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APPENDIX II.

ANNUAL REPORT OF LIEUTENANT-COLONEL G. H. MENDELL, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

UNITED STATES ENGINEER OFFICE,
San Francisco, Cal., July 9, 1879.

GENERAL: I have the honor to transmit the annual reports of the river and harbor works under my charge for the fiscal year ending June 30, 1879.

Very respectfully, your obedient servant,
G. H. MENDELL,
Lieut. Col. of Engineers.

Brig. Gen. H. G. WRIGHT,
Chief of Engineers, U. S. A.

II I.

IMPROVEMENT OF OAKLAND HARBOR, CALIFORNIA.

The appropriations for this work have been as follows, namely:

June 23, 1874.....	\$100,000
March 3, 1875.....	100,000
August 14, 1876.....	75,000
June 18, 1878.....	80,000
March 3, 1879.....	60,000
Total.....	415,000

The original estimate for the completion of the work was \$1,335,435.20.
The amount expended from the beginning to the date of this report is \$259,058.26.

The objects to which this expenditure was devoted were the construction of two stone jetties extending from the shore to deep water in San Francisco Bay and dredging a channel between these jetties. These jetties are respectively 12,000 feet and 9,500 feet in length, and have thus far required 139,213 tons of stone. The amount of dredging has been thus far 222,341 cubic yards.

PRESENT CONDITION OF THE WORKS.

The jetties remain in the condition noted in the last report, unless, perhaps, they have been slightly lowered in height by the action of waves. The channel at the date of the last report had a width of 200 feet, in which the depth was 10 feet at low-water, with some indications of shealing at the outer end of the channel. No careful survey has since been made to determine the exact condition of the channel, but no change of importance can have taken place. Were it otherwise the fact

would have made itself known by the inconvenience in the navigation of the channel by the large vessels, both steam and sail, which enter the harbor.

OPERATIONS OF THE PAST YEAR.

The river and harbor acts have for the past two years imposed the restriction that the sum of money appropriated shall not become available until "the right of the United States to the bed of the estuary and the training walls is secured, free of expense to the government, in a manner satisfactory to the Secretary of War."

This restriction has prevented any active operations of construction throughout the whole of the year.

In order to carry out the provisions of the act by securing to the United States the rights essential for a successful prosecution of the work, a map and description of the areas to be preserved from encroachment were forwarded to the department on the 30th September, 1878. This map and the views which it represented were approved by the Secretary of War, and the United States attorney for this district was instructed to have the provisions executed in due form.

The Oakland Water Front Company, which is the party with whom the United States have to deal in the matter, made objections to the project when submitted for their approval, and in consequence did not execute the necessary release. The river and harbor act of March 3, 1879, in addition to restating the restriction of the next previous act, requires the appropriation which it contains of \$60,000 to be covered into the Treasury in case the "said right shall not be received by September 1, 1879."

A number of consultations with representatives of the company have been held during the past three or four months, with the view of reaching a common ground of agreement. Some modifications of the original project can properly be made which will meet in part the objections of the company, and at the same time fulfill the engineering and commercial requirements of the harbor. A new project containing these modifications has been prepared, to be submitted for the approval of the Secretary of War, in case the Water Front Company assents to the release required of it. If the company assents this project will be forwarded to the department in a few days.

FUTURE OPERATIONS.

If the conclusion in the matter just mentioned shall permit the expenditure of the sums that have been appropriated by Congress, it is proposed to apply them to the jetties and to the channel between the jetties.

The north jetty, beginning at the shore end, will be raised to high-water level for a distance of 6,400 feet. The general level of this portion of both jetties is about 4 feet below high-water mark.

The shore end of the south jetty will be raised to the same level for a distance of 7,750 feet. The outer portions of both jetties will also have to be enlarged and raised, but not to the level of high-water.

The 10-foot channel is now 200 feet wide, and it is proposed to widen it 100 feet. This improvement will add greatly to the convenience of commerce. There are now six large ferry-boats plying on this route, several of which have as much as 80 feet beam, and a length of 300 feet or more. The freight ferry-boats are large enough to carry 16 freight-cars. It is not easy for these boats to pass each other in the channel

at low-water, and as they all make quite a number of trips during the day, ferry-boats passing every ten minutes, the aggregate inconvenience of a narrow channel is considerable.

The operations which have been indicated will probably consume all, or about all, the money that will be available for the coming year. If, however, there be any surplus above these requirements, it, with the next appropriation to be made, can be usefully employed in increasing the tidal prism of the harbor, by excavating the upper basin. The increase of tidal prism will be the next point to require attention. The State of California, about three years ago, authorized the city of Oakland to levy a tax to be applied to the condemnation of land occupying the site of a canal, projected in the original plan for this harbor, to connect the harbor with the bay of San Leandro. Proceedings of condemnation were instituted in one of the State courts by the United States attorney. A day was set for trial some months ago, but before it came off one of the defendants, by some action in the United States court, succeeded in procuring a postponement of the case, which yet remains unsettled. The object of the canal is to increase the tidal prism of the harbor. It not being possible to undertake this method of increasing the store of tidal water, the only alternative action is to excavate the upper basin. The amount of material to be excavated is estimated to be more than 3,000,000 cubic yards. In order to accomplish this with due regard to economy, the dredging must be combined with an operation for raising the marsh-land on the shore. If this be not accomplished, the only alternative will be to deposit the dredged material in the bay of San Francisco. This course is in itself very objectionable, and is also unduly expensive, owing to the long distance of transportation.

STATISTICS OF TRADE.

All supplies for Oakland which come from other ports are delivered in the harbor, and in this way the expense of transshipment is saved. The supplies of coal and lumber are notable instances, and the aggregate annual saving to the people of Oakland, due to the improvement of the harbor, must be something near \$100,000.

In addition to this direct saving, the improvement has had a marked effect in increasing values and in promoting commerce.

The measure of these effects is, in money, many times the amount that has been expended by the government. The appendix contains a detailed statement of the commercial statistics of the report.

Oakland is in the customs-district of San Francisco. The amount collected for duties at the port of San Francisco for the last fiscal year was \$6,147,840.24. The nearest forts and light-houses are those in San Francisco Bay.

The ferry-slip arranged for a terminus of the Oakland and Central Pacific Railroad, referred to in the last annual report, has been completed, and is used, so that now all the freight sent to or from San Francisco over this road is received at this point, passing between the jetties.

The South Pacific Coast Railroad Company has established a ferry between Alameda, which is a flourishing suburb, and the city.

These changes give a very lively aspect to the commerce of the harbor, and prove that the improvement is a matter of great public interest.

Some further indication of the improvements that are going on is given by the quantity of dredging which was done by private parties during the year. The deposit of the material dredged is supervised by this office. The total amount dredged was 262,453 yards.

Money statement.

July 1, 1878, amount available.....	\$99,642 81
Amount appropriated by act approved March 3, 1879	60,000 00
	\$159,642 81
July 1, 1879, amount expended during fiscal year	3,701 07
	155,941 74
July 1, 1879, amount available.....	
Amount (estimated) required for completion of existing project.....	920,435 20
Amount that can be profitably expended in fiscal year ending June 30, 1881.	200,000 00

COMMERCIAL STATISTICS.

SAN FRANCISCO, July 1, 1879.

COLONEL: I have the honor to submit the following report on the commercial and general business statistics of Oakland Harbor during the past calendar and fiscal years.

Increase in city and ferry business.

Calendar year.	Population.	Assessments.	Real-estate sales.	Number of ferry passengers.	Total amount collected.
1874	18,938	\$19,867,762	\$3,042,371	3,192,904	\$348,448
1875	27,043	22,200,906	4,076,821	4,028,310	437,206
1876	35,000	24,000,718	7,711,545	4,909,460	524,312
1877	40,500	25,849,328	9,128,495	5,570,555	585,282
1878	45,000	27,730,109	9,500,000	5,681,978	584,472

The following tables show the comparative results of commercial statistics for the fiscal years of 1878 and 1879, at the city wharf alone:

City wharf.

During fiscal year 1878.	Draught.
One ship, 1,350 tons register.....	16 6
One brig, 495 tons register.....	16 0
Seven vessels, 460 tons each.....	15 6
Eleven vessels, 500 tons each.....	15 0
Twelve vessels, 466 tons each.....	14 6
Seven vessels, 200 tons each.....	14 0

Between July 1, 1878, and May 30, 1879.	Draught.
One British ship, 743 tons register.....	17 4
Two sea-going vessels, 410 tons register each	16 6
Three sea-going vessels, 570 tons register each	16 0
Four sea-going vessels, 726 tons register each	15 6
One British bark, 1,085 tons register.....	15 6
Eight sea-going vessels, 537 tons register each	15 0
Fourteen sea-going vessels, 330 tons register each.....	14 6
Eighteen sea-going vessels, 200 tons register each.....	14 0
One sea-going vessel, 188 tons register.....	13 6
Seven sea-going vessels, 134 tons register each.....	13 0

The subjoined table contains a summary statement of the combined business transacted at the several wharves owned by private parties along the water front during the past year:

No.	Wharves.	Number of vessels.	Tons register.	Tons freight.
1	Market Street Wharf.....	36	19,440	20,000
2	Clay Street Wharf.....	100	12,000	15,000
3	Washington Street Wharf.....	88	11,000	13,000
4	Broadway Ferry Landing.....	14	4,550	29,112
5	Franklin Street Wharf.....	417	32,130	28,963
6	Webster Street, or City Wharf.....	486	40,985	57,627
7	Anderson's Wharf.....	64	2,415	3,200
*8	La Ren's Wharf.....	500	40,000	39,260
†9	Alameda Railroad Ferry Landing.....			18,098
10	New Overland Railroad Landing.....			66,621
	Totals, 1878.....	1,705	162,520	290,821
	Totals, 1877.....	1,768	186,640	187,446

*Seven months ending December 31, 1879.

†Six months ending December 31, 1879.

Long Wharf Ferry Landing:	1877.	1878.
Number of foreign vessels.....	28	80
Centals grain (exported).....	624,840	3,014,256
Tons freight (through and local).....	616,349	644,248

The nearest port of entry to this harbor is San Francisco, distant 7 miles by water, which has a safe and direct communication with Oakland Harbor throughout the entire year.

Port of San Francisco.

	1877.	1878.
Number of vessels entered.....	911	645
Number of vessels cleared.....	1,024	676
Customs revenues.....	\$6,779,904	\$6,370,618
Imports, merchandise and treasure.....	76,208,875	75,261,553
Exports, merchandise and treasure.....	61,911,237	66,678,026

Two additional lines of ferry-boats have been started in Oakland Harbor during the past year, namely, the Overland freight ferry of the Central Pacific Railroad, and the Alameda passenger ferry, or the South Pacific Coast ferry landing. The former is included in the above statistics.

Alameda passenger ferry.

Years, calendar.	Population.	Freight.	Number of passengers.	Amount collected.
1877.....	3,600	Tons.		
1878.....	5,300	18,098	171,241	\$21,405

For 7 months ending December 31, 1878.

Respectfully submitted.

L. J. LE CONTE,
Assistant Engineer.

Lieut. Col. G. H. MENDELL,
Corps of Engineers, U. S. A.

II 2.

IMPROVEMENT OF WILMINGTON HARBOR, CALIFORNIA.

The amounts and dates of appropriations made for this work are as follows, namely:

March 3, 1871	\$200,000
June 10, 1872	75,000
March 3, 1873	150,000
March 3, 1875	30,000
June 18, 1878	20,000
March 3, 1879	12,000
	487,000

The estimate made in 1876 for the completion of the work was \$100,000, of which amount \$32,000 has been appropriated, leaving to be appropriated the sum of \$68,000.

PRESENT CONDITION OF THE HARBOR.

The channel continues to show improvement both in width and depth. There is now a practical channel of 9.5 feet.

At the beginning of the year there was a narrow and crooked channel of 9 feet. The 9-foot channel is now 200 feet wide. The increase of depth is less than we have had for several years. In 1875 the depth was 6 feet, and each year has added 1 foot until the last, which has given something less.

The original project contemplated 10 feet at low tide. It is probable that this depth will be realized during the coming year. This continued improvement, although, perhaps, it may be regarded as slow, is very satisfactory.

The depth at the commencement of work on the harbor in 1872 was something less than 2 feet. Our works have added to this 7.5 feet. This rate of increase in depth, as well as the depth that the present works will produce, is approaching its maximum.

The cut through the reef is at the depth of 12 feet. This will necessarily be the maximum. The width of this cut is 150 feet. The width ought to be 200 feet at least, and better 250 feet, for two reasons; first, that it would be more convenient for entrance, and, secondly, that it would reduce the velocity of the current, which is now very considerable. While the improvement in the channel is satisfactory, our efforts to accumulate sand along the line of the main jetty have not resulted so favorably. In the spring of the present year a considerable quantity of the seed of the plant which covers the dunes on the coast was planted and came up finely, but the waves and winds destroyed the growth before it could yield favorable results. If this plant can once be started it accomplishes two results: it holds the sand that has been gathered and it helps to gather more. The results of planting this seed have been very good for the past several years. New dunes have been created which extend themselves and continue to rise until they reach the general level of the old dunes, 8 or 10 feet above high-water. Further attempts will be made to prolong the line of dunes along the jetty. If these efforts are not successful it may become necessary, in two or three years, to protect with stone the portion of the jetty left uncovered by the sand dunes.

OPERATIONS OF LAST YEAR.

After the usual process of advertising, a contract was made with Mappa & Gay for the delivery on the lines of the harbor of about 7,700 tons of stone. The first stone delivered under this contract was placed on October 4. During the month of October they delivered 300 tons, and in November, to the 21st, 481 tons.

The contract required the delivery of 2,500 tons by the 30th September, and of 7,700 tons by December 15. The work actually accomplished was so much below the requirements of the contract, and the prospects of the contractors finishing their work in any reasonable time were so poor, that it was thought best to annul the contract, which was done on November 21. A temporary arrangement was made with the masters of the schooners employed by the contractor, under which they delivered three loads, amounting to 419 tons. Both their vessels were wrecked on December 20. A number of loads of small stone were purchased and applied to the work in January, at the close of which month work was suspended to await the opening of spring. In April Mr T. B. Hayes began the delivery of stone, agreeing to supply 1,500 tons per month, at the rate of \$3 per ton for weights over 500 pounds, and \$1.50 for stone of less weight.

He has carried out the agreement in a satisfactory way, and has delivered to the close of the year 2,866 tons of large and 406 tons of small stone, in all 3,272 tons.

The stone has been applied as follows:

	Tons.
Protecting timber line	685
Raising main jetty	175
On west training-wall	5,212
Filling crib groins	94
Total	6,166

The remainder of last year's appropriation will pay for about 500 tons of stone, which will be delivered in July.

The timber jetty was protected for a distance of 330 feet in a way that is satisfactory for the present. More stone may perhaps be required at some future time. The west wall has been built on for a distance of 1,000 feet, so that now it rises, with an exception of 60 feet, to a height of 4 feet above low-water, and has a width of about 10 feet at this level.

About 150 feet of the main jetty has been raised to a height of 3.5 feet above low-water. During the last three or four years this line has been flattened out by the sea so that its general level is about 1.5 feet above low-water, its original height having been 4 feet.

The portions of the main jetty which were carried away in 1872 were repaired by a filling of stone and gravel, and have never been water-tight. It was impossible for the beach near the work to form properly so long as even a slight current ebbed and flowed. Clay to the extent of 427 tons was placed against the line for a distance of 700 feet during the year, and has proved successful in preventing the wash of fine sand. It was also necessary to place two small groins of crib-work and stone along the line to correct a slight tendency of the current to carry away the sand. Some uneasiness has been felt at various times during the year at the apparent tendency to the formation of a bar outside the entrance, but a careful examination has shown that at present there is no ground for fears of this kind.

Four stone-lighters were rebuilt during the year.

THE TRADE OF THE HARBOR.

The coasting vessels trading here which draw 13 feet of water or less habitually enter. If they draw more than 13 feet they generally discharge a part of the cargo into lighters outside, and enter when the draught is sufficiently reduced.

At ordinary high-water there is quite 14 feet of water, and at spring tides 17 feet.

It is quite the custom now for the smaller vessels to sail in, whereas until lately they were always towed. The Ancon, a steamer of 1,500 tons, entered the harbor twice during the past year, on occasions when the state of the sea at the outside anchorage did not permit her to receive or discharge freight. By this course she escaped a detention of several days.

The following table shows the arrivals in 1878:

	Ships.	Barks.	Brigs.	Schooners.	Steamers.
Arrived in 1878.....	3	12	6	77	216
Came inside.....		7	6	75	45

Wilmington is a port of delivery in the collection-district of San Diego. The amount of duties collected in the last fiscal year was \$9,514.68, which was principally for coal. The nearest fortification is at San Diego, and the nearest light-house at Point Fernin, 2 miles distant.

The trade of the port for the year ending December 31, 1878, is shown in the following statement:

EXPORTS.		IMPORTS.	
General merchandise, pounds.....	985,578	General merchandise, tons.....	15,019
Grain, pounds.....	12,070,519	Coal, tons.....	12,426
Wine, pounds.....	449,678	Railroad ties.....	127,900
Wool, pounds.....	574,663	Laths.....	1,848,800
Hides, pounds.....	144,249	Posts.....	56,253
Crude petroleum, pounds.....	78,970	Lumber, feet.....	12,122,434
Hay, pounds.....	180,000	Shingles.....	3,223,250
		Powder, acid, &c., pounds...	35,020
		Turpentine, coal-oil, pounds..	390,070

Exports, 7,246 tons; imports, 27,635 tons; lumber and ties, 17,488,800 feet.

The advantages of this improvement have not yet been fully realized by the people, but the time must soon come when they will be felt in the relief which will be given to the whole district tributary to the port by dispensing with lighterage.

It is quite practicable to do this now for most of the vessels which frequent the port.

FUTURE OPERATIONS.

The work that remains to be done in order to complete the improvement in such a shape that it can be left to take care of itself, having a depth of not less than 10 feet, and perhaps as much as 12 feet, at mean low-water, consists of the following items:

The cut through the reef is now 150 feet wide and 12 feet deep. It ought to be widened at least 50 feet to the same depth. It would be better to have it 250 feet than 200.

This work ought to be undertaken next, but in order to do it we must have \$35,000 or \$40,000. An additional cut of 50 feet will require the excavation of more than 5,000 yards, which may cost \$5 per yard.

If, as is very likely, the United States may be obliged to build a dredger for the purpose, the ultimate cost may be more.

The second item is to protect the timber line, where the sand does not promise to cover it. This may require 6,000 tons of stone.

The main stone jetty ought to be raised 2 or 3 feet to its original level. The west training-wall also needs to be raised on the shore end, and possibly to be extended. These latter operations will require about 6,000 tons of stone.

The estimate for all these operations and for the completion of the work is \$68,000.

This work can all be done profitably within two years. It is recommended that the appropriation for the next year be not less than \$40,000.

What has been said in previous reports may be repeated, namely, that smaller appropriations cannot be expended with economy.

Money statement.

July 1, 1878, amount available.....	\$20,000 00	
Amount appropriated by act approved March 3, 1879.....	12,000 00	
July 1, 1879, amount expended during fiscal year.....		\$32,000 00
July 1, 1879, amount available.....		18,022 40
July 1, 1879, amount available.....		13,977 60
Amount (estimated) required for completion of existing project.....	68,000 00	
Amount that can be profitably expended in fiscal year ending June 30, 1881.	40,000 00	

Abstract of bids received and opened August 1, 1878, for delivery of stone.

No.	Name of bidder.	Large stone, per ton 2,240 pounds.	Small stone, per ton 2,240 pounds.
1	Mappa & Gay.....	\$2 50	\$2 00
2	Charles E. Beane & Co.....	2 81	2 23
3	T. B. Hayes.....	3 45	1 66½
4	J. T. James*.....		

Informal, not considered.

Abstract of contracts made between June 30, 1878, and June 30, 1879.

Name of contractors.	Object of contract.	Price per ton.
Mappa & Gay.....	Delivery of stone.....	\$2.50 for large stone, \$2 for small stone.

II 3.

IMPROVEMENT OF SACRAMENTO AND FEATHER RIVERS, CALIFORNIA.

The first appropriation for these rivers was made in 1875, the second in 1878, and the third on March 3, 1879. The first two were \$15,000 each, and the last, which is for the Sacramento alone, is \$20,000, making a total of \$50,000. The first appropriation was expended in removing snags from the Upper Sacramento and Feather, and in building brush wing-dams in the Feather. The second appropriation was devoted to the removal of snags in the Sacramento and Feather, and to a detailed