

NOTE:

Base point of mileage is 780 feet beyond of the overhead power transmission line.

SCALE IN FEET

COMPOSITE ENVIRONMENTAL STATEMENT
SAN FRANCISCO BAY REGION CALIFORNIA

SAN RAFAEL CREEK
PROJECT LOCATION

U.S. ARMY ENGINEER DIST., SAN FRANCISCO, C OF E
DRAWN: TRACED: CHECKED: TO ACCOMPANY C.E.S. FILE NO. DATED

3. Petaluma River.

- 1.027 a. Congressional Authorization. The Petaluma River project, located in northwestern San Pablo Bay, was adopted by the Rivers and Harbors Act of 1930 and provides for dredging a channel 200 feet wide, eight feet deep and 33,000 feet long across the mudflats in San Pablo Bay to the mouth of the Petaluma River; thence 100 feet wide, eight feet deep and 69,000 feet long to Western Avenue in the city of Petaluma, including a turning basin 300 to 400 feet wide and eight feet deep, thence 50 feet wide, four feet deep to Washington Street in Petaluma, thence 40 feet wide (Plate I-6), four feet deep, for 935 feet above Washington Street Bridge. The primary users of the channel across the mudflats are commercial tugs and barges, and occasional recreational boaters traveling between San Pablo Bay and the Petaluma River.
- 1.028 b. Dredging History. The Petaluma River Channel was first dredged to the above dimensions in 1933. A historic summary of dredging is shown below:

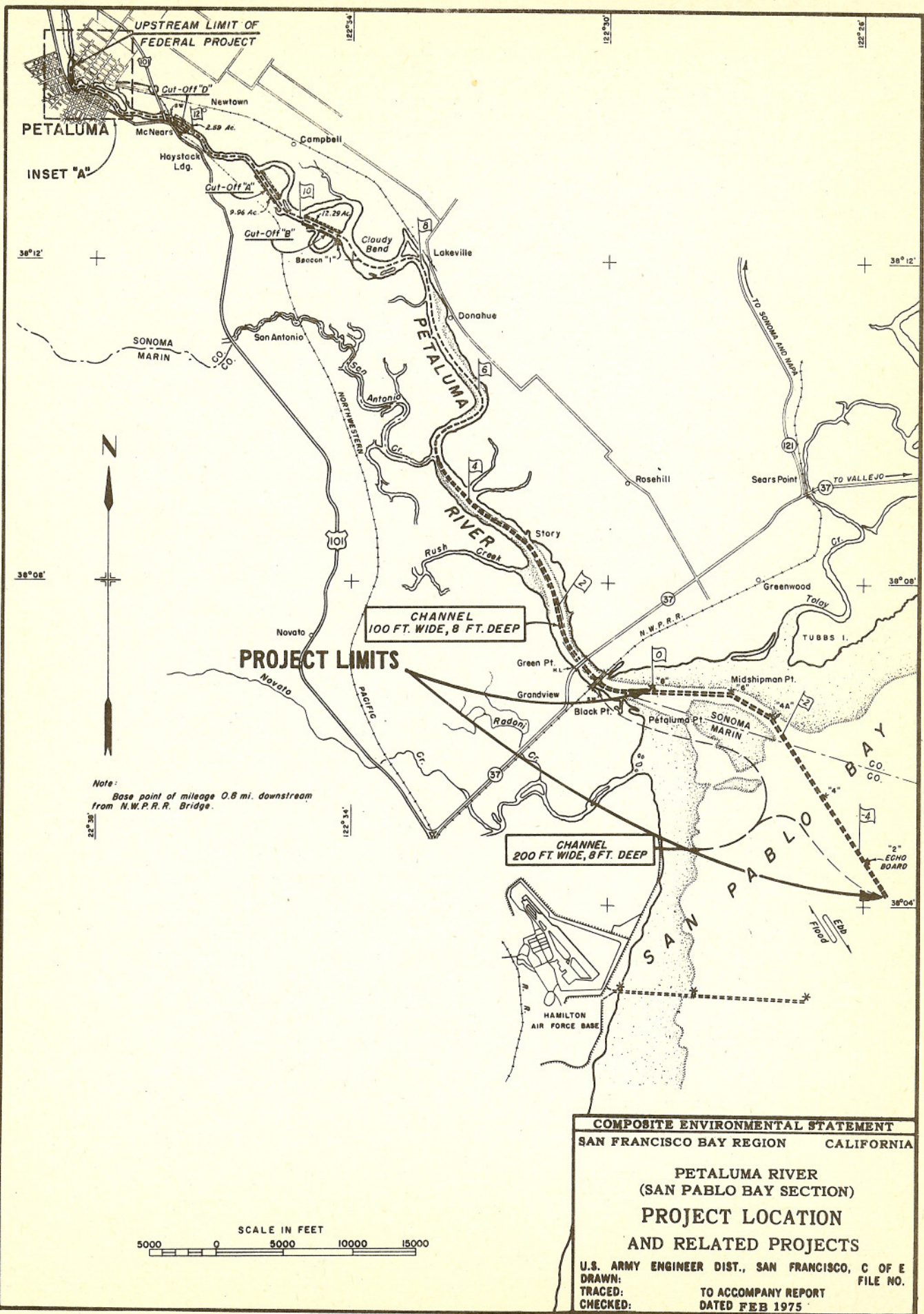
TABLE I-6

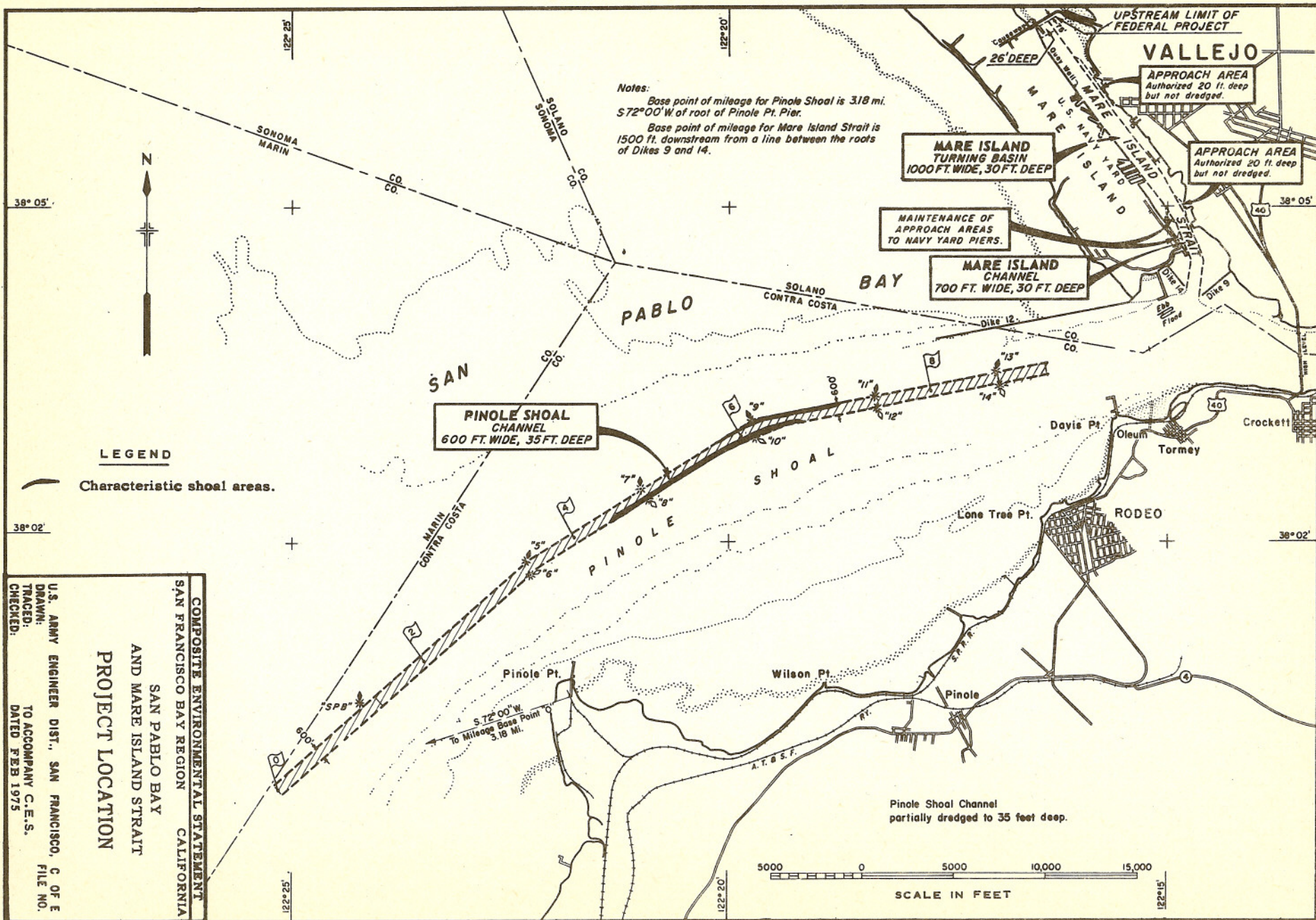
DREDGING HISTORY OF PETALUMA RIVER PROJECT

<u>Fiscal Year</u>	<u>Quantity Removed (c.y.)</u>	<u>Method of Dredging</u>
1933*	552,100	hydraulic pipeline
1937	276,700	" "
1938	31,800	" "
1939	30,800	" "
1941	960,000	" "
1942	67,300	" "
1943	25,400	" "
1945	113,300	" "
1947	144,500	" "
1948	323,200	" "
1957	51,700	" "
1960	293,600	" "
1962	348,100	" "
1965	267,300	" "
1969	266,000	" "

*Improvement work.

- 1.029 Maintenance dredging is performed in two sections: the San Pablo Bay Section (Phase I) and the Upper River Channel Section (Phase II). The section of river between these two sections will not be dredged in the near future. Recent hydrographic surveys indicate no need for dredging this portion of the river.
- 1.030 c. Proposed Maintenance. The San Pablo Bay Section (Phase I), shown on Plate I-6, is to be clamshell dredged to a depth of eight feet, with two feet allowable overdepth. It is the only part of the Petaluma River channel extending into greater San Francisco Bay; therefore, the impacts of dredging only this part of the river will be considered in the Composite Statement. An estimated 668,000 cubic yards of material will be removed and barged to the San Pablo Bay aquatic disposal site (see Plate I-2). This section of the river is dredged approximately once every 12 years, and is next scheduled to be dredged in the fall of 1976 (FY 1977). The historic quantity and frequency of dredging is equivalent to an average annual quantity of 33,000 cubic yards (Table I-1). The Corps will contract the work out to a private dredging firm. The environmental impacts of the entire project (Phases I and II) have already been discussed in a Final Environmental Statement issued in August 1975 (202) but in order to be consistent with the objectives of the Composite Statement, Phase I will be re-evaluated in light of the overall impact of dredging operations in the Bay.
- 1.031 d. Related Projects. The Upper River Channel (Phase II) is hydraulically dredged approximately once every four years. Dredging of the channel is scheduled to be completed in January 1976 when an estimated 441,000 cubic yards are to be removed and deposited on land within an impoundment facility near Adobe Creek. Since this portion of Petaluma River is considered outside the geographic scope of the Composite Statement, the environmental impacts of dredging this portion of the river will not be discussed in this report, but, as mentioned above, have already been discussed in the Final Environmental Statement issued in August 1975.
- 1.032 Shellmaker, Inc. has applied for a Corps permit to breach a dike in its construction of the Port Sonoma Development Project at the mouth of the Petaluma River. If completed, this 112-acre complex would consist of: one 40-berth marina and two 200-berth marinas; marina-related facilities, a channel from the marinas to the main Petaluma River channel; storage area for Shellmaker dredging equipment; commercial and office buildings;





seafood restaurant; bulk sand depot; maintenance dredging disposal area; parking area; and landscaping. These facilities would increase by 450 the number of recreational boats using the San Pablo Bay Section of the channel (169). Other related projects include private maintenance dredging upstream on the Petaluma River, but will not be discussed since they are outside the geographic scope of the Composite.

4. San Pablo Bay and Mare Island Strait.

a. Pinole Shoal Channel.

1.033

(1) Congressional authorization. The Pinole Shoal channel in San Pablo Bay was first authorized by the Rivers and Harbors Act of 27 February 1911. Authorized depth was 30 feet. With subsequent increases in navigation traffic through San Pablo Bay by deeper draft ships, the channel was deepened to 35 feet under the Act of 8 August 1917, and widened from 500 feet to 600 feet under the Act of 21 January 1927. The existing dimensions consist of a channel 600 feet wide, 35 feet deep, and about eight miles long across Pinole Shoal (Plate I-7). The primary users of the channel are commercial ships traveling between Carquinez Strait and Central San Francisco Bay.

1.034

(2) Dredging history. The Pinole Shoal channel was first dredged to its present dimensions in 1929. Since 1957 the dredged materials have usually been disposed of at the San Pablo Bay disposal site. A few times the material was disposed at the Carquinez Strait site, but this site is no longer used for Pinole Shoal dredgings. A historical summary of dredging is shown below:

TABLE I-7

DREDGING HISTORY OF PINOLE SHOAL PROJECT

<u>Fiscal Year</u>	<u>Quantity Removed (c.y.)</u>	<u>Method of Dredging</u>
1936	181,700	hopper
1938	1,403,100	"
1939	733,200	"
1940	754,700	"
1941	1,024,800	"
1942	2,363,400	"
1943	1,122,100	"
1944	1,654,800	"
1947	420,100	"
1949	235,800	"
1950	381,100	"
1954	649,400	"
1957	231,500	"
1958	120,000	"
1959	315,500	"
1960	2,588,000	"
1961	843,000	"
1962	1,034,500	"
1967	218,200	"
1969	450,000	"
1970	290,500	"
1971	816,000	"
1972	665,000	"
1974	481,000	"

1.035 Dredging is performed every other year. The average annual quantity removed since 1967 has been approximately 324,000 cubic yards.

1.036 (3) Proposed Maintenance. The maintenance dredging to be done during January 1976 consists of removing approximately 508,000 cubic yards of material from the existing Pinole Shoal channel described above, and depositing this material at the San Pablo Bay disposal site (shown on Plate I-2 and described in Table I-2). The shoal areas along the channel which usually require dredging are shown on Plate I-7. The project will be performed by a Corps hopper dredge and will take approximately three weeks to complete. The dredge will operate 24 hours-a-day, seven days-a-week, except during refueling and replenishing of supplies, which occurs about every 12-14 days. Dredging/disposal cycle time averages 1.3 hours per load. As part of an unwritten agreement with sport fishing interests, this channel is not dredged during November.

1.037

(4) Related projects. Deepening of Pinole Shoal channel to 45 feet, widening to 750 feet, and maneuvering area at the Oleum oil pier on Davis Point, have all been authorized under the River and Harbors Act of 27 October 1965, but have not been accomplished. These navigation improvements are being studied under the San Francisco Bay to Stockton Project (John F. Baldwin and Stockton Ship Channels) which is under advanced engineering and design studies. The overall Baldwin and Stockton Ship Channel project will be discussed in depth in an Environmental Working Paper to be issued by the Corps in the near future. The Pinole Shoal deepening and widening would involve removal of 13,200,000 cubic yards, and the Oleum maneuvering area another 3,000,000 cubic yards. If the deepening and widening are accomplished, it would increase maintenance dredging requirements from the present 420,000 c.y./year to 1,750,000 c.y./year.

1.038

The Union Oil Company of California has received a Corps permit to perform maintenance dredging over a period of five years at the Oleum oil pier. As described in Corps Public Notice No. 75-261-030, Union Oil proposes to dredge 90,000 cubic yards each year for five years to maintain the general maneuvering area around the pier at a depth of 35 feet. Material would be removed by clamshell dredge and barged one-half mile to the same Carquinez Strait disposal site used by the Corps. However, if the Baldwin and Stockton Ship Channel project is performed as described above, maintenance dredging of part or all of the Oleum maneuvering area may, in the future, be performed by the Corps as part of the Pinole Shoal Channel.

b. Mare Island Strait.

1.039

(1) Congressional authorization. Mare Island Strait is the body of water located between the Napa River and Carquinez Strait, just east of San Pablo Bay. The first of a series of navigation improvements in Mare Island Strait was begun by the Department of the Navy in 1892. Subsequent improvements were undertaken by the Corps under the Rivers and Harbors Acts of 13 June 1902, 27 February 1911, and 8 August 1917. The Act of 21 January 1927 increased the channel width to 600 feet and the depth to 30 feet and authorized the Carquinez Strait site as the disposal area. The width was increased again to 700 feet and the length of the turning basin increased under the Act of 20 June 1938. The most recent Act of 2 March 1945 authorized approach areas at Vallejo, South Vallejo and Navy yard piers.

1.040

The existing authorized dimensions include: a channel 700 feet wide through Mare Island Strait, flaring to a turning basin generally 1,000 feet wide from former Dike No. 6 to within 75 feet southerly from the causeway between Vallejo and

Mare Island, 30 feet deep except at the northerly end where the project depth is 26 feet; for dredging two approach areas 20 feet deep to the waterfronts at Vallejo and South Vallejo, and for maintenance of two approach areas to Navy yard piers at the southern end of Mare Island (Plates I-7 and I-8). (The approach areas to the two Navy yard piers are no longer dredged as these piers no longer exist; similarly, the approach areas at Vallejo and South Vallejo have not required dredging in recent years). The Mare Island Channel is primarily used by nuclear submarines and other deep-draft Navy vessels moving to and from the Mare Island Naval Shipyard, where maintenance and repair facilities are located.

- 1.041 (2) Dredging history. The Mare Island Strait Channel and turning basin was first dredged to the present dimensions in 1943. A historic summary of dredging is shown below:

TABLE I-8

DREDGING HISTORY OF MIS PROJECT

<u>Fiscal Year</u>	<u>Quantity Removed (c.y.)</u>	<u>Method of Dredging</u>
1931	1,046,500	hopper
1932	1,540,200	"
1933	323,900	"
1934	1,042,600	"
1935	325,300	"
1936	2,061,400	"
1937	1,098,700	"
1938	1,281,400	"
1939	1,899,200	"
1940*	3,428,300	"
1941	2,752,900	"
1942*	3,458,600	"
1943*	960,200	"
1944	2,179,000	"
1945	899,300	"
1946	2,069,400	"
1947	2,439,000	"
1948	2,056,400	"
1949	1,451,000	"
1950	1,902,900	"
1951	1,251,000	"
1952	1,785,800	"
1953	255,000	"
1954	1,586,700	"
1955	1,390,000	"
1956	1,134,000	"
1957	1,865,000	"
1958	1,218,500	"
1959	1,979,600	"
1960	3,629,000	"
1961	1,681,000	"
1962	2,520,400	"
1963	4,344,700	"
1964	3,095,200	"
1965	3,154,700	"
1966	2,969,100	"
1967	1,932,000	"
1968	2,450,800	"
1969	2,173,500	"
1970	2,747,000	"
1971	1,957,000	"
1972	2,314,000	"
1973	1,265,000	"
1974	2,497,500	"
1975	2,500,000	"
1976	Approx. 2,500,000	"

*Includes improvement work.

- 1.042 It is important to note that the Corps does not necessarily dredge the entire channel. The Corps only dredges those parts of the channel which receive frequent use by deep-draft vessels and which have shoaled in above the authorized depth. Plate I-8 shows the shoal areas usually dredged by the Corps. All these areas are within the 600-foot-wide Navy Channel (described below), and tend to be concentrated between the Navy's submarine slips and finger piers.
- 1.043 (3) Proposed Maintenance. The maintenance dredging, to be done during the periods September-November and February through April of each year, consists of: a channel 700 feet wide, 30 feet deep, through Mare Island Strait, flaring to a turning basin generally 1,000 feet wide from former Dike No. 6 to within 75 feet southerly from the causeway between Vallejo and Mare Island. In addition, the westerly 600-foot-wide section of the turning basin will be maintained to a depth of 32 feet to accommodate shipping to and from Mare Island Naval Shipyard (see Plate I-8). This additional two feet of depth, previously maintained by the Navy, is now maintained by the Corps for national defense purposes, as authorized by Section 117 of the Rivers and Harbors Act of 13 August 1968. Approximately 2,500,000 cubic yards of shoaling is proposed to be removed by a Corps hopper dredge and deposited at the Carquinez Strait disposal site (shown on Plates I-2 and I-8). Dredging during each year will be performed in two phases: September through November, when 1,200,000 cubic yards will be removed; and February through April, when 1,300,000 cubic yards will be removed. This biannual scheduling is necessary in Mare Island Strait due to the high shoaling rate in this area.
- 1.044 As in the past, the project maintenance will be performed by a Corps hopper dredge. Shoal material will be hydraulically sucked into the ship's hoppers and when filled (in about 20 minutes), will be hauled to the Carquinez Straits disposal site. Disposal at the site will take place while the ship is in motion, thus dispersing the sediments over the length of the disposal area. The hopper dredge will be operating 24 hours-a-day, seven days-a-week, except during refueling and replenishing of supplies, which occurs about every 12-14 days.
- 1.045 Average haul distance between dredge sites and the Carquinez disposal site is only 2.8 miles (one way), which is the primary reason for using the Congressionally approved Carquinez site. Since the Mare Island Channel is maintained so frequently and in such great volume, a nearby and therefore economical means of disposal is required if the channel is to be maintained at all.

1.046

The Mare Island navigation project is considered the most important navigation project in San Francisco Bay in terms of frequency of maintenance (biannual) and amount dredged per year (2.5 million cubic yards). It represents almost half the total volume of Corps maintenance dredging in the Bay (excluding the Main Ship Channel).

1.047

(4) Related projects. The Navy dredges approximately 400,000-600,000 cubic yards per year in Mare Island Strait to maintain areas alongside Mare Island Naval Shipyard at depths required by vessels using the Shipyard. The dredging area, shown on Plate I-8, extends from the Highway 37 bridge to the three parallel Navy finger piers at the southern part of Mare Island, and includes maneuvering areas around Piers 34 and 35 at the southern end of Mare Island. To perform this dredging, the Navy owns and operates a 12-inch hydraulic cutter suction dredge which is permanently set up at Mare Island and is used sporadically throughout the year. The dredge mixes large quantities of water with the material to be removed, forming a slurry which may then be pumped via pipeline to a land disposal site. The dredge is connected to any of four permanent pipelines by floating flexible pipe which allows movement of the dredge. The permanent pipelines run across Mare Island to seven diked lowland areas on the western side (see Plate I-8). The Navy has performed dredging in Mare Island Strait since 1900, and recently applied for a Corps permit, as announced in Corps Public Notice No. 1 74-0-148(b). The permit would apply only to the dredging part of the operation, since the disposal areas are above mean higher high water and therefore outside Corps jurisdiction.

1.048

Over the next 12 years, the Navy expects to generate some 4,800,000 cubic yards of dredged material from Mare Island Strait, and is considering three possible methods of accommodating this quantity: (1) raising and strengthening existing dikes; (2) constructing a dike across marshland between existing disposal areas and Dike 12; and/or (3) pumping dredged material to Skaggs Island via a handling basin near Mare Island. This third possibility is currently being studied in depth by the Navy. An engineering feasibility study was prepared for the Navy by International Engineering Company in early 1975. It evaluated alternative methods of land disposal at Skaggs Island to accommodate all Navy dredged material in the Bay Area (246). These alternative methods are presently in the early planning stages and would require a Corps permit in any areas below the historic plane of mean higher high water.

- 1.049 Maintenance dredging is also performed in Mare Island Strait at the Vallejo Municipal Marina, the Vallejo Yacht Club, and the State of California Maritime Academy. The City of Vallejo has applied for a Corps permit to perform maintenance dredging at the Vallejo Municipal Marina. As described in Corps Public Notice No. 74-21-50, a hydraulic pipeline dredge owned and operated by the city would remove 138,000 cubic yards from the marina bottom and dispose of the material at an adjacent 55-acre land site (north of the Mare Island Causeway) above mean higher high water (and therefore outside Corps jurisdiction). This land area has previously been used for dredge material. The dredge would operate nearly every day for seven and one-half months, bringing the marina bottom down to the eight- to ten- foot depth required by recreational boats. To maintain this depth in the years following, the dredge will be operated sporadically, removing 23,800 cubic yards per year and disposing at the same land site. The marina will eventually be expanded to extend down the shoreline to the Vallejo Yacht Club, doubling the number of berths.
- 1.050 The Vallejo Yacht Club is planning to dredge 50,000 cubic yards to provide enough depth for sailboats. The Yacht Club hopes to lease the Municipal Marina's dredge and dispose at the same land site. This dredging would also require a Corps permit. The Yacht Club also plans to build up its perimeter walls to reduce future maintenance dredging requirements.
- 1.051 The City of Vallejo plans to construct a breakwater around both the Municipal Marina and the Yacht Club to reduce siltation in the marinas to approximately one-fourth the present rate, thereby dramatically reducing their maintenance dredging requirements.
- 1.052 The State of California periodically dredges 13-14,000 cubic yards at its berthing area at the southeast corner of Mare Island Strait, with disposal at the Carquinez Strait disposal site.
- 1.053 As part of its waterfront redevelopment plan, the City of Vallejo is planning to construct the South Vallejo Industrial Park on a 207-acre site across the strait from the Navy's finger piers. The city has applied to the Corps for a permit. The project elements, as described in Corps Public Notice No. 74-169-138, consist of:
- 1.054 Area A (to be leased to Kaiser Steel for fabrication of offshore oil drilling rigs):
- (a) construct 100-foot by 600-foot concrete pile-supported outfitting dock; and
 - (b) construct pile-supported launchways.

.055 Area B (to be leased to Peter Kiewit Sons' Company
for marine construction activities):

- (a) two barge mooring slips with gantry cranes;
- (b) mooring dolphins and floating dock in barge
mooring basin; and
- (c) 700-foot outfitting area with sheet pile
bulkhead backfilled with 3,000 cubic yards fill.

.056 The project includes removal of two existing timber
piers and construction of a 2,500-foot "training wall." A total
of 6,700 piles will be driven, 145,000 cubic yards of fill will
be placed on land areas, 700,000 cubic yards of material will be
dredged in the area and disposed at the Alcatraz, Carquinez Strait,
and 100-Fathom disposal sites in coordination with RWQCB and EPA,
and 50,000 cubic yards will be dredged each year for the five
years following the project to maintain depths of 12 to 14 feet
in the mooring areas. This project is intended to broaden the
economic base in Vallejo, thereby reducing dependence on the
Mare Island Naval Shipyard. Barge traffic in Mare Island Strait
would increase, but is not expected to necessitate additional
Corps maintenance dredging.

.057 Upstream of Mare Island Strait, the Corps is planning
to widen the Napa River to provide flood control. This project
would consist of:

- (a) excavating 2.4 million cubic yards of
dry material;
- (b) hydraulically excavating 4.8 million
cubic yards of wet material;
- (c) filling 2.1 million cubic yards to construct
levees, dikes, backfill, and filling meanders;
- (d) dispose of the remainder of lowlands next
to the river; and
- (e) landscaping along the river.

- 1.055 Area B (to be leased to Peter Kiewit Sons' Company for marine construction activities):
- (a) two barge mooring slips with gantry cranes;
 - (b) mooring dolphins and floating dock in barge mooring basin; and
 - (c) 700-foot outfitting area with sheet pile bulkhead backfilled with 3,000 cubic yards fill.
- 1.056 The project includes removal of two existing timber piers and construction of a 2,500-foot "training wall." A total of 6,700 piles will be driven, 145,000 cubic yards of fill will be placed on land areas, 700,000 cubic yards of material will be dredged in the area and disposed at the Alcatraz, Carquinez Strait, and 100-Fathom disposal sites in coordination with RWQCB and EPA, and 50,000 cubic yards will be dredged each year for the five years following the project to maintain depths of 12 to 14 feet in the mooring areas. This project is intended to broaden the economic base in Vallejo, thereby reducing dependence on the Mare Island Naval Shipyard. Barge traffic in Mare Island Strait would increase, but is not expected to necessitate additional Corps maintenance dredging.
- 1.057 Upstream of Mare Island Strait, the Corps is planning to widen the Napa River to provide flood control. This project would consist of:
- (a) excavating 2.4 million cubic yards of dry material;
 - (b) hydraulically excavating 4.8 million cubic yards of wet material;
 - (c) filling 2.1 million cubic yards to construct levees, dikes, backfill, and filling meanders;
 - (d) dispose of the remainder of lowlands next to the river; and
 - (e) landscaping along the river.

1.058

The Napa River Flood Control project extends from Trancas Street north of the town of Napa, downstream to Good Luck Point, which is about seven miles north of Mare Island Strait. The flood control channel and levees, planned to be constructed between 1975-1980, would alter the hydrography of the Napa River, but are not expected to have a significant effect on the shoaling rate in Mare Island Strait. Since 85 percent of the sediments which are deposited in Mare Island Strait are believed to be from sources other than the Napa River (114), a very significant change to the sediment deposition rate of the Napa River would be required to produce even a small change in the total amount of sediment which is deposited in Mare Island Strait. Thus, the impact of the flood control project is thought to be of little significance.

5. Richmond Harbor.

1.059

a. Congressional Authorization. The project was initially adopted by the Rivers and Harbors Act of 8 August 1917 and subsequently modified by Acts of 3 July 1939, 30 August 1935, 20 June 1938, 2 March 1945 and 3 September 1954. For descriptive purposes, the project can be conveniently divided into Richmond Inner Harbor and Richmond Outer Harbor.

1.060

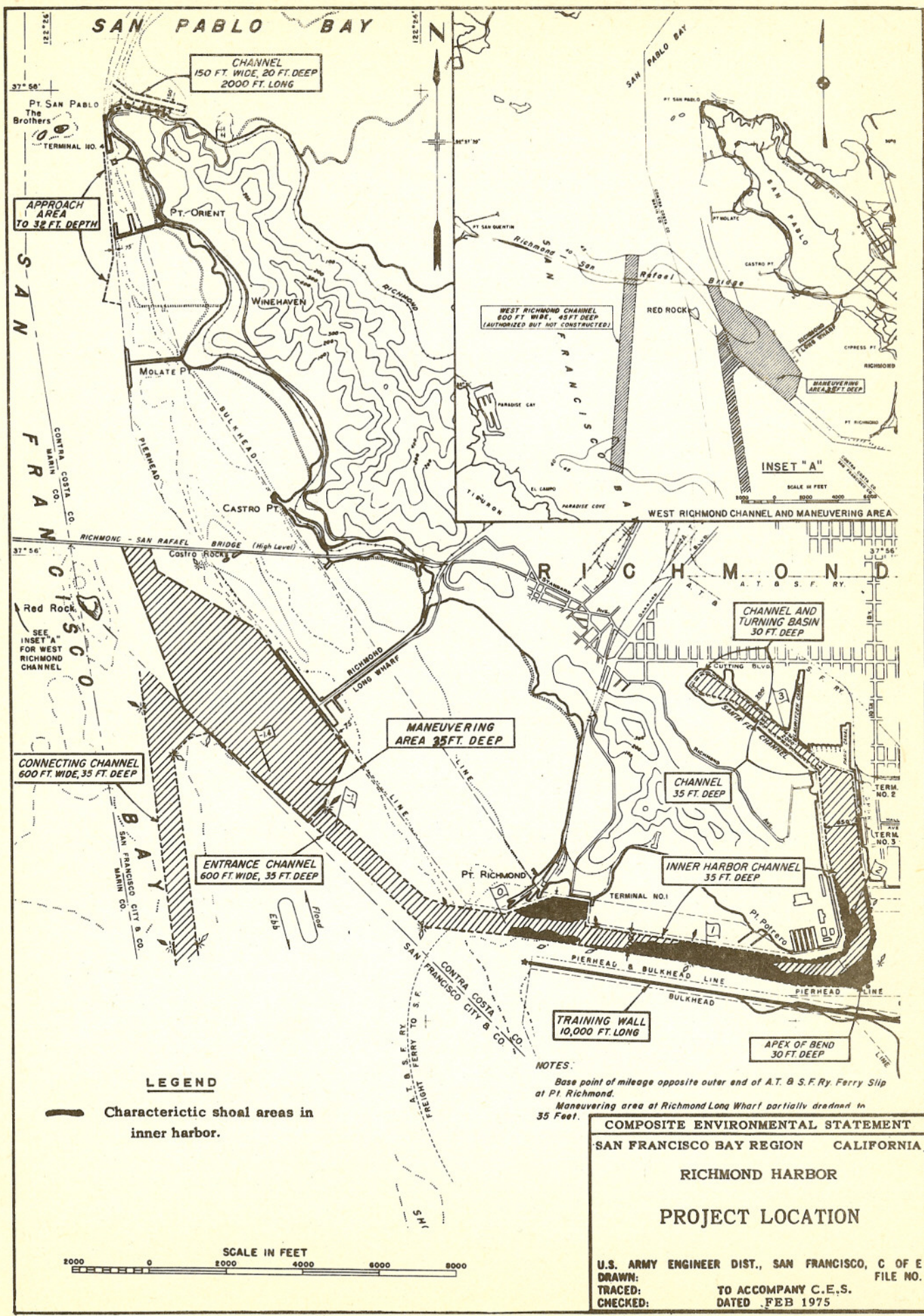
(1) Richmond Inner Harbor. Inner Harbor was the project originally authorized in 1917 but later expanded upon by all of the Acts above except the 1945 Act, to meet the demands of increased navigation commerce in the Richmond area. The present dimensions of Inner Harbor include: an entrance channel 600 feet wide, 35 feet deep and one mile long leading from the south end of the Long Wharf maneuvering area to Point Richmond, where there is a turning basin; thence an "inner harbor" channel, 35 feet deep 500 feet wide which gradually flares to 600 feet at Point Potrero; the channel then turns northward and is 1,150 feet at its widest point and 35 feet deep except for a depth of 30 feet at the southerly apex of the bend; the inner harbor channel width decreases to 850 feet as it proceeds northward and narrows to 200 feet in the Santa Fe Channel. The inner harbor channel is approximately 2-1/2 miles long. Santa Fe Channel is 2,000 feet long and 35 feet deep which leads to a 30-foot deep turning basin at the head of navigation. There is also a rubble-mound training wall 10,000 feet long extending westerly from Brooks Island which protects the inner harbor channel.

1.061

(2) Richmond Outer Harbor. The Outer Harbor project was not authorized until 30 August 1935 but as the needs increased so did the improvements. Outer Harbor was modified by the 1945 and 1954 Acts, and now consists of: an entrance channel running north-south, 600 feet wide, about 6,500 feet long and 35 feet deep, adjacent to Southhampton Shoal from deep water to the Long Wharf maneuvering area; Richmond Long Wharf maneuvering basin, 35 feet deep, adjacent to Richmond Long Wharf, an approach area between Point Orient and Point San Pablo, 32 feet deep to within 75 feet of the pierhead line; and a channel 150 feet wide, 2,000 feet long and 20 feet deep along the north side of Point San Pablo.

1.062

The entire project (Richmond Inner and Outer Harbors) is shown on Plate I-9, and primarily serves Terminal No. 4, at Point San Pablo, the Long Wharf, and 26 piers, wharves and docks in the Inner Harbor. The primary commerce includes petroleum and dry bulk cargo which are elaborated upon in the Navigation Commerce Section of the Working Paper. The channel on the north side of Point San Pablo, apparently, is no longer used by commercial navigation.



1.063

b. Dredging History. The Inner Harbor channel project was initiated in 1918 and was intermittently worked on until 1940. The training wall, also authorized in 1917, was not completed until 1931. The 32-foot approach channel was completed in 1945, and improvements authorized in 1954 were initiated in 1955 and completed in 1957. An historic summary of dredging from 1932 is listed below:

TABLE I-9

DREDGING HISTORY OF RICHMOND HARBOR PROJECT

Fiscal Year	Quantity Removed (c.y.)	Method of Dredging	Portion of <u>1/</u> Project Dredged
1932*	1,053,500	hydraulic pipeline	I
1932*	258,800	hopper	i
1934	38,800	"	I
1934*	1,683,500	hydraulic pipeline	I
1934	153,900	hopper	i
1936	90,000	"	i
1937	339,700	hydraulic pipeline	I
1937*	470,300	hopper	i
1938	595,600	"	I, i, 0
1939	377,500	"	i
1940	202,600	"	I, i, 0
1940*	634,200	hydraulic pipeline	0a
1940*	250,700	hopper	0a
1941*	28,676	"	0a
1942	390,100	"	I, i, 0
1943	584,100	"	I, i, 0
1944	753,700	hydraulic pipeline	I, i, 0
1946	1,521,700	hopper	I, i, 0
1946*	106,800	hydraulic pipeline	0b
1947	76,800	hopper	i, 0
1947	74,600	hydraulic pipeline	I
1947	86,800	hopper	0a
1948	217,400	"	I, i
1949	598,400	"	I, i, 0
1951	885,100	"	I, i
1952	660,200	"	I
1953	363,200	"	I
1954	90,800	"	I
1955	203,400	"	I
1956	734,800	"	I, 0
1957*	1,386,500	hydraulic pipeline	I, i
1958	166,000	hopper	I, i, 0
1958	86,800	"	0a

TABLE I-9 (Cont'd)

Fiscal Year	Quantity Removed (c.y.)	Method of Dredging	Portion of <u>1/</u> Project Dredged
1959	535,200	hopper hydraulic pipeline	I, i, 0
1959	50,800		0 ^b
1960	518,000	hopper	I, i, 0
1961	567,800		I, i
1961*	425,000	"	0
1962	741,500		I, i, 0
1963	640,000	"	I, i, 0
1964	1,001,400		I, i, 0
1964	37,500	clamshell	0 ^b
1965	678,900	hopper	I, i, 0
1966	763,100		I, i
1967	434,400	"	I, i, 0
1967	114,000		0 ^a
1968	491,100	"	I, i, 0
1968	26,200		0 ^b
1969	200,000	clamshell	
1970	351,000	hopper	I, i
1971	151,000		I, i
1972	319,000	"	I, i
1973	1,226,500		I, i
1974	256,500	"	I, i
1975	262,000		I
1976	440,000	"	I, i, 0

- 1/ I -- Richmond Inner Hbr: Pt. Richmond to head of navigation or portions thereof.
i -- Richmond Inner Hbr: channel from Pt. Richmond to Long Wharf maneuvering basin.
0 -- Richmond Outer Hbr: Long Wharf maneuvering basin and entrance channel.
0^a-- Richmond Outer Hbr: Approach area, Pt. Orient.
0^b-- Richmond Outer Hbr: 20-ft. channel north of Pt. San Pablo.
* Includes improvements (deepening).

1.064 Although the Richmond Harbor project is maintained annually, not all portions are dredged every year. Based on Table I-9, Richmond Inner Harbor is dredged annually but the Long Wharf maneuvering basin dredging schedule is highly variable, ranging from once per year to once every eight years. The 20-foot channel north of Point San Pablo is infrequently dredged, having been dredged only three times since the initial dredging of 1946. The approach channel near Point Orient has only been maintained four times since the initial work in 1940 with an average maintenance cycle of nine years.

- 1.065 Records of disposal sites are incomplete but since Fiscal Year 1972, the material has been disposed at the Alcatraz site. From 1951 through 1971, the hopper dredges were disposing the material east of Angel Island. Other aquatic disposal areas closer to the project maintenance were used in the pre-1950's.
- 1.066 c. Proposed Maintenance. Next maintenance is scheduled for FY 1977 when approximately 480,000 cubic yards will be dredged by hopper and disposed at the Alcatraz site (see Plate I-2). That portion of the project to be maintained includes the Long Wharf maneuvering basin, and channels of Richmond Inner Harbor up to Terminal No. 3. The major shoal areas that were dredged in Fiscal Year 1975 are shown on Plate I-9, which are the same general areas that require maintenance year after year.
- 1.067 A final Environmental Statement on the maintenance of Richmond Inner Harbor was written in 1973 (237). The Composite Statement, however, will cover the entire project (Inner and Outer Harbors) and relate it to the rest of the Federal navigation projects in the Bay.
- 1.068 d. Related Projects. The approach channel near Point Orient requires infrequent maintenance as mentioned above, and is not scheduled for next fiscal year. The 20-foot channel north of Point San Pablo has not been dredged since 1968 when only 26,200 cubic yards were removed. Apparently, this channel is no longer used by commercial boats and might be rendered "inactive" by the Corps in the future. There are no plans to maintain this channel in the foreseeable future.
- 1.069 The 20-foot channel was authorized in the 20 June 1938 Act for the purpose of providing access to the sardine reduction plants for commercial fishing boats. In 1950, there were 21 sardine reduction and canning plants in Richmond but each one eventually closed as the sardine catch began to drastically decline during the 1950's.
- 1.070 A recent authorization (Act of 27 October 1965) has allowed for deepening of the Long Wharf maneuvering basin to 45 feet, and construction of the West Richmond channel, 600 feet wide, three miles long and 45 feet deep through the west navigation opening of the Richmond-San Rafael Bridge (see inset "A" of Plate I-9). Deepening of the Long Wharf maneuvering basin would involve removal of 4,700,000 cubic yards of material, and the West Richmond Channel would involve removal of 4,000,000 cubic yards. These two proposed projects would increase future maintenance dredging requirements to 460,000 cubic yards per year at the Long Wharf, and to 450,000 cubic yards per year for the West Richmond Channel (not presently maintained).

- 1.071 These two navigation improvements are being studied under the San Francisco Bay to Stockton Project (John F. Baldwin and Stockton Ship Channels) which is under advanced engineering and design studies. An Environmental Working Paper on the San Francisco Bay to Stockton improvement project will be issued in the near future and will discuss the impacts of the overall project.
- 1.072 An investigation by the Corps into deepening Richmond Inner Harbor is also being conducted, as authorized by a House Resolution dated 10 July 1968. Preliminary plans of the study are discussed in the Environmental Working Paper issued in April 1974 (207).
- 1.073 A small berthing area at the Navy fuel pier at Point Molate is periodically but infrequently dredged. A portion of this basin is dredged by the Corps of Engineers at the request of the Navy. The Point Molate project is discussed in greater detail elsewhere in this report as a separate O&M project.
- 1.074 Aside from Federal dredging activities in this area, several local concerns also have need of dredging their respective docks and piers. For example, the City of Richmond, Atlantic Richfield Oil Corp. and Standard Oil periodically apply for Corps permits to dredge. Total dredging in the last four years by private interests amounted to 900,000 cubic yards, most of which were from the Long Wharf berthing basin. This averages out to 230,000 cubic yards of annual dredging required by non-Federal interests.

6. Oakland Harbor.

- 1.075 a. Congressional Authorization. Federal participation in developing Oakland Harbor has been on-going since the authorization to construct two jetties in 1874. The project has been modified and enlarged since then under a number of Rivers and Harbors Acts which include the Acts of: 23 June 1874, 25 June 1910, 22 September 1922, 21 January 1927, 28 April 1928, 3 July 1930, 2 March 1945, and 23 October 1962. Oakland Harbor, like Richmond Harbor, is actually made up of two sub-projects, which are commonly referred to as Oakland Inner and Outer Harbors.
- 1.076 (1) Oakland Outer Harbor. The Outer Harbor is a more recent Federal development than the Inner Harbor, being first authorized for deepening in the 1927 Act and later enlarged through the 1930 and 1962 Acts. The Federal project in Oakland Outer Harbor consists of an entrance channel, 800 feet wide and 35 feet deep, from deep water in Central San Francisco Bay, across a shoal southeast of Yerba Buena Island, which then narrows to 600 feet across from Seventh-Street Terminal E, and then widens to 950 feet terminating at the head of Outer Harbor (Plate I-10). The length of the Outer Harbor channel is 3.4 miles.
- 1.077 (2) Oakland Inner Harbor. This area, also known as the "Oakland estuary," can be further divided into two smaller project areas, and are referred to as the Inner Harbor and Tidal Canal.
- 1.078 (a) Inner Harbor. The Inner Harbor navigation project constitutes an entrance channel, 35 feet deep, 800 feet wide, branching easterly from the Outer Harbor entrance channel and immediately narrowing to 600 feet between the north and south jetties lining the entrance to the Oakland estuary; and continuing, essentially at this same width, to Government Island except where it is widened to within 75 feet of the Oakland pierhead line in front of the Grove Street terminal, and along the south side of the channel from East Posey Tube eastward to Harbor-line Point 119 in Brooklyn Basin; a channel 35 feet deep and 500 feet wide continuing through Brooklyn Basin; a triangular area, 35 feet deep, about 2,700 feet long and a maximum width of 300 feet at the western end of Brooklyn Basin, abutting the south side of Government Island; a 1,300-foot long channel, 35 feet deep and 300 feet wide at its maximum width along the north channel of Brooklyn Basin, which decreases to a 25-foot depth, 3700 feet long, paralleling the north shore of Government Island, and leads into a turning basin, 35 feet deep, 500 feet wide and 1,200 feet long at the east end of Brooklyn Basin (east of Government Island).

Total length of the Inner Harbor channel (excluding the north channel of Brooklyn Basin) is seven miles (see Plate 1-10). The two jetties previously mentioned are also part of the Inner Harbor project with the north jetty being 9,500 feet long and the south jetty 12,000 feet long.

- 1.079 (b) Tidal Canal. This part of the project consists of a canal channel 275 feet wide, 0.4 miles long and 30 feet deep from the Brooklyn Basin to the Park Street Bridge, which continues at the same width but only 18 feet deep to San Leandro Bay. The length of the tidal canal is 1.6 miles. The 30-foot and 18-foot deep portions of the tidal canal are actually authorized respectively to 35 feet and 25 feet but, at present, are only maintained to their former depth.
- 1.080 In addition to the Federal channels in the Inner Harbor, the project included three highway bridges across the tidal canal, two of which (at Park Street and High Street) have been replaced by local interests. The railroad and highway bridges at Fruitvale Avenue are maintained and operated by the Federal Government.
- 1.081 The Oakland Harbor project (Inner and Outer) serves the deep-draft Port of Oakland as well as the Oakland Army Terminal and Naval Supply Center.
- 1.082 b. Dredging History. The jetties authorized in 1874 were completed in 1894. The project as authorized by the various Acts up to 1945 has been completed except for a portion of the north channel of Brooklyn Basin, the authorized deepening of the 18-foot portion of the tidal canal, and reconstruction of the Fruitvale Avenue Highway Bridge. Dredging the north channel of Brooklyn Basin is contingent upon local interests either removing all sewers discharging therein or contributing one-half of the cost of maintenance as required by the Act of 1927. This requirement has not been met. Phase I of the deepening of Inner Harbor to 35 feet (plus two-foot overdepth), as authorized in the Act of 1962, was completed in 1974, which constituted the deepening from 30 to 35 feet, from the western entrance of the Inner Harbor to the Brooklyn Basin at Government Island, a distance of about 5-1/2 miles. Phase II, the deepening from 30 to 35 feet of the eastern half of Brooklyn Basin and tidal canal to the Park Street Bridge, is indefinite at this time.
- 1.083 The following table lists the dredging frequency since fiscal year 1931:

