

HARBOR OF ST. LOUIS.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

The information required by a resolution of the House of Representatives respecting the Harbor of St. Louis.

APRIL 4, 1838.

Referred to the Committee on Commerce.

DEPARTMENT OF WAR, *March 31, 1838.*

SIR: I have the honor to transmit, herewith, a report of the Chief Engineer, in reply to the resolution of the House of Representatives of the 21st instant, calling for certain information respecting the harbor of St. Louis.

Very respectfully, your most obedient servant,

S. COOPER,

Acting Secretary of War.

HON. JAMES K. POLK,
Speaker of the House of Reps.

ENGINEER DEPARTMENT,

Washington, March 30, 1838.

SIR: In answer to the resolution of the House of the 21st instant, introduced by the Hon. J. Miller, calling for "the plan that has been adopted for the improvement of the harbor of St. Louis; what progress has been made in said work, and whether any further appropriation will be necessary for its prosecution the ensuing year; and, if so, what amount will be required;" I have the honor to submit the accompanying copy of the report of Lieutenant Lee, who has charge of that work. The preparations there referred to have been in progress during the winter, and operations will commence as soon as the stage of the water permits. No further appropriation will be necessary for the coming season, as the balance of unexpended appropriations will be ample for all that is at present contemplated.

I am, sir, very respectfully, your obedient servant,

C. GRATIOT.

HON. J. R. POINSETT,
Secretary of War.

ST. LOUIS, *December 6, 1837*

SIR: Upon my arrival here in August last, in obedience to your orders assigning to my superintendence the application of the appropriations made by Congress for the erection of the contemplated works in this harbor, I proceeded to make such an examination as would enable me to submit for your approval the necessary plans; a report of which I now lay before you.

HARBOR OF ST. LOUIS.

The appropriation for the improvement of this harbor has for its object the removal of a large sand-bar, occupying below the city the former position of the main channel of the Mississippi; which, gradually augmenting for many years, has now become an island of more than two hundred acres in extent, covered with a growth of young cotton-wood, and reaching from the lower part of St. Louis, which it shuts out from the river, to two miles below. The extensive shoals formed around its base, extend on the east to the middle of the river, and, connecting with the main on the west, affords, at low water, a dry communication between. A flat bar projects from the upper end to the foot of Bloody island, opposite the town, which, at low stages of the river, presents an obstacle to the approach of the city, and gives reason to apprehend that, at some future day, this passage may be closed. This is rendered more probable by the course of the river above, and can be better explained by reference to the accompanying map.* The united waters of the Missouri and Mississippi, for some miles below their junction, sweep with great velocity along the Illinois shore, when they are deflected to the Missouri side. The main body, passing west of Cascarot island, joins with the lesser portion at its foot, and the whole is compressed between the narrow gorge V, VI. Spreading out in the wide area below, the main current still keeps to the Missouri shore; while a large part of the river, directed towards the Illinois side, is fast wearing away its bank, and cutting out a large channel.

Further apprehension is also afforded from the formation of this part of the bank, which has a fall to Cahokia creek, that runs within a short distance. But an inspection of the map will at once show the tendency of the river to this course, both from the direction of the deep water issuing from the gorge above, as well as the location of the large shoal extending from the head of Bloody island.

It will also be seen, that wherever the bed of the river is sufficiently contracted, a regular and deep channel is formed by the current, and that this is always interrupted when the water is spread over too large a surface. That the greater part of the river enters the gorge at V, VI, close to the Missouri shore, and while the mean depth is in the middle, all the shoal water is on the east side, and all the deep on the west. Passing around in the bend below, the deepest water still keeps to the Missouri side; and in the narrow section between the city and Bloody island, all the deep water is found, as before, on that side, and all the shoal on the opposite. From this point the current is deflected from the Missouri shore, and its velocity is so far diminished by the time it reaches the foot of the

* The map referred to in this document is omitted to be printed, under the order of the House of Representatives of 11th of September, 1837.

island; from the expansion of its bed, that the abrasion of the bottom ceases; the earthy matter with which it is surcharged subsides, creating by its deposit the bar and Duncan's island. The two channels again uniting at the foot of Bloody island, the whole body of water sweeps down the Illinois shore; and its velocity becoming again increased by the narrowing of its bed, the abrasion of the bottom recommences, all the deep water being here on the Illinois side, and all the shoal on that of Duncan's island. Spreading out below, the depth of the channel soon diminishes; and, dividing at the head of the bar extending from Cahokia island, the main current still keeps to the Illinois shore, until having passed its foot. It is, therefore, evident that it is only necessary to concentrate the current wherever the channel requires to be deepened; that the branch of the river which passes between the city and Bloody island has a velocity sufficient to excavate the bed to the depth of thirty-nine feet below low-water level; that this depth continues as far as the section continues; and would, in all probability, extend, if the section were lengthened. Moreover, that this is sufficient without the aid of that branch passing east of Bloody island; which, therefore, is not necessary to produce this effect. But, in order to arrest the wearing away of the eastern bank of the river, and to protect the Illinois shore, it will be necessary to divert from it the force of the current. This may be done by running a dike from above the small slough on that side, parallel to the western shore, sufficiently far to throw the water west of Bloody island.

The distance from where the dike would have to be commenced, to the head of Boody island, is 1.5 mile, and the length of the dike would require to be equal to half this distance, or three-quarters of a mile, and might be obliged to be extended the whole way. The same effect would be produced by throwing a dam directly across from the head of Bloody island to the Illinois shore; the *dead* water created by which would extend as high as the point above the slough, and, by its resistance, throw the great body of the river into the Missouri channel. This will also bring a greater volume of water to bear upon the bar and head of Duncan's island; and by constructing a dike from the foot of Bloody island, parallel to the shore in front of the city, and of sufficient length, it will receive the proper direction. A cross section of the proposed dam and dike is shown on the map, which are similar to those constructed on the Hudson river.

The length of the dam will require to be 594 yards, and its height five feet above low-water level; its width on top is ten feet, having its exterior slopes equal, and three of horizontal to one of vertical height. A row of piles, five feet from centre to centre, are driven firmly into the bed of the river, at the intersection of the slopes with the plane of low water. Brush, of proper length, to extend well towards the *toe* of the slopes, with their butts and branches so interwoven with the piles as to be held firmly in place and form a complete matting, is laid at right angles with the direction of the dike, and sunk to the bed of the river with large stones. This is carried up as high as low-water level; the interior filled in with small stones, sand, facines, &c., and the slopes and crest above this plane revetted with stones placed on their edges, and well bound together, so as to form a revetment of from a foot and a half to two feet thick. The slopes below the plane of low water are secured by throwing stones promiscuously over, and distributing them as equally as possible.

The length of the dike, as laid down on the map, is 1,000 yards ; it will probably require not to be less than this, but must be determined by its effect. Its height above low water will be five feet, and the plan and mode of construction are the same as were described for the dam. In addition to these works, the western shore of Bloody island will have to be protected from its head to the centre, so as to secure it against the action of the current.

The erection of these works will be attended with great difficulty.

The whole bed of the river is composed of the alluvial matter brought down by the Missouri, consisting of a light loam, mixed with the finest sand, which melts and yields to every pressure of the current. Its depth must be at least forty feet below low-water level, and has so little stability as to be changed by every flood. Besides the unfavorable foundation, the great velocity of the Mississippi, its violence during the spring freshets, and the short season for operations, present impediments so great, that, in addition to the uncertainty always connected with hydraulic architecture, the result cannot be predicted. The plan proposed appears to me the best calculated to accomplish the end in view ; but how far it may be successful, or what modifications it may require, can only be shown by experience. Neither can the estimate of its probable cost be stated with any degree of certainty, or be considered more than conjectural, and embraces merely the prices of the required materials and labor, with the necessary boats and machinery, and the incidental expenses that can be foreseen.

The importance of St. Louis in a commercial point of view, the vast country of which it is the market, and the interest it has at stake in the improvements under consideration, are so well known to you, that I need not urge upon the department the necessity of affording all the relief that the case will admit of.

From the statement furnished by the politeness of the harbor-master, which is hereto appended, you will see that the number of steamers trading with the port has regularly increased since 1831, from 60 to 195; being at the rate of 22.5 per year, and 51 *for the last year*; that the tonnage during that time has increased from 7,796 tons to 22,794, giving an increase of 2,166 per year; and that the number of arrivals at the port has increased from 432 to 1,607; each year averaging 212 more than the preceding.

The quantity of goods and merchandise, of all descriptions, that have arrived within the last year, deduced from this statement, notwithstanding the general stagnation of business, cannot fall short of 225,000 tons.

The map of the harbor, which is herewith presented for your consideration, has been prepared with care, and is as much in detail as time would allow.

The portion of the river embraced in the survey is eight miles in extent. The triangulation of its shores gives their relative position with much accuracy; and from the soundings on the cross sections, its bed, as it then stood, has been carefully laid down. At the time of making the survey, the river was twelve feet above low-water level, and all the soundings are referred to this plane. The average fall of its surface at this stage, determined by a line of levels run on the Illinois shore, was 0.425 of a foot per mile; and the mean velocity of the current through the section V, VI, was calculated to be 4.54 feet per second, or 3.09 miles per hour; and

that in the pass between St. Louis and Bloody island, 4.34 feet per second, or 2.95 miles per hour. Not having had an opportunity to make any observations upon the river at the season of high or low water, I learn, from a statement politely furnished me by the gentleman charged with the meteorological department of the Western Academy of Natural Science, that it was at its lowest in January last, and highest in July. On the 10th of the latter month it reached its greatest height, 23 feet above low-water level; at which time, from a mean of three observations, the velocity of the current in front of the city was found to be, *on the surface*, 5.55 miles per hour.

Supposing the river to have the same fall at its lowest stage as that found when it was 12 feet above this plane, the mean velocity in the section between the city and the proposed dike would be at the rate of 20.48 inches per second; and, on the same supposition, at five feet above low water, the mean velocity would be 33.12 inches per second. The last of these, according to the authorities, would give a *bottom velocity* sufficient to prevent a deposite in the bed of the river, and thus preserve the channel excavated during its higher stages.

The necessary preparations for commencing the work early next year will be made this winter.

Contracts have been entered into for the construction of a steam tow-boat, and four large boats for the transportation of stone and other materials. Some smaller scows, pile-drivers, &c., will have to be built, and a contract made for the supply of piles. An abundance of stone can be procured on the bank of the river, about four miles below the city, at the cost of quarrying and transporting it.

Annexed is a tabular statement of the dimensions of the proposed dam and dike, and an estimate of their probable cost.

Dimensions of the proposed dam from the head of Bloody island to the Illinois shore.

Description.	Length in feet.	Cubic yards.
To low-water mark - - -	1,064	46,550
To six feet water - - -	284	77,240
To twelve feet water - - -	189	137,592
From twelve to twelve feet - - -	245	282,240
	1,782	543,622

ESTIMATE.

800 piles - - - - -	\$2,400
4,691 cubic yards of brush - - - - -	9,382
7,852 cubic yards of stone for pavement - - - - -	31,408
3,346 cubic yards of stone to sink brush - - - - -	13,384
7,000 cubic yards of sand, facines, small stone, &c. - - - - -	7,000
	<u>\$63,574</u>

Dimensions of proposed dike from the foot of Bloody island.

Description.	Length in feet.	Cubic yards.
To low-water mark - - -	1,490	65,188
To six feet water - - -	417	113,560
To eight feet water - - -	957	493,862
	2,864	672,610

ESTIMATE.

1,200 piles - - - - -	-	\$3,600
5,000 cubic yards of brush - - -	-	10,000
12,209 cubic yards of stone for pavement - -	-	48,836
2,500 cubic yards of stone to sink brush - -	-	10,000
8,244 cubic yards of sand, facines, small stone, &c. -	-	8,244
		<u>\$80,680</u>

ESTIMATE FOR THE PROTECTION OF BLOODY ISLAND.

4,000 cubic yards of stone - - - - -	-	\$12,000
500 cubic yards of brush - - - - -	-	1,000
Stakes - - - - -	-	1,300
		<u>\$14,300</u>

AGGREGATE.

Probable cost of dam - - - - -	-	\$63,574
Probable cost of dike - - - - -	-	80,680
Probable cost of protection of Bloody island - -	-	14,300
		<u>\$158,554</u>

Statement of the number of the different steamers which have entered the port of St. Louis since 1830, together with their aggregate tonnage, and number of entries in each year.

	1831.	1832.	1833.	1834.	1835.	1836.	1837.		
							To 25th Nov'r.	Monthly average.	Total 1837.
Steamers -	60	80	99	110	121	144	195		
Tonnage -	7,796	9,520	12,222	13,173	15,470	19,447	22,794		
Entries -	432	508	573	607	803	1,355	1,484	123	1,607

NOTE.—The average tonnage of the boats for 1837 is equal to 116.89 tons; which being multiplied by 1,607, the whole number of arrivals, gives 187,842.23 tons of commerce for the year 1837. The entire *freight* of the boats generally exceeds their measured tonnage by 25 per cent.; but if we add 20 per cent., it will give 225,390.67 tons of merchandise, &c., that have arrived in 1837. If the *departures* of the boats are to be considered, and we suppose them to carry away the same quantity that they bring, there will have been 450,000 tons employed in the trade of St. Louis for the year 1837.

All which is respectfully submitted:

R. E. LEE,
Lieut. Engineers.

General C. GRATIOT,
Chief Engineer, Washington, D. C.