

# Supplement to Treasure Island Ferry Terminal Location Study

July 2004



Prepared by:



Concept Marine Associates, Inc.

## INTRODUCTION

Concept Marine Associates, Inc., (CMA) was retained in July 2003 to provide an analysis of two potential ferry terminal locations at former Naval Station Treasure Island (TI). The two locations analyzed were the existing Pier One site, at the eastern edge of TI, and a site along the west shore, in an as yet undefined location. CMA completed the initial analysis of those sites in November 2003, and presented its Treasure Island Ferry Terminal Location Study (Ferry Study) to the Treasure Island Development Authority (TIDA) and the Treasure Island Citizens Advisory Board (TICAB) in early 2004. During the public hearings that followed, several questions were raised, some which required further review and analysis. This supplemental report (Supplemental Report) responds to those issues. The background information that CMA reviewed as part of preparing the Ferry Study and the Supplemental Report is submitted in the Technical Appendices (TA).

The questions and comments from TIDA Board Members, TICAB members and the public that were identified during the public hearings held to review the Ferry Study are as follows:

1. Provide more detail regarding the structural integrity of Pier One for future use by the ferry system.
2. Provide more detail regarding construction cost estimates for piers, breakwaters, and associated ferry terminal improvements required at both the Pier One site and a site along the west shore.
3. Provide more detail regarding passenger travel times from the various routes to and from TI.
4. Provide more detail regarding the number of ferries that would be needed to provide adequate service to TI during peak periods.
5. Provide further analysis of the impact that the sand bar at Clipper Cove may have on ferry service at Pier One.
6. Provide further analysis of the impacts from vessel wake on ferry related improvements at TI.
7. Provide further analysis of the risk of impacts between ferries and recreational boat and water users at TI.
8. Provide more detail regarding operating costs associated with ferry service from the proposed terminal sites on TI.
9. Respond to issues related to potential ridership advantages of a ferry terminal along the west shore.
10. Provide more detail concerning the potential regulatory approval process required for construction of new ferry terminals.

CMA's discussion of these issues is presented on the following pages.

## DISCUSSION

### 1. STRUCTURAL EVALUATION OF PIER ONE

Pier One has a structural concrete deck supported by concrete vertical and concrete batter piles. It was constructed by the United States Navy to homeport and provide support to the Battleship Missouri, a vessel substantially larger and heavier than the ferry vessels proposed to utilize the pier. Pier One is currently being used to store and launch America's Cup Sailing vessels. These vessels weigh approximately 25 tons each and are launched from Pier One using a 140 ton truck crane.

Prior to permitting the current America's Cup utilization of Pier One, the San Francisco, Department of Public Works, Bureau of Engineering, Structural Section, performed calculations to confirm that the structure was adequate to support the given loads from the proposed America's Cup use. The City's evaluation, which considered vertical loadings, found that Pier One was capable of withstanding the proposed loadings (see TA, Appendix K).

The loadings imposed on Pier One by the crane during the lifting of the America's Cup vessels would greatly exceed the proposed loadings from pedestrian access and potential single story construction (100 psf) on the pier itself. Accordingly, CMA believes that Pier One would be adequate to support both ferry uses and as yet unspecified ferry terminal development. Our findings were reviewed by A.J. Miller and Associates, an expert in structural pier engineering, who confirmed that Pier One is capable of withstanding the proposed loads for ferry use and terminal facilities. In addition, the pier was also found to be capable of withstanding the lateral loads that current seismic design criteria would impose on the structure (see TA, Appendix J).

### 2. PIER / BREAKWATER CONSTRUCTION COSTS

Since submitting the Ferry Report, CMA has conducted further analysis related to the costs associated with constructing waterside improvements necessary for the development of the Pier One and the west shore sites. As discussed in the Ferry Report and depicted by the Wave Roses in Figure 1, Pier One has relatively infrequent wind exposure from the predominant wave generating directions for the site (south and south east). Given the wind and wave climatology at Pier One, it is CMA's conclusion that a concrete floating breakwater would provide adequate and reliable protection for a ferry terminal. This conclusion is supported by the presence of floating breakwaters in Sausalito that are exposed to the same wind exposure as the Pier One site and larger wave generating fetch lengths. Even with the greater wave height that can be incident at Sausalito facilities, such as the Clipper Yacht Harbor, properly designed, floating breakwaters continue to be a reliable and cost effective means of protection for that harbor. In addition to the floating breakwater, the development of a ferry terminal at Pier One would also require the construction of a ferry berth, transfer span and passenger waiting area. See Figure 1 for a layout of the proposed waterside

development along TI, and Table 1 for the costs associated with these proposed improvements at Pier One.

A ferry terminal located along the west shore of TI would be exposed to much greater wind generated waves than the Pier One site. As shown by the Wind Roses in Figure 1, the western side of the island is exposed to significant wave generating fetch lengths and the predominant, westerly winds. Due to this extreme exposure, it is CMA's conclusion that three fixed breakwaters would be needed to protect a ferry terminal along the western shoreline of TI. Preliminary planning-level designs for the general waterside layout of the proposed ferry terminal are presented in Figure 1. This conclusion is supported by similar locations within San Francisco Bay, like the structures protecting the entrance to the Berkeley Marina. Fixed, rubble mound breakwaters currently protect that facility from its westerly exposure. Due to the geotechnical and spatial constraints associated with the west shore of TI, a rubble mound breakwater is not practical or cost effective. Therefore, a pile supported, fixed breakwater is recommended to protect a ferry terminal located along the western shoreline. Ferry terminal development along this shoreline would also require construction of a pier, a ferry berth, a transfer span, and a passenger waiting area, in addition to the two fixed, shore perpendicular breakwaters and one fixed, detached breakwater discussed above. The pier is needed to provide public access into deep enough water for ferry berth operation. The costs for the waterside improvements proposed for the west shore are provided in Table 2.

The cost estimates shown in Tables 1 and 2 also give greater detail than what was published in the Ferry Study. The increases arise due to additional information obtained regarding geotechnical issues at TI, further analysis of waterside improvements and the addition of landside improvements (passenger waiting areas). The additional geotechnical review revealed the presence of rock dikes surrounding the island under the floor of the Bay. These dikes are up to 40 feet thick, and have underlying, interspersed, and liquefiable layers of sand fill, shoal materials and new bay mud (see TA, Appendix L). The existence of the rock dikes makes placing the piles more costly, while the underlying, liquefiable layers will result in an increase in the number and length of the piles needed to construct the necessary improvements at both locations. This increase was magnified at the west shore site due to the substantially larger number of piles needed to provide an access pier into deep water, and to provide breakwaters to protect the ferry terminal.

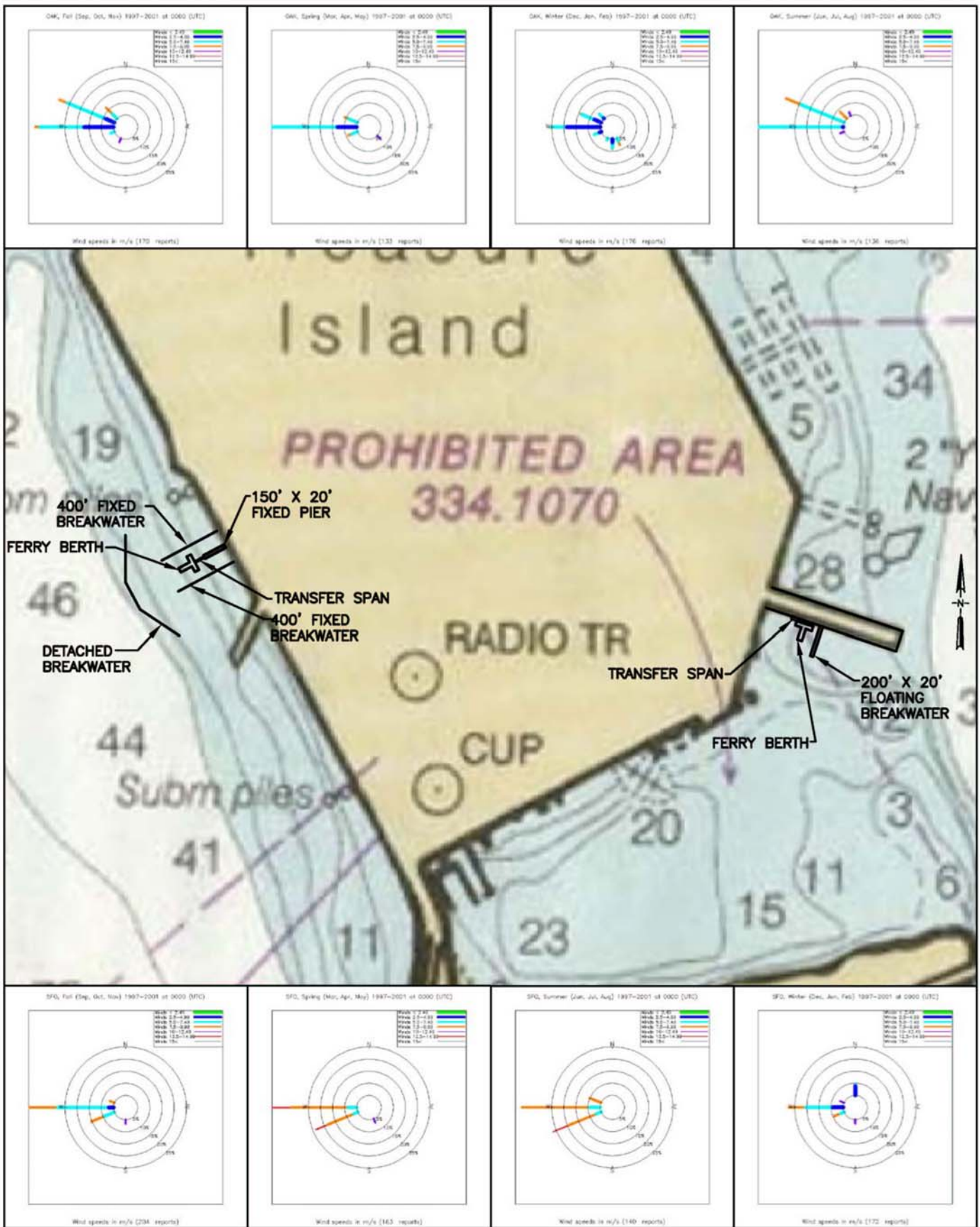


Figure 1: Ferry Terminal Plans

**Table 1: Pier One Terminal and Breakwater Cost**

No.	Description	Unit	Low Quantity	High Quantity	Low Unit Price	High Unit Price	Cost Range
1	Mobilization	LS	1	1	\$300,000	\$400,000	\$300,000 - \$400,000
<b>BREAKWATER:</b>							
2	Furnish and Install Floating Breakwater	SF	3,000	4,000	\$120	\$150	\$360,000 - \$600,000
3	Furnish Concrete Piles (24" Octagonal, 100' Long)	LF	1,100	2,100	\$40	\$50	\$44,000 - \$105,000
4	Install Concrete Piles	EA	11	21	\$2,500	\$3,000	\$27,500 - \$63,000
<b>FERRY BERTH:</b>							
5	Docking System <sup>1</sup>	EA	1	1	\$2,800,000	\$4,580,000	\$2,800,000 - \$4,580,000
6	Transfer Span <sup>2</sup>	EA	1	1	\$135,000	\$250,000	\$135,000 - \$250,000
7	Passenger Waiting Area <sup>2</sup>	SF	1,560	3,656	\$200	\$300	\$312,000 - \$1,096,800
	Design and Engineering (20%)						\$795,700 - \$1,418,960
	Construction Contingency (20%)						\$795,700 - \$1,418,960
<b>Total Pier 1:</b>						<b>\$5,569,900 - \$9,932,720</b>	

Notes:

1. See Appendix E of the Technical Appendices for a more detailed breakdown of the ferry berth costs.
2. See Appendix D of the Technical Appendix for additional information.



**Table 2: West Shore Terminal and Breakwater Cost**

No.	Description	Unit	Low Quantity	High Quantity	Low Unit Price	High Unit Price	Cost Range	
1	Mobilization	LS	1	1	\$430,000	\$800,000	\$430,000	- \$800,000
<b>ACCESS PIER:</b>								
2	Concrete Pier Deck <sup>1</sup>	CY	125	222	\$350	\$500	\$43,750	- \$111,111
3	Concrete Pier Reinforcing Steel	100 LBS	250	778	\$45	\$60	\$11,250	- \$46,667
	Furnish Concrete Piles (24" Octagonal, 150' Long)	LF	3300	7200	\$40	\$50	\$132,000	- 360,000
	Install Concrete Piles	EA	22	48	\$2,000	\$3,000	\$44,000	\$144,000
<b>BREAKWATER:</b>								
4	Furnish Sheetpile	SF	48,000	64,000	\$7	\$10	\$336,000	- \$640,000
5	Install Sheetpile (including Walers)	LF	1,600	1,600	\$300	\$500	\$480,000	- \$800,000
6	Furnish Concrete Piles (24" Octagonal, 150' Long)	LF	16,500	24,450	\$40	\$50	\$660,000	- \$1,222,500
7	Install Concrete Piles	EA	110	163	\$2,000	\$3,000	\$220,000	- \$489,000
<b>FERRY BERTH:</b>								
8	Docking System <sup>2</sup>	EA	1	1	\$2,800,000	\$4,580,000	\$2,800,000	- \$4,580,000
9	Transfer Span <sup>3</sup>	EA	1	1	\$135,000	\$225,000	\$135,000	- \$225,000
10	Passenger Waiting Area <sup>3</sup>	SF	1,560	3,656	\$200	\$300	\$312,000	- \$1,096,800
Design and Engineering (20%)							\$1,120,800	- \$2,103,016
Construction Contingency (20%)							\$1,120,800	- \$2,103,016
<b>Total West Shore:</b>							<b>\$7,845,600</b>	<b>- \$14,721,109</b>

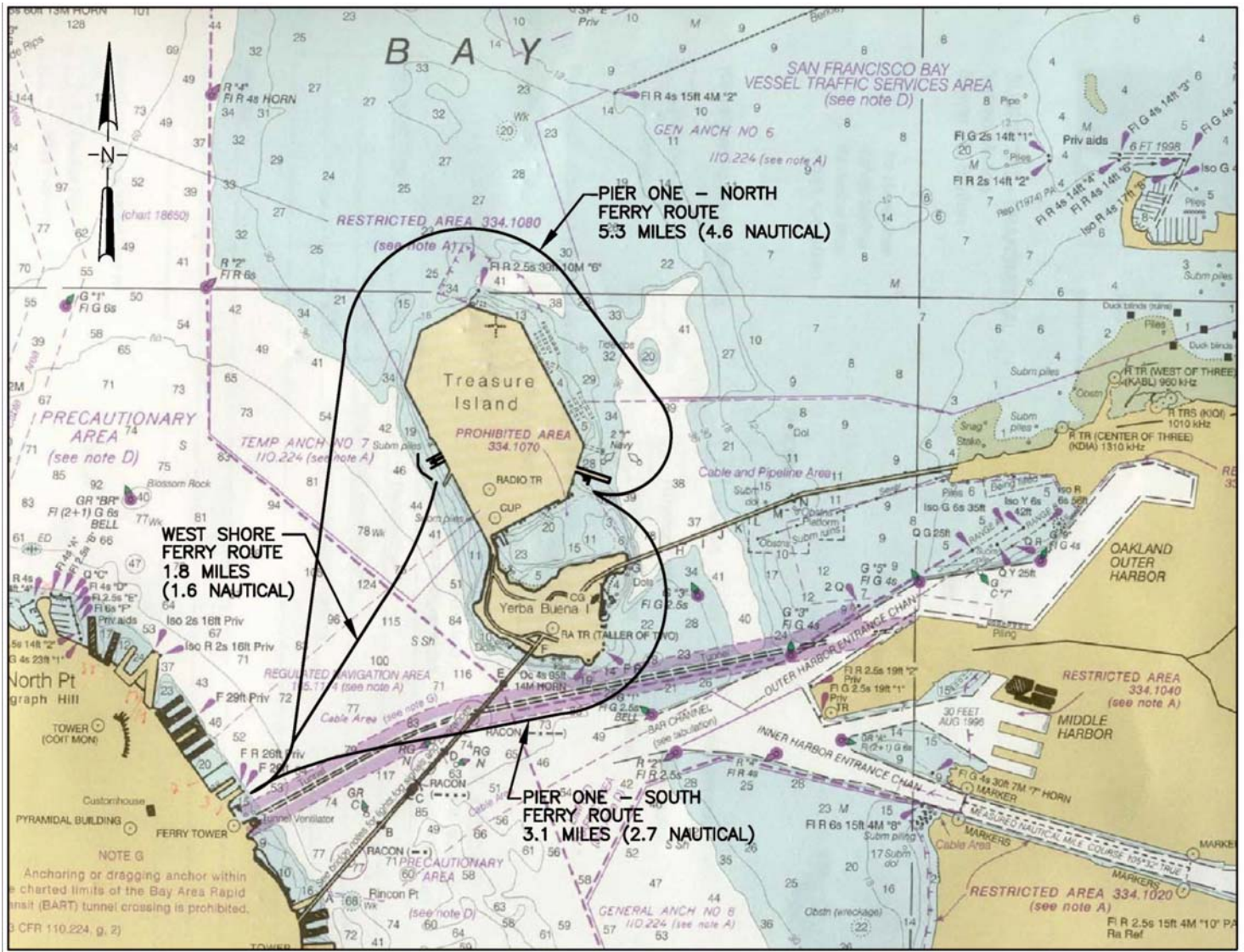
Notes:

1. Cost based on a 150' long pier that varies between 15 to 20 feet wide.
2. See Appendix E of the Technical Appendices for a more detailed breakdown of the ferry berth costs.
3. See Appendix D of the Technical Appendix for additional information.

**3. PASSENGER TRAVEL TIME**

As part of preparing this Supplemental Report, CMA consulted with the Water Transit Authority (WTA) to discuss the issue of travel times. One of the issues discussed was the possibility of a southern route from Pier One around Yerba Buena Island as an alternative to the previously considered northern route from Pier One around Treasure Island. The WTA believes that a southern route is feasible and viable and, therefore, should be analyzed. Accordingly, CMA has now considered this southern route on passenger travel times and total round trip times (cycle times), in addition to the calculations that we previously made concerning the northern route. The southern route reduces the travel time to Pier One from

the Ferry Building in San Francisco by 4.5 minutes compared to a northern route around TI. See Figure 2 for a depiction of the potential routes.



**Figure 2: Ferry Routes**

Figure 2 also shows the anticipated waterside development needed to provide a ferry terminal at the two sites on TI. The western site will require a larger and more extensive breakwater system to protect the ferry berth and vessels while loading from the prevailing winds and waves found along the west shore. As a result, vessels will have additional maneuvering time while navigating the breakwater system, resulting in slightly longer trip durations than previously estimated. See Tables 3, 4, and 5 for the revised west shore trip durations.



<b>Table 3: Ferry Route Trip Duration – Treasure Island to San Francisco (Ferry Building)</b>					
<b>Item #</b>	<b>Location</b>	<b>Maneuver/Action</b>	<b>Time (seconds)</b>		
			<b>Pier One Site North</b>	<b>Pier One Site South</b>	<b>West Shore Site</b>
1	Treasure Island	Passenger Loading <sup>1</sup>	96	96	96
2		Departure (Retract ramp, Cast Off, and Back Out)	90	90	90
3		Turning <sup>1</sup>	35	35	125
4		Accelerate to 25 Knots	25	25	25
5		Cruising (25 Knots)	657	389	234
6		Decelerate & Maneuvering	210	210	210
7		Berthing (Approach <sup>2</sup> , Make Lines Fast, and Deploy Ramp)	88	88	88
8	San Francisco	Unloading Passengers <sup>3</sup>	96	96	96
		<b>One-Way Trip (Seconds)</b>	<b>1297</b>	<b>1029</b>	<b>964</b>
		<b>One-Way Trip (Minutes)</b>	<b>21.6</b>	<b>17.2</b>	<b>16.1</b>

<b>Table 4: Ferry Route Trip Duration – San Francisco (Ferry Building) to Treasure Island</b>					
<b>Item #</b>	<b>Location</b>	<b>Maneuver/Action</b>	<b>Time (seconds)</b>		
			<b>Pier One Site North</b>	<b>Pier One Site South</b>	<b>West Shore Site</b>
1	San Francisco	Passenger Loading <sup>1</sup>	20	20	20
2		Departure (Retract ramp, Cast Off, and Back Out)	90	90	90
3		Turning	35	35	35
4		Accelerate to 25 Knots	25	25	25
5		Cruising (25 Knots)	657	389	234
6		Decelerate & Maneuvering <sup>1</sup>	210	210	300
7		Berthing (Approach <sup>2</sup> , Make Lines Fast, and Deploy Ramp)	88	88	88
8	Treasure Island	Unload Passengers <sup>3</sup>	20	20	20
		<b>One-Way Trip (Seconds)</b>	<b>1145</b>	<b>877</b>	<b>812</b>
		<b>One-Way Trip (Minutes)</b>	<b>19.1</b>	<b>14.6</b>	<b>13.5</b>

**Table 5:  
Ferry Cycle Times - Treasure Island to San Francisco (Ferry Building) to Treasure Island**

Item #	Location	Maneuver/Action	Time (seconds)		
			Pier One Site North	Pier One Site South	West Shore Site
1	Treasure Island	Passenger Loading <sup>1</sup>	96	96	96
2		Departure (Retract ramp, Cast Off, and Back Out)	90	90	90
3		Turning <sup>1</sup>	35	35	125
4		Accelerate to 25 Knots	25	25	25
5		Cruising (25 Knots)	657	389	234
6		Decelerate & Maneuvering	210	210	210
7		Berthing (Approach <sup>2</sup> , Make Lines Fast, and Deploy Ramp)	88	88	88
8	San Francisco	Unloading Passengers <sup>3</sup>	96	96	96
9	San Francisco	Passenger Loading <sup>1</sup>	20	20	20
10		Departure (Retract ramp, Cast Off, and Back Out)	90	90	90
11		Turning	35	35	35
12		Accelerate to 25 Knots	25	25	25
13		Cruising (25 Knots)	657	389	234
14		Decelerate & Maneuvering <sup>1</sup>	210	210	300
15		Berthing (Approach <sup>1</sup> , Make Lines Fast, and Deploy Ramp)	88	88	88
16	Treasure Island	Unload Passengers <sup>3</sup>	20	20	20
		<b>Cycle Time (Seconds)</b>	<b>2442</b>	<b>1906</b>	<b>1776</b>
		<b>Cycle Time (Minutes)</b>	<b>40.7</b>	<b>31.8</b>	<b>29.6</b>

Notes (Tables 3, 4 and 5):

1. Additional time for west shore is the result of navigating the extensive breakwater system needed to protect the ferry terminal from the western exposure.
2. Approach refers to time required to come to a stop in berth from one boat length out.
3. Unloading and loading times assumes 21 seconds for walk to vessel from waiting area (or from vessel to waiting area), a loading rate of 10 passengers per minute per unit width, and an access width of 6 feet.

The cycle times for the East Bay routes have also been prepared for comparison purposes and are presented in Tables 6 and 7. The trip durations and cycle times for the routes provided in Tables 3, 4, 5, 6, and 7 have all been reviewed by the WTA.

<b>Table 6: Ferry Route Cycle Times - Treasure Island to Oakland (Jack London) to Treasure Island</b>				
Item #	Location	Maneuver/Action	Time (seconds)	
			Pier One Site	West Shore Site
1	Treasure Island	Passenger Loading <sup>1</sup>	20	20
2		Departure (Retract ramp, Cast Off, and Back Out)	90	90
3		Turning	35	125
4		Accelerate to 25 Knots	25	25
5		Cruising (25 Knots)	673	813
6		Decelerate & Maneuvering	210	210
7		Berthing (Approach <sup>2</sup> , Make Lines Fast, and Deploy Ramp)	88	88
8	Oakland	Unloading Passengers <sup>1</sup>	20	20
9	Oakland	Passenger Loading <sup>1</sup>	96	96
10		Departure (Retract ramp, Cast Off, and Back Out)	90	90
11		Turning	35	35
12		Accelerate to 25 Knots	25	25
13		Cruising (25 Knots)	673	813
14		Decelerate & Maneuvering	210	300
15		Berthing (Approach, Make Lines Fast, and Deploy Ramp)	88	88
16	Treasure Island	Unload Passengers <sup>1</sup>	96	96
		<b>Total Cycle Time (seconds)</b>	<b>2,474</b>	<b>2,935</b>
		<b>Total Cycle Time (minutes)</b>	<b>41</b>	<b>49</b>

Notes:

1. Unloading and loading times assumes 21 seconds for walk to vessel from waiting area ( or from vessel to waiting area), a loading rate of 10 passengers per minute per unit width, an access width of 6 feet, and 149 passengers each way.
2. Approach refers to time required to come to a stop in berth from one boat length out.

**Table 7:  
Ferry Route Cycle Times - Treasure Island to Berkeley to Treasure Island**

Item #	Location	Maneuver/Action	Time (seconds)	
			Pier One Site	West Shore Site
1	Treasure Island	Passenger Loading <sup>1</sup>	20	20
2		Departure (Retract ramp, Cast Off, and Back Out)	90	90
3		Turning	35	125
4		Accelerate to 25 Knots	25	25
5		Cruising (25 Knots)	577	697
6		Decelerate & Maneuvering	210	210
7		Berthing (Approach <sup>2</sup> , Make Lines Fast, and Deploy Ramp)	88	88
8	Berkeley	Unloading Passengers <sup>1</sup>	20	20
9	Berkeley	Passenger Loading <sup>1</sup>	96	96
10		Departure (Retract ramp, Cast Off, and Back Out)	90	90
11		Turning	35	35
12		Accelerate to 25 Knots	25	25
13		Cruising (25 Knots)	577	697
14		Decelerate & Maneuvering	210	300
15		Berthing (Approach, Make Lines Fast, and Deploy Ramp)	88	88
16	Treasure Island	Unload Passengers <sup>1</sup>	96	96
		<b>Total Cycle Time (seconds)</b>	<b>2,282</b>	<b>2,702</b>
		<b>Total Cycle Time (minutes)</b>	<b>38</b>	<b>45</b>

Notes:

1. Unloading and loading times assumes 21 seconds for walk to vessel from waiting area ( or from vessel to waiting area), a loading rate of 10 passengers per minute per unit width, and an access width of 6 feet.
2. Approach refers to time required to come to a stop in berth from one boat length out.

The Ferry Study calculated the one-way travel time and round-trip travel time for both the Pier One and the west shore site. Some members of the public raised the concern that actual passenger travel time was not given for comparison purposes.

Table 8 provides the calculated one-way passenger travel time (excludes passenger loading and unloading) from the west shore of TI to the San Francisco Ferry Building, Berkeley and Oakland, the one-way passenger travel time from Pier One to those same sites and actual passenger travel times for some of the existing Bay Area ferry routes.

Review of these tables confirms that the shortest one-way passenger travel time to San Francisco is from the west shore, although a southern route from Pier One only takes one minute longer. The shortest one-way passenger travel time to the East Bay, should that route occur, would be from the Pier One site. Table 8 also confirms that the one-way

passenger travel times for both locations on Treasure Island would compare very favorably with the other existing ferry routes in the Bay.

ROUTE	TRIP DURATION (sec.)	TRIP DURATION (min.)
Vallejo/SF Ferry Building	3300	55
Sausalito/SF Fisherman's Wharf	1800	30
Oakland/SF Ferry Building	1800	30
<b>TI West Shore/Oakland</b>	<b>1380</b>	<b>23</b>
<b>TI West Shore/Berkeley</b>	<b>1260</b>	<b>21</b>
Alameda/SF Ferry Building	1200	20
Tiburon/SF Ferry Building	1200	20
<b>TI Pier 1/Oakland</b>	<b>1140</b>	<b>19</b>
<b>TI Pier 1 - North/SF Ferry Building</b>	<b>1080</b>	<b>18</b>
<b>TI Pier 1/Berkeley</b>	<b>1020</b>	<b>17</b>
<b>TI Pier 1 - South/SF Ferry Building</b>	<b>840</b>	<b>14</b>
<b>TI West Shore/SF Ferry Building</b>	<b>780</b>	<b>13</b>

- Notes: 1. Bold items represent possible new routes from TI.  
2. Passenger travel time includes items 2 through 7 on Tables 4, 5, 6 and 7.

#### 4. NUMBER OF FERRY VESSELS

Questions were raised regarding the number of vessels that would be needed to provide adequate service to TI, from either the Pier One site or a proposed site along the western shoreline. The Ferry Report discussed thirty minutes as the minimum round-trip (cycle) time necessary for a site to be served by a single ferry vessel. This approach assumed that the frequency of ferry service needed at TI would be similar to existing routes in the Bay. Based on this approach, CMA concluded that two ferry vessels would be needed at both sites to accommodate ferry service every half hour during peak usage period. Neither site could accommodate such service with a single vessel, according to the round-trip (cycle) times computed for the Ferry Study.

Since submitting the Ferry Study, CMA has performed additional analysis on trip durations from both sites. The additional analysis included refinement of the maneuvering required due to the waterside breakwater improvements and consideration of a southern route from Pier One.

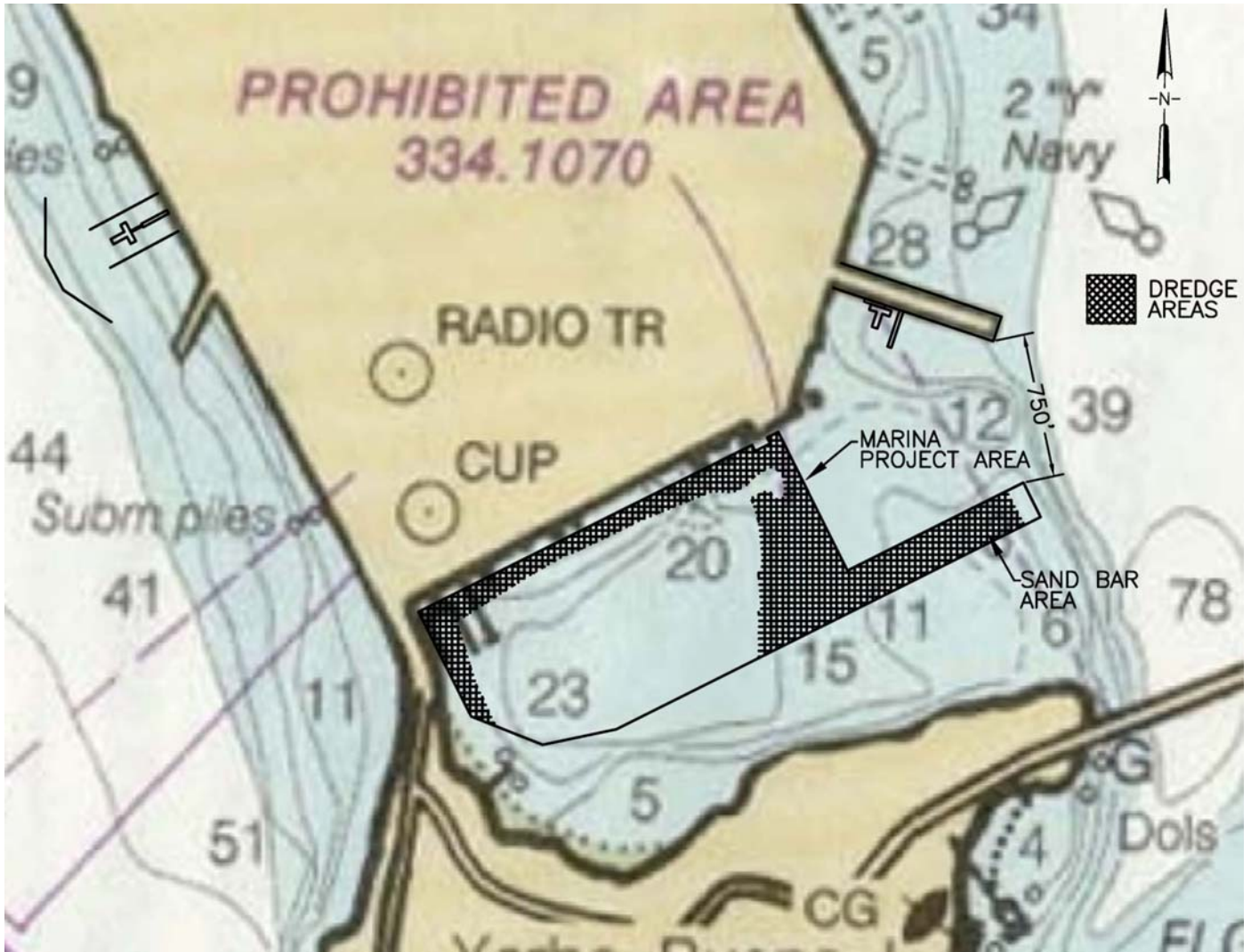
After completing the re-evaluation of the trip durations for the three potential routes, the west shore site has a cycle time of 29.6 minutes, the southern route from Pier One would have a cycle time of 31.8 minutes, and the northern route from Pier One would have a cycle time of 40.7 minutes. Once these revised cycle times had been reviewed by the WTA, further discussion was conducted to determine the effect of the trip durations on the number of ferry vessels needed to serve the routes. The WTA indicated that ferry service at TI would initially



be provided according to projected ferry usage and then would be re-evaluated and adjusted to meet the actual demand for the service. If additional service is needed, it could be achieved by either utilizing larger vessels or by adding a second vessel during peak periods. The WTA also indicated that another important consideration in determining the maximum headway (time between ferry departures for the same one-way route) for a ferry service is the attractiveness of the service to its users, which is heavily dependant on the frequency and duration (one-way trip time) of the service. Since the duration of service for the west shore and a southern route to Pier 1 only vary by 1 minute, and the duration of service for the west shore and a northern route to Pier One only vary by 5.5 minutes, it is concluded that the frequency of the service and the number of ferries needed would be the same at either of the two sites.

#### 5. SAND BAR AT THE ENTRANCE TO CLIPPER COVE

The sand bar located at the entrance to Clipper Cove was identified in the Ferry Study as not having a direct impact on ferry operations at Pier One. Further information obtained since the completion of the Ferry Study revealed that the TIDA's proposed marina development project would include an application for a dredging permit to dredge the sand bar at the mouth of Clipper Cove to provide an access channel to the marina. The dredging will be performed, where needed, to a minimum depth of -12 Mean Lower Low Water (MLLW). The new dredged entrance channel will be 750 feet from Pier One. This distance is more than adequate to safely allow ferry vessel maneuvering (250 feet needed) at the pier and recreational boating activities in the vicinity to operate simultaneously. Such dredging activity would eliminate the sand bar as a possible future concern for ferry operations at Pier One as well. This will also eliminate any concern of the sand bar potentially redirecting traffic leaving Clipper Cove towards Pier One. Figure 3 illustrates the Marina Project Area and the proposed area to be dredged.



**Figure 3: Proposed Marina Project Area at Clipper Cove**

## 6. WAVE IMPACT FROM VESSELS

Public comment raised the concern that vessel wake of any type was not considered during the evaluation of wave impacts on the ferry terminal development at the two sites. Vessel wake is not considered to be significant because the magnitude of the waves produced by vessels is below current design criteria for projects of this type at both sites, which are based on wind waves, not vessel waves.

Another potential concern is the affect of ferry vessel wake on recreational boating within Clipper Cove. Since the ferry vessels will be preparing for docking when in the vicinity of Clipper Cove, there speed will be reduced which will result in no significant wave energy in the Clipper Cove area.

## 7. RISK OF COLLISIONS BETWEEN FERRIES AND RECREATIONAL USES

Comments were made concerning the risk of collisions between ferries and recreational uses, particularly with regard to the Pier One site. CMA considered this issue again, and consulted with the WTA, and once more concluded that no significant increase in incident occurrence has been identified (see TA, Appendix A). However, the research did determine that, should a risk of collision be identified in the future, the problem could be mitigated by having an additional deck hand on watch to assist the ferry crew in identifying and avoiding potential conflicts with recreational uses. The operating costs described herein include an additional deck hand for the Pier One routes where the potential risk is likely to be greater. There is no conclusive evidence that an additional deck hand would be required, and the operating cost calculated for Pier One could be lower if there is no need for this additional employee.

## 8. OPERATING COSTS

Preliminary annual operating costs for the three possible routes from TI to the San Francisco Ferry Building and routes to East Bay terminals at Oakland (Jack London) and Berkeley have been evaluated. In order to perform this evaluation, the ferry specialists at Art Anderson & Associates, Seattle, Washington, were retained. Additionally, background information and costs regarding ferry operations prepared by the WTA were also reviewed.

Art Anderson & Associates performed model simulations for the possible ferry routes from TI to the San Francisco Ferry Building to determine the fuel and maintenance costs. (See TA, Appendix M). The operating costs for the two sites are provided in Tables 9, 10, 11, 12, 13, 14, and 15 below. As shown in the operating cost tables, a number of the operational items will have the same cost for either route. However, three items, crew, fuel, and maintenance, have higher costs for the Pier One route to the San Francisco Ferry Building due to the longer travel distance and the potential need for an additional deck hand to be on watch to avoid impacts to navigational hazards. If the additional deck hand is not deemed a requirement for the Pier One routes, then the operational costs of the Pier One southern route to the San Francisco Ferry Building is estimated to be only \$53,002 more than the western route, and the Pier One northern route is estimated to be only \$144,550 more than the western route.

For the East Bay routes to Oakland (Jack London) and Berkeley, only the crew cost is higher for the Pier One site compared to a west shore site. This is a result of the travel distance to these sites being greater for a west shore site which results in higher fuel and maintenance costs. If the number of crew members is not found to be greater for the Pier One routes, then the operating costs for routes from a west shore site would be \$56,506 greater to Oakland and \$52,431 greater to Berkeley on an annual basis when compared to routes from Pier One. See Table 16 for a comparison of the operating costs for all of the routes evaluated.

<b>Table 9:</b> <b>Pier One - North to San Francisco Ferry Building Route</b> <u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 4 Deck)	\$1,886,920
Fuel	\$149,651
Passenger Services	\$112,320
Maintenance	\$117,740
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$2,427,511</b>

<b>Table 10:</b> <b>Pier One - South to San Francisco Ferry Building Route</b> <u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 4 Deck)	\$1,886,920
Fuel	\$91,143
Passenger Services	\$112,320
Maintenance	\$84,700
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$2,335,963</b>

<b>Table 11:</b> <b>West Shore to San Francisco Ferry Building Route</b> <u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 3 deck)	\$1,599,780
Fuel	\$57,270
Passenger Services	\$112,320
Maintenance	\$65,571
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$1,995,821</b>

<b>Table 12: Pier One to Oakland (Jack London)</b>	
<u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 4 Deck)	\$1,886,920
Fuel	\$151,909
Passenger Services	\$112,320
Maintenance	\$119,517
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$2,431,546</b>

<b>Table 13: West Shore to Oakland (Jack London)</b>	
<u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 3 deck)	\$1,599,780
Fuel	\$183,534
Passenger Services	\$112,320
Maintenance	\$144,398
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$2,200,912</b>



<b>Table 14: Pier One to Berkeley</b>	
<u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 4 Deck)	\$1,886,920
Fuel	\$130,168
Passenger Services	\$112,320
Maintenance	\$102,412
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$2,392,700</b>

<b>Table 15: West Shore to Berkeley</b>	
<u>Preliminary Operating Costs</u>	
Item Description	Cost
Crew (Captain, Senior Deck, 3 deck)	\$1,599,780
Fuel	\$157,275
Passenger Services	\$112,320
Maintenance	\$127,736
Insurance	\$80,000
Licenses	\$6,000
Cleaning Crew	\$74,880
<b>Total</b>	<b>\$2,157,991</b>

Notes (Tables 9 through 15):

1. Costs based on 149 passenger vessel.
2. Passenger Services includes costs for urea solution, fresh ater and sewage disposal.

<b>Table 16: Operating Cost Comparison Chart</b>			
Treasure Island Location -"route"	SF – Ferry Building	Oakland	Berkeley
Pier One – North (4 Crew Members)	\$2,427,511	\$2,431,546	\$2,392,700
Pier One – South (4 Crew Members)	\$2,335,963		
Pier One – North (3 Crew Members)	\$2,140,371	\$2,144,406	\$2,105,560
Pier One – South (3 Crew Members)	\$2,048,823		
West Shore	\$1,995,821	\$2,200,912	\$2,157,991

## 9. RIDERSHIP ADVANTAGE OF A SHORT FERRY ROUTE

Some members of the public expressed the opinion that a shorter ferry route from the western shore would increase ridership and therefore support the development of TI. Discussions with representatives of the WTA revealed that ridership counts have been found to be dependent upon travel time. However, CMA believes that, given the comparatively small differences in travel times between the various potential routes on TI, ridership would be relatively constant, especially when a southern route to Pier One is considered.

Many opinions can be given regarding what motivates the public to use various forms of transit, including ferries. Factors include, ease of use, trip duration, cost, aesthetics and personal taste. While some individuals may not ride the ferry to TI because it navigates around the island from San Francisco, the differential one-way travel time between a west side terminal and east side terminal is only one minute utilizing the southern route to Pier One, or 5.6 minutes using a northern route to Pier One. Given the parking issues in San Francisco and potential delays on the Bay Bridge and San Francisco roadways, any ferry alternative will provide a fast and pleasant linkage between TI and San Francisco. In addition, both potential terminal sites on TI are located within easy walking distance of the active uses proposed for TI, so it is unlikely that either terminal location will significantly affect ferry ridership.

## 10. REGULATORY APPROVAL PROCESS

The proposed improvements needed to develop a ferry terminal on TI will be subject to the permitting requirements of the Bay Conservation and Development Commission (BCDC) under the McAteer-Petris Act (Gov. Code §§ 66600 *et seq.*) and the U.S. Army Corps of Engineers (Corps) under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403) and, to the extent solid fill is involved or pilings that are the equivalent of solid fill, Section 404 of the Clean Water Act (33 U.S.C. § 1344). Waste discharge requirements under the Porter-Cologne Water Quality Control Act (Water Code § 13000 *et seq.*) and/or a certification under Section 401 of the Clean Water Act (33 U.S.C. § 1341) may be required from the Regional Water Quality Control Board (RWQCB). A preliminary list of the various permits required for ferry service in the Bay, prepared by the Water Transit Authority, is attached as Table 17.

Each of these agencies is independent, and each has separate regulatory requirements that must be met. However, as a general proposition, each agency will require an analysis of alternatives in order to ensure that any fill is the “minimum necessary,” will “minimize harmful effects to the bay area,” there is “no alternative upland location” for the fill, and the “public benefits from fill clearly exceed the public detriment from loss of water surface area” (BCDC); or is the least environmentally damaging practicable alternative (Corps, RWQCB). In practice, this means that, absent other considerations such as the presence of endangered species,

- sites with less fill will be preferred over those with more fill;
- pile-supported fill for ferry facilities will be preferred over solid fill for such facilities because of the greater adverse impacts of the latter on tidal circulation and benthic species; and
- locations requiring less solid fill will be preferred over those with more.

In the case of the proposed ferry terminal sites on TI, the significantly larger amount of pile-supported and solid fill needed to develop the west shore site would have to be justified over the smaller impacts associated with the development of the Pier One site. This would have to be accomplished, if at all, by showing financial and other public benefits sufficiently compelling to overcome the greater adverse impacts on San Francisco Bay of developing the west shore site. Given the development costs, operating costs, ridership expectations, and impacts connected with the development of the two sites discussed previously in this Supplement, it appears that it would be difficult to justify development of the west shore site over the Pier One site.

**TABLE 17: List of Likely Permits for Ferry Systems in the San Francisco Bay**

Activity	Permit	Agency	Terminal								
			Berkeley	Richmond	Treasure Island	Mission Bay	Oyster Point	Redwood City	Martinez	Pittsburg/Antioch	Hercules/Rodeo
Terminal Construction	Building Permit	City/County	x	x	x	x	x	x	x	x	x
Dredging & Dredge Material Disposal	Dredge Permit	DMMO									x
Dredging & Dredge Material Disposal	CWA Section 401 Certification	RWQCB									x
Construction Stormwater Discharge			x	x	x	x	x	x	x	x	x
Bay Fill	BCDC permit	BCDC	x	x	x	x	x	x	x	x	x
Pile Driving	Incidental Harrassment Permit - Seal Haulout (noise)	NMFS							x		
Construction & Operations	Section 7 Consultation - Salt Marsh Harvest Mouse	USFWS				x		x	x		
Construction & Operations	Section 7 Consultation - Black Rail	USFWS						x			
Construction & Operations	Section 7 Consultation - Clapper Rail	USFWS	x					x	x		
Ferry Operations	Incidental Harrassment Permit - Seal Haulout	NMFS			x				x		
Ferry Operations	Approval for Permit	USACE	x	x	x	x	x	x	x	x	x
Ferry Operations	Air Permit	BAAQMD/CARB	x	x	x	x	x	x	x	x	x
Terminal Operations	NPDES Permit	RWQCB	x	x	x	x	x	x	x	x	x
Terminal Operations Stormwater Discharge	Industrial Activities General Permit	RWQCB	x	x	x	x	x	x	x	x	x
Local Sewer Discharge	Industrial Discharge Permit	Local	x	x	x	x	x	x	x	x	x