accompanied the report.

A description of the harbor and bar and the obstructions to navigation, as well as statistical information concerning the commerce to be benefited by the improvement, are given in the papers appended to the report of Captain Phillips. At present there are only about 4½ feet of water on the shoalest part of the bar at mean low-water, and about 6 feet at the shoalest part of the approaches to the wharves.

It was proposed to excavate a channel across the bar 8 feet in depth at ordinary low-water, and 300 feet wide, as well as a channel 8 feet in depth and 100 feet in width through the mud flats at the approach to the wharves, at an estimated cost of $8,800 for the work on the bar, and $1,200 for that near the wharves.

An appropriation of $3,000 was made by the law of March 3, 1879, not quite one-third of the estimate for the improvement. Upon a call made April 7 for a project of expenditure of this appropriation, it was recommended April 29 that the money be used in dredging on the bar to a depth of 8 feet at mean low-water, the width to be given to the channel to be as great, about 100 feet, as the funds would allow.

This project was approved by the Chief of Engineers, but permission to begin the work was withheld.

For small works like this the most economical course unquestionably is to appropriate the whole amount of the estimate at once. Captain Phillips used the following language in his report: "If this work should be provided for by Congress, it will be a matter of regret if the whole amount is not given in one appropriation." The amount asked for the fiscal year ending June 30, 1881, is therefore the difference between the original estimate and the last appropriation, which is also the first and only one thus far.

This place is in the collection-district of Cherrystone, Virginia, and the nearest light-house is that at Watt's Island.

Money statement.

Amount appropriated by act approved March 3, 1879	$3,000 00
July 1, 1879, amount available	3,000 00
Amount (estimated) required for completion of existing project	7,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881	7,000 00

COMMERCIAL STATISTICS.

CUSTOM-HOUSE, DEPUTY COLLECTOR'S OFFICE,
Onancock, Va., July 5, 1879.

SIR: In reply to your letter of the 30th ultimo, I have to inform you that Onancock, Va., is located in the collection-district of Cherrystone. The nearest port of entry is Eastville, distant about 6 miles, and the nearest light-house is Watt's Island, distant about 10 miles.

The amount of duties on imports collected in this district for the past fiscal year was $530.76; we have no direct importations. The amount just named was paid on goods saved from vessels wrecked on our sea-coast.

At this port there are 205 vessels documented, and the hospital and fee collections for the year ending June 30, 1879, aggregated $1,529.57. Seventeen vessels are engaged in trading from this creek, besides the steamers Tangier and Maggie; large quantities of truck are shipped annually; of potatoes alone 78,000 barrels were sent in 1878. The detention on the bar is often injurious to such freight, its perishable nature rendering rapid transportation highly important. Apart from that drawback, it is universally held here that an increase of water on the bar, to say 8 feet or 10 feet of water, would open up new and desirable markets.

I shall be pleased to answer any further inquiries or to render any service in my power.

Very respectfully,

THOMAS W. TOY, JR.,
Deputy Collector.

COLLECTOR OF CUSTOMS,
Baltimore, Md.

F 9.

IMPROVEMENT OF THE JAMES RIVER BELOW RICHMOND, VIRGINIA.

In the summer of 1870 the first examination of the James River was made after the war, with a view to its improvement by the United States. The first appropriation was in July, 1870—$50,000. At that time but 8 feet of water could be carried to the city of Richmond at low-water, which was equivalent to 11½ feet at high-water. The great freshet of 1870 reduced the depths to 7 and 10½ feet. Besides the natural obstacles to navigation, others quite formidable existed, which had been placed in the river by the Confederate authorities, or were otherwise the result of the war. These consisted of sunken vessels, cribs of timber filled with stone, and remains of the supports of military bridges. Previous to that time very little money had been appropriated by the United States for the James River. What had been available from that source had been chiefly expended in dredging, generally in co-operation with the authorities of the city of Richmond, who had from time to time spent considerable sums in the purchase of dredges and other machinery, and in operating it. Many large and small bowlders had been removed from the upper part of the river near the city, and a small portion of the rocky ledge at Rocketts had been excavated. A very important defect in the dredging operations had been the deposition of the material removed from the river in places where it could eventually find its way back into the channel again.

The very high freshet of the autumn of 1870 led to the opening to navigation of the Dutch Gap Cut-off. The opening of this cut-off had been suggested by Captain Stansbury, United States Engineer, many years before.

The first operations undertaken were the removal of sunken vessels and the remains of bridges. Work was also begun ou the Dutch Gap Cut-off and the reef at Rocketts. Dredging on the worst shoals was resumed, and the construction of dikes begun, their double object being to afford a place behind which the dredged material could be safely placed, while being also a beginning of the needed rectification of the natural banks and the contraction of the waterway.

From 1870 up to the present time, the operations have been very much the same in kind. Those of previous years will be found described in detail in previous annual reports, and those of the fiscal year just closed are particularized in the appended report of Mr. H. D. Whitcomb, the resident engineer.

During these years the authorities of the city of Richmond have co-operated cordially with those of the United States. The city of Richmond has spent her own money freely, thus supplementing the appropriations made by Congress. There has never, however, been as much money available as true economy required in the judicious prosecution of the work, according to a well-settled plan. Operations have often been necessarily suspended for months at the best seasons for active work. Losses have also occurred during several freshets of unusual violence. These things have increased the cost of the improvement, but there has all the time been a steady gain in depth of water and facility of navigation. Very much of this is to be attributed to the skill and good judgment of Mr. Whitcomb. Thanks are also due to Capt. Thomas Cunningham for his zeal and faithfulness, which, combined with his thorough knowledge of the river, have made his services almost indispensable to those directing the work.

In contrast with the condition of the river in 1870, as stated above, navigators can now safely calculate upon 11.8 feet of water, at low-water, up to the city, which is equivalent to 15.3 at high-water.

Rocketts Reef has been lowered so that there is a channel 60 feet wide, with 11.8 feet at low-water (15.3 feet at high tide). The removal of perhaps 50 cubic yards from points of the ledge will increase this depth to 13 feet at low-water. The channel is now 1 foot deeper than was reported last year.

A gain of 1 foot in depth in solid rock is a great one.

By the action of the dams in contracting the waterway, "Richmond Bar has been lowered 1 foot during the year, and now has 12½ feet at low-tide, an improvement of at least 5 feet since 1870."

Dutch Gap Cut-off has been greatly improved by widening at the entrances, thus allowing a better direction to vessels passing through. The least width at low tide is about the middle, and is 200 feet; at the entrances the width is over 300 feet. The least depth in the fairway is 15 feet, and the removal of 5,000 cubic yards would make a channel of 18 feet at low tide, with 130 feet bottom width.

In 1870 no vessel could pass through this cut-off. Now large vessels can do so, and save, at the same time, 5½ miles in distance, besides avoiding the bar in Trent's Reach, formerly one of the worst in the river.

The total excavation of material from the river during the year amounted to 88,574 cubic yards, of which 1,234 was solid rock. The material excavated was deposited on the wing-dams, giving them additional strength, and thus becoming a useful instead of a hurtful element in the river.

The original estimates contemplated very little work below the Dutch Gap Cut-off, and no greater depth in any part of the river than 18 feet at *high-water*. It is now proposed to make the depth of the channel about 18 feet at *low-water* below Dutch Gap, for the reason given by Mr. Whitcomb in the following extract:

The examination of the shoals below Varina, made in May, 1879, shows that the channels have not lessened in depth for 25 years past, and the cost of deepening them is a comparatively small matter. The rise and fall in the lower part of the river is much less than it is at Richmond. At the mouth of the Chickahominy the rise and fall is 1.9 feet, while it is 3.865 feet on Rocketts Reef and for several miles below. The mean high tide at Richmond is 3.463 feet above our assumed zero, and the channel is to be 15 feet below this zero. If the depth below zero is made the same on the lower part of the river, a deeper draft can be carried from the city at *high tide* than can be carried over the shoals below at *high tide;* and so moderate is the cost of deepening the channel through the lower shoals that it seems advisable to make the depth below Dutch Gap at *low tide* the same that it is above at *high tide*. In that case vessels loaded for the full depth at high tide at Richmond could approach within 15 miles of the city at any stage, and at high tide proceed to the city. In the other cases, vessels will be limited to the low-tide depths, or to 1.9 feet over, and must stop at every shoal until high-tide.

The appropriations have been—

1870—July 11	$50,000
1871—March 3	50,000
1872—June 10	50,000
1873—March 3	75,000
1874—June 23	50,000
1875—March 3	50,000
1876—August 14	60,000
1878—June 18	70,000
1879—March 3	75,000

It was stated in the last annual report that to complete the estimate there should be yet provided $188,000. Deducting the appropriation of March 3, 1879, there would remain $113,000. It was found necessary to enlarge the Dutch Gap Cut-off beyond the original expectation, and the necessity of increased depth over the shoals below that point led to an increase of the estimate to $161,000.

Money statement.

July 1, 1878, amount available	$70,011 94	
Amount appropriated by act approved March 3, 1879	75,000 00	
		$145,011 94
July 1, 1879, amount expended during fiscal year		62,010 46
July 1, 1879, amount available		83,001 48
Amount (estimated) required for completion of existing project		161,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881		100,000 00

Proposals for building four scows for James River, Virginia, opened at 12.5 *p. m. August* 6, 1878.

Number.	Name.	Residence.	Time. Commence.	Time. Complete.	Price.	Remarks.
1	C. J. Fox	Richmond, Va			$5,800	Delivered at Richmond, Va.
2	American Dredging Co.	Philadelphia, Pa			5,500	Do.
3	G. H. Ferris	Baltimore, Md			2,750	Delivered in Baltimore, Md.
4	H. L. Thomas	do			3,900	Delivered at Richmond, Va.
5	H. E. Culpepper	Portsmouth, Va			4,495	
6	J. H. Newell	Richmond, Va			3,970	
7	Donly & Brown	do			4,748	This proposal was delayed by an accident to the train which carried the mail containing it, and opened 3 p. m.

Contractor, G. H. Ferris, at $2,750.

Abstract of bids for excavation at Dutch Gap, James River, Virginia, opened at 12.5 *p. m. August* 6, 1878.

Number.	Name.	Residence.	Time. Commence—	Time. Complete—	Price per cubic yard. Above water.	Price per cubic yard. Below water.
1	G. H. Ferris	Baltimore, Md		Jan. 1, 1879	$0 27	$0 27
2	R. T. Hieston	Washington, D. C		Jan. 1, 1879	30	30
3	J. W. Southward	Virginia			25	
4	M. C. Heggarty	Richmond, Va	Aug. 10, 1878	Jan. 1, 1879	20	47
5	American Dredging Company	Philadelphia, Pa		Jan. 1, 1879	38	38
6	R. T. Hieston	Washington, D. C		Dec. 6, 1879	19⅞	

No contract. Bids rejected; prices too high.

Abstract of bids for excavation at Dutch Gap, James River, Virginia, opened at 12.5 *p. m. August* 26, 1878.

Number.	Name.	Residence.	Time. Commence—	Time. Complete—	Price per cubic yard. Above water.	Price per cubic yard. Under water.
1	M. C. Heggarty	Richmond, Va	Sept. 10, 1878	Jan. 10, 1879	$0 18	
2	Reeper & Hunter	do	Sept. 24, 1879	Jan. 24, 1879	24½	
3	G. H. Ferris	Baltimore, Md	In accordance with time mentioned in specifications.		23½	$0 37½

Contractor, M. C. Heggarty, at 18 cents.

REPORT OF MR. H. D. WHITCOMB, ASSISTANT ENGINEER.

RICHMOND, *June* 1, 1879.

COLONEL: I have the honor to submit the following report on the improvement of James River from June 1, 1878, to May 31, 1879, inclusive.

At the date of the last annual report, no work other than surveys had been done on the river for five months. This condition remained until July 12, 1878, when your orders to proceed were received.

The following machines, &c., were rented from the city of Richmond for the cost of ordinary repairs, viz: 2 steam-tugs, 3 dredges, 1 pile-driver, 1 floating smith-shop, and 7 platform and 2 dumping scows. Later in the season the United States purchased 4 new platform-scows for this work.

One of the dredges and the pile-driver began work July 15; another dredge on the 16th. The third dredge began work August 2, and the United States drilling and hoisting machines on the 12th.

The drilling machinery was employed on Rocketts Reef, and at intervals on other rocks as they were uncovered by the dredges. The dredges were employed in raising part of the blasted rock; in deepening and widening the channel in the hard material within 2 miles of the city; and for a short time in removing a sand-shoal at the head of Warwick Bar. The pile-driver was employed in building wing-dams.

The expenditure on the improvement by the city of Richmond during the year was confined to repairs of machinery, but orders have been recently given by the city committee to begin work with two dredges in the present month. A small amount of work was done by the James River and Kanawha Company, and by the Old Dominion Steamship Company, in removing a deposit of sand left by freshets near the outlet to the ship-lock.

In October, Mr. M. C. Heggarty began work on his contract for the enlargement of Dutch Gap Cut-off. This contract, which included the work on the left bank, was completed May 1. By the premature explosion of a blast March 5, Mr. Heggarty, the contractor, Mr. E. G. Hall, the superintendent of rock-excavation on this improvement, and a laborer were killed. Mr. Hall had been connected with this improvement for several years, and his death is severely felt, not only by his family and immediate friends, but by the friends of the improvement. Mr. Heggarty was a well-known and reputable contractor on public works, and had had long and varied experience as such. This unfortunate occurrence is the first accident from the use of nitro-glycerine during several years' experience on this work.

The enlargement on the right bank was done by days' work.

The divers, with the hoisting machine, were employed in March removing the remains of vessels sunk in Kingsland's Reach during the war. Parts of 3 schooners, a piece of an iron-clad vessel stripped of armor, and several large logs and stumps were removed from the channel or near it.

The repairs to machinery, the rebuilding of the laboratory and tide-gauge houses, swept away by the flood of November, 1877, and the new scows, made the expenditures more than usual in the first three months.

During the year we have made a survey of the river from Mayo's Bridge to Falling Creek, a distance of seven miles (including a close measurement of Rocketts Reef); have resurveyed Kingsland's Reach, Dutch Gap Cut-off, and the river adjoining it, and have surveyed the shoals at Deep Bottom, Curle's Neck, Bermuda Hundred, Swan Point, and Goose Hill Flats.

WORK DONE.

Rocketts Reef has been lowered so that there is a channel 60 feet wide with 11.8 feet at low tide (15.3 feet at high tide). The removal of perhaps 50 cubic yards from points of the ledge will increase this depth to 13 feet. The channel is now 1 foot deeper than was reported last year. Below this reef the channel has been widened 28 feet, but this additional cut has not been carried through the shoal. The channel opposite the lower end of Drewry's Island has been widened 56 feet and deepened for a greater width, and now has 13 feet at low tide, and for the most part 15 feet. There are hard points in the bottom, some of which will require to be blasted.

The plan of contraction by wing-dams was continued; but much more of this work remains to be done before the full benefit of the experiment can be secured. From the action of these dams, Richmond Bar has lowered 1 foot during the year, and now has 12½ feet at low tide, an improvement of at least 5 feet since 1870. A shoal 500 feet long remains at the head of Randolph's Flat, with 11½ feet at low tide; which will probably be removed by the city in June; elsewhere, except as stated above, the channel has 13 feet at mean low tide.

Dutch Gap Cut-off has been greatly improved by widening at the entrances, thus allowing a better direction to vessels passing through. The least width at low tide is about the middle, and is 200 feet; at the entrances the width is over 300 feet. The