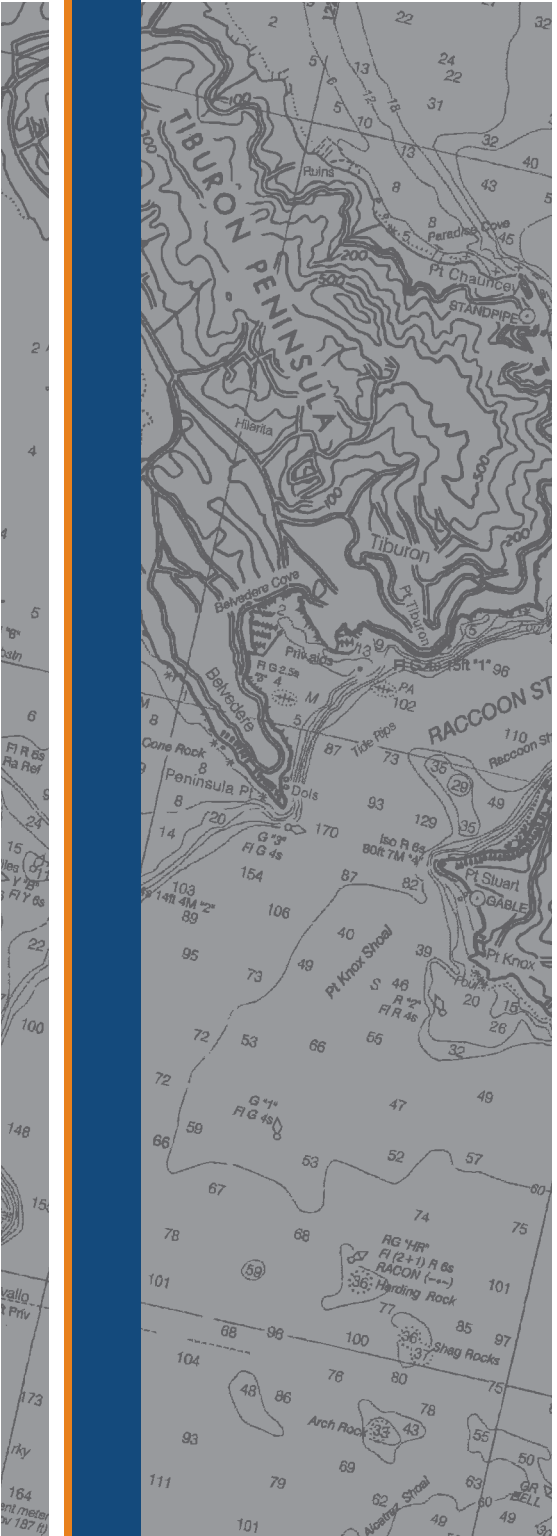
A Strategy to Improve Public Transit with an Environmentally Friendly Ferry System

Final Implementation & Operations Plan

July 2003

San Francisco Bay Area Water Transit Authority



WTA

Dear Governor Davis and Members of the California Legislature:

After two years of work, the San Francisco Bay Area Water Transit Authority (WTA) is delivering an Implementation and Operations Plan. It is a viable strategy to improve Bay Area public transit with an environmentally friendly ferry system. It is a well-thought-out plan calling for a sensible transportation investment. It shows how the existing and new individual ferry routes can form a well-integrated water-transit system that provides good connections to other transit.

When you enacted Senate Bill 428 in October 1999, the WTA was formed and empowered to create a plan for new and expanded water transit services and related ground transportation terminal access services. It was further mandated that the Authority must study ridership demand, cost-effectiveness and expanded water transit's environmental impact. From that mandate, we determined that the Authority's mission is to build and operate a cost-effective, convenient and environmentally responsible ferry system that will enhance commuter choices and the Bay Area's public-transit system. This plan accomplishes that mission.

We are committed to building the cleanest water-transit system in the world. In three years, we can have ferries in service that are ten times cleaner than today's fleet. Meanwhile, our proposed research-and-development program will be developing true zero-emissions ferries so we can deploy them as quickly as possible.

People will leave their cars and ride this system. Our ridership study used state-of-the-art private sector market research that will guide us in building a large, loyal patron base of commuters and recreation travelers.

This proposed system is cost-effective and compares favorably with other Bay Area transbay transit. This system is also safe. Statistics show that people riding Bay Area ferries are riding the region's safest form of public transit. We will make it even safer. Furthermore, expanded water transit adds enormous resources for emergency planners should an earthquake or other disaster strike the Bay Area.

Finally, as the Final Program Environmental Impact Report (FEIR) details, this system is environmentally responsible.

From beginning to end, this plan is built on solid, conservative technical data and financial assumptions. If the State of California adopts this plan and it is funded, we can begin making expanded water transit a reality.

The current economy makes it tough to find funds for new programs, even those as worthy as expanded Bay Area water transit. The Authority understands the economic challenges it faces and is already working hard to overcome that hurdle. Today, the Authority's future is unclear, pending your consideration. But the prospects for expanded Bay Area water transit — and the benefits it can bring to the region — are clear.

We are grateful to the Metropolitan Transportation Commission, the U.S. Coast Guard, local and county elected officials throughout the Bay Area and concerned citizens, like the members of Bluewater Network and other environmental organizations, who helped us create this plan. We also appreciate the countless hours our advisory groups spent with us during the past two years, reviewing technical studies and system-planning strategies to ensure that this plan is well-thought-out.

We also thank the San Francisco Bay Conservation and Development Commission (BCDC), the regulatory agencies, the existing ferry operators and the other transit agencies that provided enormous help to our staff and technical consultants and who are committed to doing whatever they can to help improve Bay Area transportation.

This Implementation and Operations Plan presents the first steps to improve Bay Area public transit with an environmentally friendly ferry system. We look forward to working with you and taking the next steps to make this plan a reality.

Sincerely,

Charlene Haught Johnson

Charlene Haught Johnson
President, San Francisco Bay Area Water Transit Authority

QUOTED...

"The State of California made a huge investment in studying how ferries can give Bay Area commuters and recreational visitors more transit options. The opportunity to build a water transit system for the region's future is exciting. I'm pleased by all the hard work, top expertise and public participation that has gone into the WTA's plan."

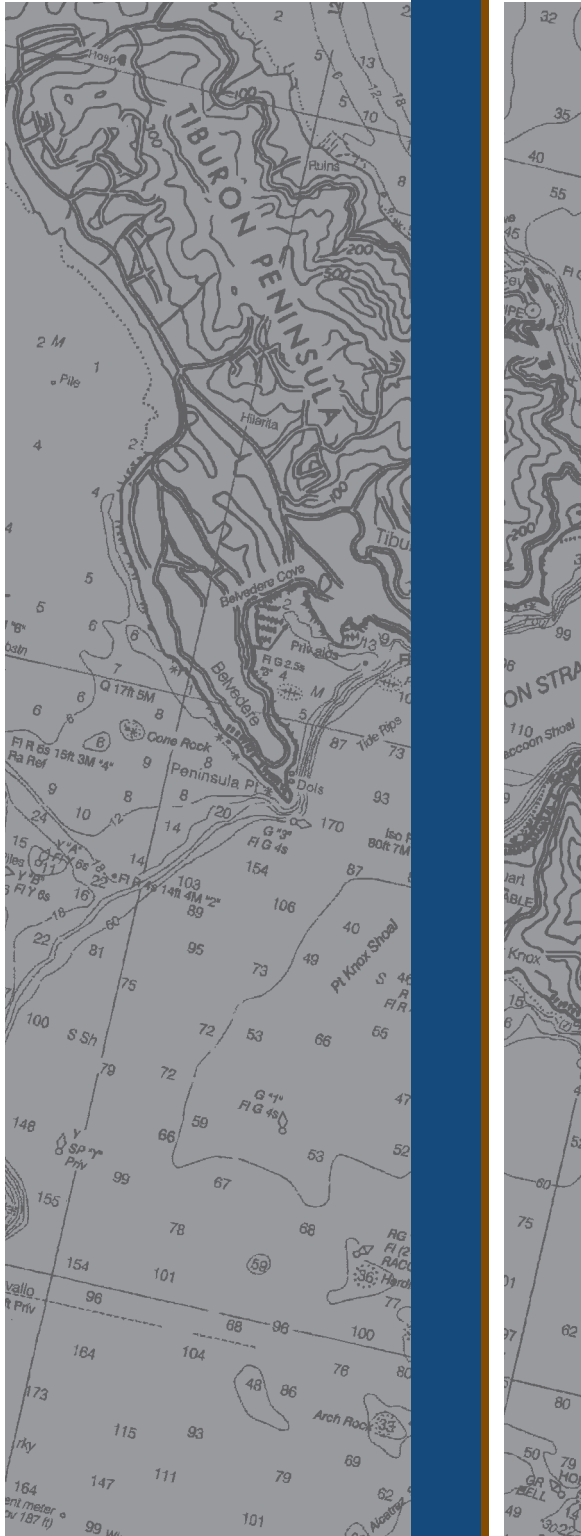
— Don Perata
California State Senator
Oakland

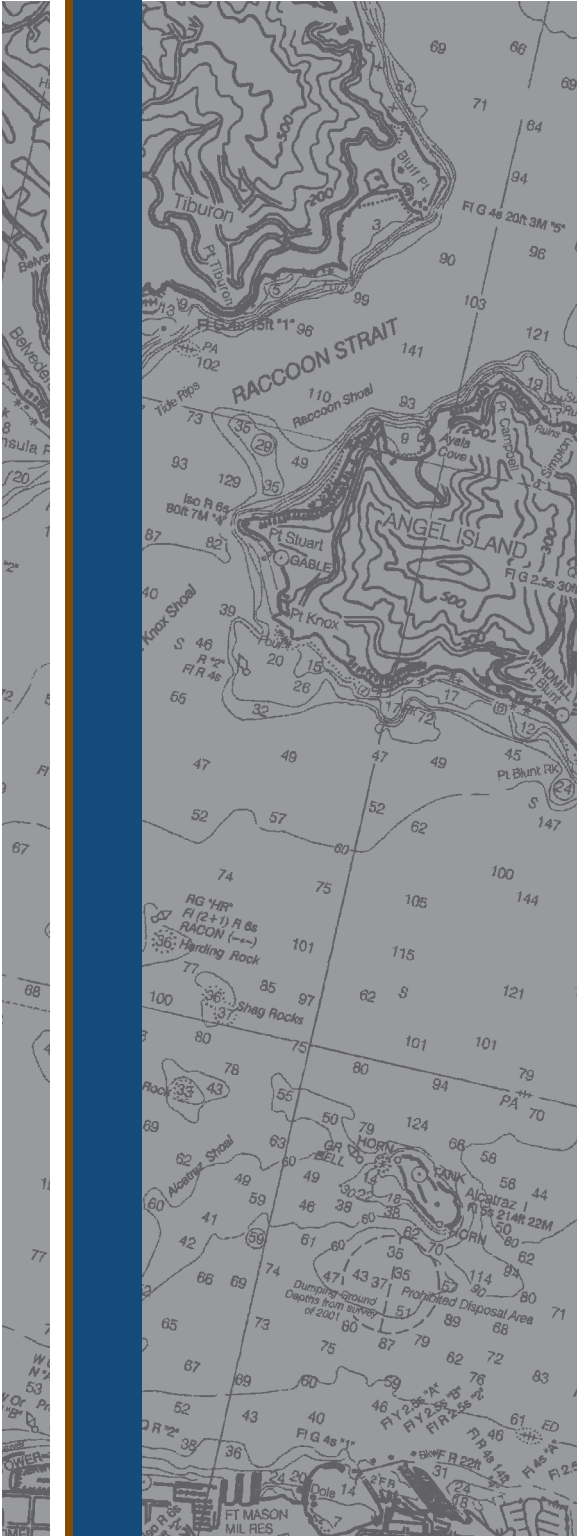
"The WTA's plan for developing clean technologies for the next fleet of ferries is visionary. The standard has been set high for improving air quality and preserving the health of the Bay. Environmentally friendly ferries reflect the values of North Bay residents."

— Cynthia Murray
Supervisor
Marin County

"We are working to transform the former Alameda Naval Base into a flourishing new regional hub for housing, employment and recreation. Ferry service will be very important to the multi-modal transit approach we are planning to meet public transit needs. Alameda Point is a great example of the concept being promoted by the WTA to enhance ferry ridership by putting residents, workers and visitors within close distance of ferry terminals."

— Doug Yount
Deputy City Manager
Alameda





"For California to meet its long-term air quality goals, it is critical to move beyond traditional technologies to zero- and near-zero emissions technologies. Clearly putting a transit system in operation that demonstrates state-of-the-art emission control technology and the development of zero-emissions ferries will help achieve our air quality goals and be a model for other regions to follow."

— California Air Resources Board

"We now have over 7,000 people working in the biotech industry in South San Francisco and we have greater employment to the tune of 30,000-40,000 new jobs in the city. We look forward to adding ferries to the many transit options our city offers its businesses and residents."

— Pedro Gonzalez
Mayor
South San Francisco

"Ferry transportation provides an environmentally friendly commuting alternative to the congested roadways in many of our nation's metropolitan areas. Ferries also play a critical role in the evacuation of citizens during emergencies, as demonstrated in New York City in September 2001. The Maritime Administration actively supports the expansion of this water mode to promote mobility and reduce congestion for our citizens."

— Margaret D. Blum
U.S. Department of Transportation
Maritime Administration

"Integrating various modes of transportation builds momentum toward a society no longer reliant on automobiles. Using bicycles as a way to connect to ferries supports a clean, healthy commute environment."

— Leah Shahum
Executive Director
San Francisco Bicycle Coalition;
Director
Golden Gate Bridge Highway
and Transportation District

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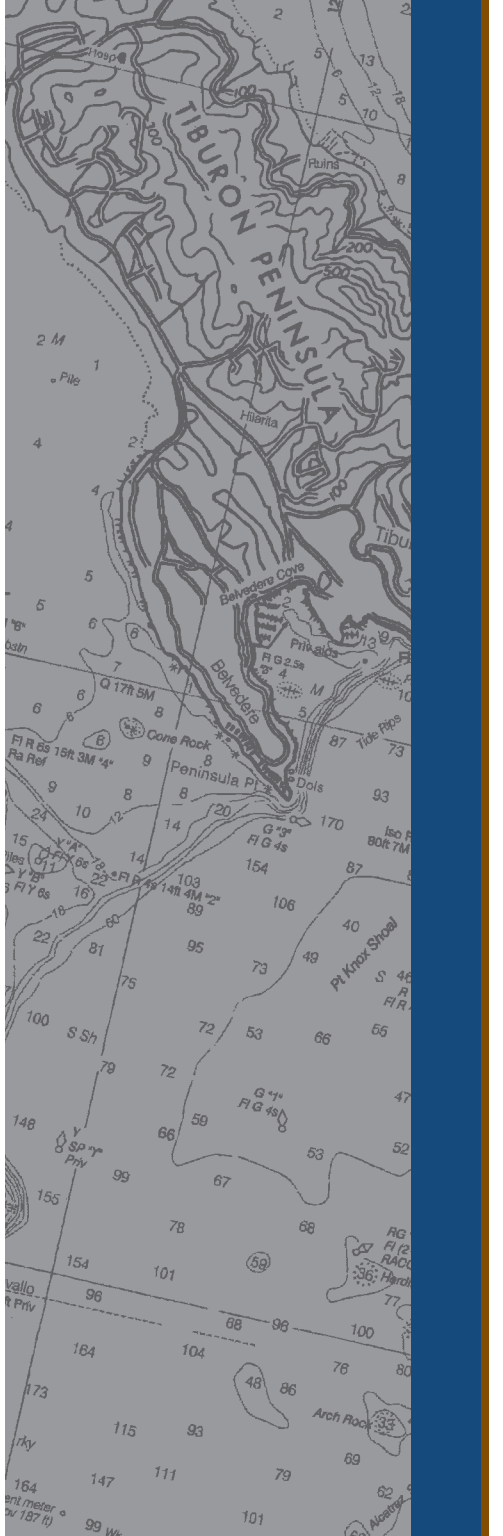
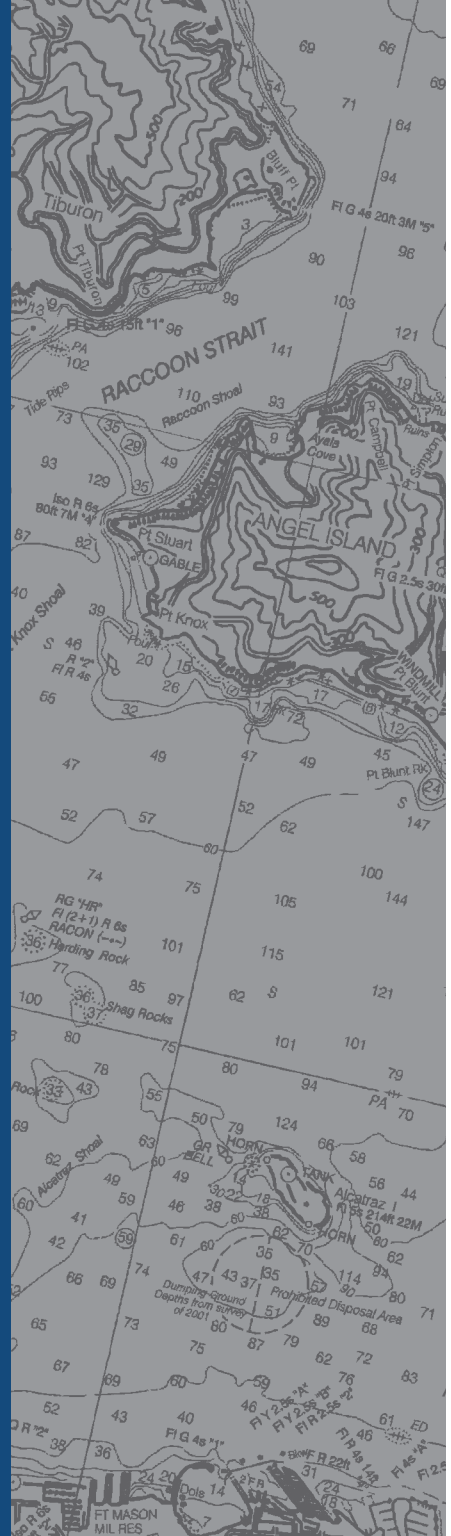




This plan shows how expanded Bay Area water transit that is affordable, reliable, convenient, flexible and clean will get drivers out of their cars and onto environmentally responsible state-of-the-art passenger ferries.

THE DEMAND

Why must San Francisco Bay Area water-transit service be expanded?

- Growth projections show 1.2 million new Bay Area jobs in the next 25 years and a 1.4 million population increase.
- During the next 25 years, there will be a 30 percent increase in region-wide travel and a 40 percent increase in transbay travel.
- Bay Area residents rank traffic among their top concerns — seven out of ten say they are willing to pay higher bridge tolls if the money is used for congestion-relief projects.

Water transit is an environmentally responsible and economically affordable public-policy choice. Water transit's operating costs per seat and subsidy per passenger are comparable to Bay Area rail and bus services.

Water transit is affordable and rapidly deployable. Unlike rail, it can be launched quickly, at low initial cost and with great flexibility. Unlike buses, ferries are unhindered by traffic congestion.

This plan shows how expanded Bay Area water transit that is affordable, reliable, convenient, flexible and clean will get drivers out of their cars and onto environmentally responsible state-of-the-art passenger ferries.

THE ROUTES

- New water-transit service will operate only where environmental impact is controlled and limited, and where localities are committed both financially and politically to expanding and supporting ferry service.
- The proposed new routes are good transportation investments comparable to other transit modes.
- Federal accident data shows that Bay Area water transit is the region's safest public transit.
- Expanded recreational service is also being planned, to provide transit access to many of the Bay Area's treasured resources, particularly on weekends when bridge-corridor traffic congestion is becoming an increasing problem.
- In 23 years, ferries have been used six times in the Bay Area to replace other disabled transportation links. Water transit uniquely provides flexible, vital transportation support in response to a natural or man-made disaster that shuts down bridges and roads.

What is the existing system?

- Oakland-Alameda-San Francisco
- Harbor Bay-San Francisco
- Vallejo-San Francisco
- Sausalito-San Francisco
- Larkspur-San Francisco
- Tiburon-San Francisco (privately run)

What is the proposed new system?

- Expansion of existing routes

New Routes

- Berkeley-San Francisco-Mission Bay
- Richmond-San Francisco
- Treasure Island-San Francisco
- Antioch/Pittsburgh-Martinez-San Francisco
- Hercules/Rodeo-San Francisco
- South San Francisco-San Francisco
- Redwood City-San Francisco
- Port Sonoma-San Francisco (further study)

Other Routes for Future Study

- East Bay-Peninsula
- Hunters Point
- Moffett Field

This plan estimates that the first new service could begin within three years of funding. Some routes could take up to eight years to begin operations.

The proposed expanded water-transit service initially has a higher cost-per-rider than several existing ferry operations due to costs associated with:

- New emissions monitoring protocol
- Planning and implementing good connections with other transit
- Acquiring new riders who are not as readily inclined to ride transit

What is the safety plan?

The Authority is working with the Coast Guard, California Maritime Academy and others to ensure that the Bay Area's safest transit system maintains the utmost safety as it expands. The Safety Plan proposes development of mutual assistance plans, increased training and emergency drills, installation of closed-circuit TV cameras to monitor unmanned areas and development of preventive maintenance programs.

THE CONNECTIONS

How does the San Francisco Bay Area water-transit system fit into the overall transit system?

The new water-transit system will include ground transit connections to buses and shuttles, and it will also encourage pedestrian and bicycle access.

- Water Transit-Oriented Development (WaTOD) in places like Jack London Square in Oakland, Alameda Point, Hunters Point and Oyster Point in South San Francisco can promote sensible land use and build significant ridership from patrons who will walk, bike or take transit to ferries.
- Expanded water transit will significantly increase the capacity for bicycles to traverse the Bay and connect to the Bay Area bike trail network.

  Good connections between transit systems are essential to increase transit ridership on all systems, and subsequently, reduce traffic congestion. The Authority will work with other transit operators to build good connections.

THE TERMINALS

- New ferry terminals on the San Francisco Bay shoreline will serve as the backbone of the water-transit system by:
  - Seamlessly connecting water transit to landside transit
  - Providing standard, predictable features for passengers
  - Enhancing shoreline access for both passengers and non-passengers
- The terminals' standard modular design can be adapted to fit into the features of each specific location and will be enhanced by the host community's aesthetic design choices.
- The San Francisco Ferry Terminal, the major hub of the proposed system, will likely see a five-fold increase in passengers. The Authority has accounted for these costs and will work with the Port of San Francisco, The Golden Gate Bridge, Highway and Transportation District (GGBH&TD) and others to ensure appropriate facilities are created.

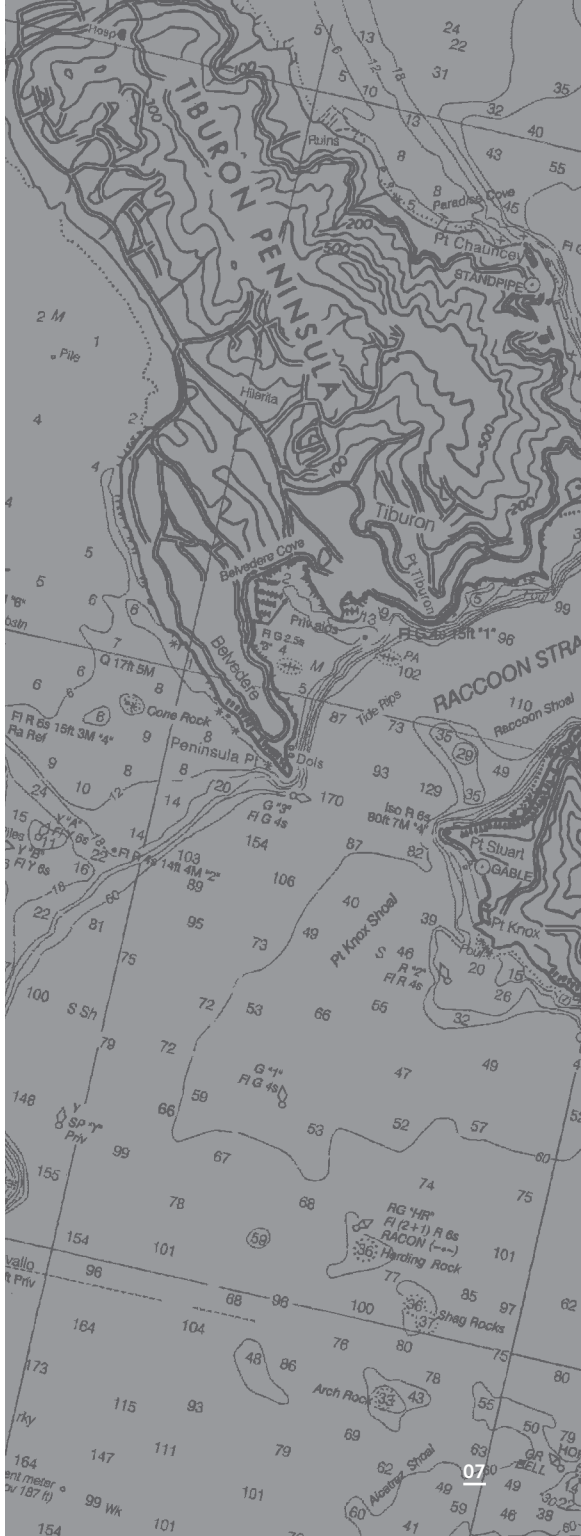
THE BOATS

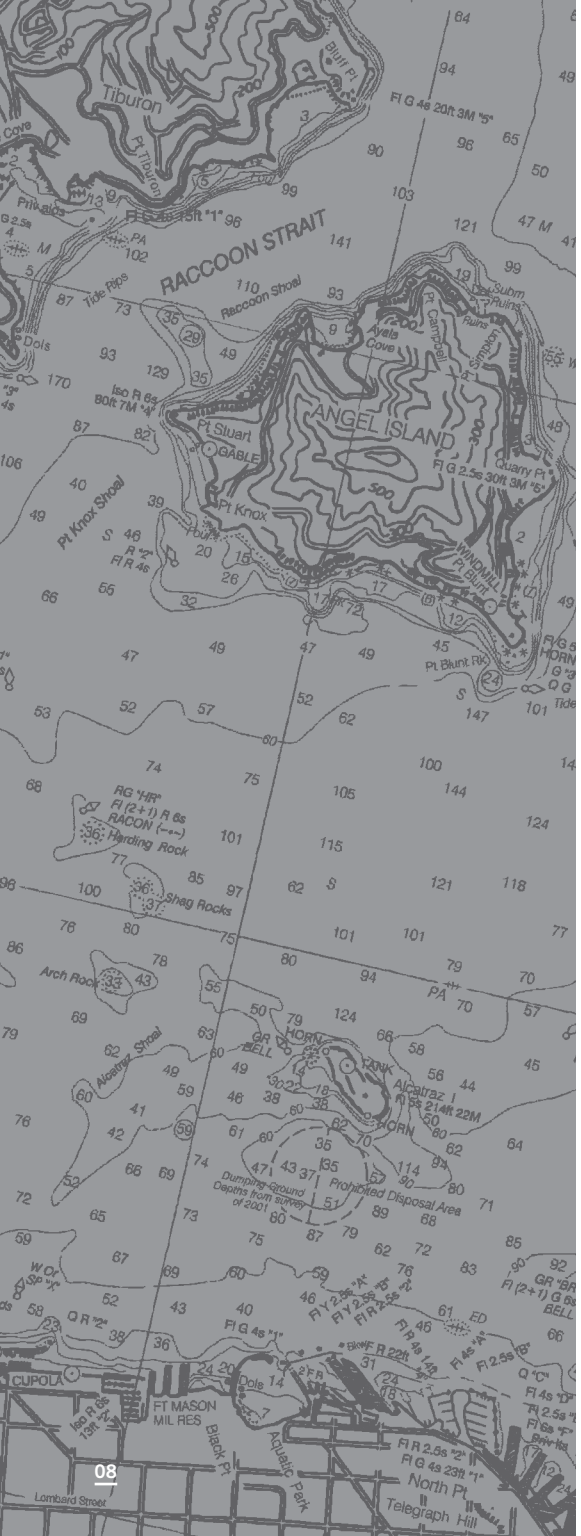
- New vessels can be deployed within three years that are ten times cleaner than existing ferries, and 85 percent better than EPA's standards for 2007 marine engines.
- The Authority's R&D program is studying the fuel-cell technology that will lead to zero-emissions ferries (ZEFs) on San Francisco Bay as soon as possible.
- On-board emissions monitoring of three existing vessels found that the current water transit fleet is far less polluting than previously thought. Using knowledge gained in this study, the Authority recommends on-board emissions monitoring of all Bay Area passenger ferries.

  The Authority recommends building two vessel classes during the first ten years: 149-passenger boats designed to travel 25 knots or less, and 300–350-passenger vessels designed for speeds up to 30–35 knots.
- The Authority's study found five propulsion systems using existing technology that meet the California Air Resource Board's (CARB) suggested emission standard of 85 percent cleaner than EPA's 2007 Tier II standard. One of these systems is immediately deployable: a diesel engine with selective catalytic reduction (SCR) and a particulate trap (PT). The others require regulatory approval or further technology development before they can be used.

  This emissions standard will be mandated in the Authority's vessel performance specifications and the cost of this technology is accounted for in the vessel capital budget.

  Vessel design specifications require both bow- and side-loading capabilities to accommodate existing and new docking configurations. This maximizes fast passenger loading, including bicycles, carriages and wheelchairs.





The vessel acquisition plan accounts for issues beyond initial purchase cost, including operating cost, maintainability, transit-cycle times and life-cycle costs. Federal law requires that passenger ferries must be built in the United States. Eleven U.S. shipyards satisfy all recommended construction requirements.

THE DISASTER-RESPONSE PLAN

What is the disaster response plan?

Experience in the Bay Area, New York City and elsewhere shows that expanded water transit can play a vital role in emergency evacuations and in maintaining vital transportation links. The Authority will continue working with other agencies responsible for the Bay Area Trans Response Plan. With agreement from the Metropolitan Transportation Commission (MTC), the Authority will take the lead role in updating the Regional Ferry Contingency Plan.

THE BAY

What are the environmental impacts?

- This plan eliminates more than 130,000 daily vehicle miles from Bay Area roads and reduces the most harmful emissions of smog-producing nitrogen oxides (NOx) and cancer-causing particulate matter (PM).
- Some dredging would be required, but the total dredging for the recommended routes is less than 0.8 percent of the annual average dredging in the Bay's Long-Term Management Strategy.
- Site-specific environmental studies are required before any new water-transit route can be implemented or any new terminal can be built.

The Final Environmental Impact Report (FEIR) that accompanies this plan is a Program EIR that follows state and federal guidelines in studying the overall impact of proposed expanded water transit.

The areas of study that have generated the most discussion are whales, seals and sea lions, birds, dredging, plants, wetlands and wake. Among those findings:

- Despite the fact that there have been no reported collisions with whales and that an extensive watch-and-reporting system already exists, the Authority will require sonar on ferries to further reduce the possibility of collision. Higher safety standards requiring a second officer on the bridge also will strengthen the water system.
- Two seal feeding and resting areas are near existing routes and a third is near a proposed route. Federal guidelines suggest staying more than 100 feet from seal "haul-outs," but the Authority will adopt a Final Program EIR finding that routes should be more than 900 feet away from these habitats.
- Site-specific study is needed to determine expanded water transit's impact on rafting birds, but the proposed ferry service will affect only a small percentage of the Bay outside existing shipping routes.
- Most ferry wakes will fall within the range of wind-generated waves. Further mitigation is possible by speed reduction, "route bending" to direct wake away from the shore, or increasing distance from the shore.

THE RIDERS

Who will ride water transit?

- Water-transit patronage on existing and new routes will grow about 12 percent annually and will draw most of its riders from vehicles. These are people who have proved unwilling to regularly use other forms of transit.
- The types of Bay Area travelers most likely to ride water transit are those who care most about their personal travel experience, want to arrive as quickly as possible and want to help the environment.
- Analysis identified eight specific market segments and plotted their geographic distribution, which gives the Authority the data to effectively market and advertise water transit to build patronage.

This plan uses the data from state-of-the-art private-sector market research — including more than 3,000 passenger surveys and 850 phone interviews — to analyze Bay Area travelers, predict water-transit ridership through 2025, identify the specific types of travelers likely to ride ferries and provide a "roadmap" showing how to maximize ridership.

The study found six factors that influence Bay Area travelers' mode choices:

- Need for flexibility
- Desire to help the environment
- Need for time savings, which includes the importance of reliability
- Sensitivity to personal travel experience, such as a need for "personal space" or quiet
- Insensitivity to transport costs
- Sensitivity to stress

The study further identified eight traveler market segments, their characteristics and where they live.

The knowledge gleaned from the ridership study will help the Authority create effective marketing and advertising campaigns to build patronage, optimize

terminal locations, schedules and fares; and, build good feeder connections.

THE FINANCES

How much will it cost?

- Expanded water transit will cost $646 million over ten years, with $396 million in capital costs and annual operating costs from $3 million in year one to $46 million in year ten. Approximately 25 percent of the operating budget is for landside connections.

How will it be funded?

- This plan requires funding from new transportation dollars. A variety of sources for new funds from federal, county, local and private sources have been identified.

Is it a good investment?

- The total investment per passenger is comparable to the most effective investment in other modes. This study shows passenger catchment areas around the shoreline are most effectively served by ferries. In these areas, ferries will relieve more congestion per dollar spent than other modes.

THE AUTHORITY

How will the WTA operate the San Francisco Bay Area water-transit system?

- The Authority will be a focused regional agency dedicated to safe, cost-effective and environmentally responsible water transit.
- The Authority will manage continued investment in clean-marine technology, advanced vessel design, systems planning, safety and disaster-response planning, ridership forecasting, terminal design and intermodal planning.
- The Authority will continue to build constructive relationships with the Metropolitan Transportation Commission (MTC), elected officials, community leaders, regulators, public interest groups, the business community and transit operators.

How will the WTA be structured?

- The Authority will operate in the public interest. It will be structured to plan and operate expanded water transit, with the flexibility to link the organizational structure to the necessary developing responsibilities and respond to changes in the operating environment.
- The Initial Phase will employ 12–14 people during this two-to-three-year period of system planning, coordination and infrastructure development. Prospective new routes will be planned, schedules and fares developed and funding sought in collaboration with existing ferry operators. The Authority will assist communities in terminal design and planning, and will build good connections with employers and other transit operators. The design and construction of new vessels will also be initiated.
- The staffing level for the Operating Phase will be determined by several factors relating to the extent of operations, including the number of new routes and the number of vessels in operation. New responsibilities related to ferry and intermodal operations will be added, as well as vessel and facilities maintenance. Outsourced functions such as accounting and human resources will move into the organization.

THE FUTURE

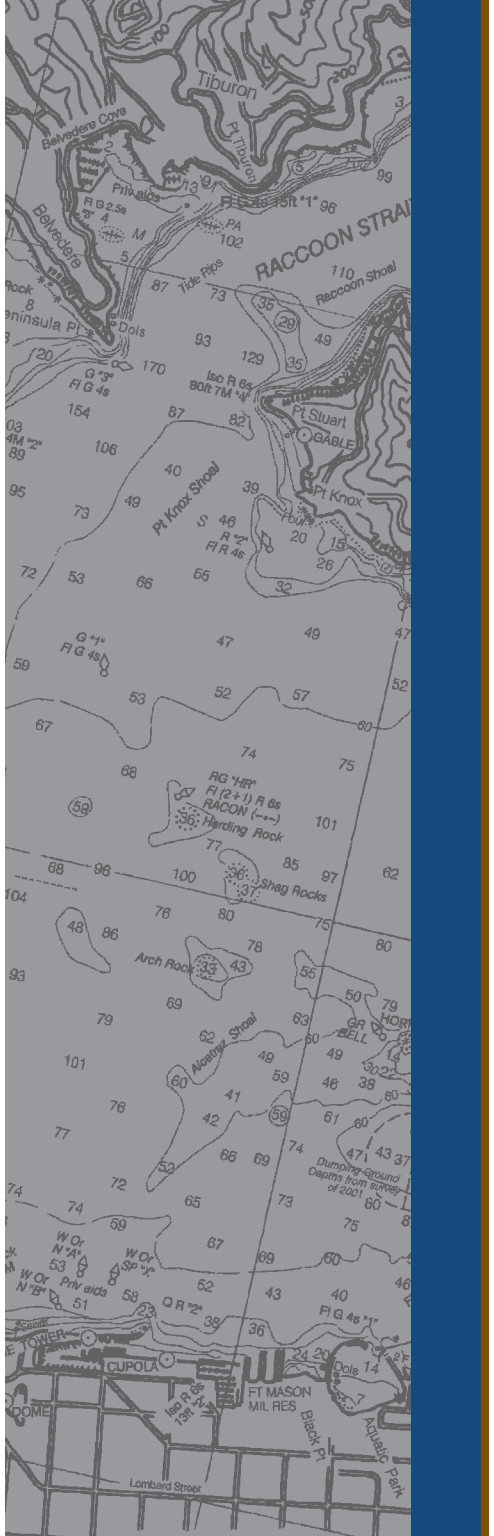
- The first step toward expanded water transit is taking a solid, well-thought-out Toll Increase Expenditure Plan that includes ferries to Bay Area voters in 2004.
- The second step is to ensure that the federal Ferry Boat Discretionary Fund is expanded in the next transportation reauthorization bill and that, like other regions with large ferry systems, the Bay Area obtains a set-aside for its water-transit system — already the nation's third largest.
- Third, the Authority will continue seeking new funding sources.

  The Authority will use the knowledge gleaned from the state-of-the-art market research study to market and brand advertise water transit. The search for funding will continue as the Authority keeps working with the existing ferry operators, the American Public Transit Association and others in these efforts.

  Water Transit-Oriented Development (WaTOD) will continue to be explored and discussed with officials and stakeholders around the Bay.

  The research-and-development program will continue pushing toward the goal of zero-emissions ferries (ZEFs). The Authority will keep working with Bluewater Network and other interested groups to deploy ZEFs as soon as possible.

  Additionally, the Authority will keep making a difference for the Bay Area in other ways. One example could be a joint program with the Golden Gate National Recreation Area (GGNRA) that uses ferries to bring students and others to historical- and environmental-study sites.



Water transit is different. Unlike rail, expanded ferry service can be launched quickly, at low initial cost and with great flexibility. Unlike buses, ferries are not hindered by traffic congestion on roads and highways or in tunnels.

The San Francisco Bay Area is one of the world's most beautiful places, but the traffic is an ugly picture — and getting worse. There is an urgent need to alleviate traffic congestion and improve mobility if we are to head-off major social, environmental and economic problems. Most of the recommended remedies, however, have very steep price tags and very long timelines.

1.01 Why must San Francisco Bay Area water-transit service be expanded?

The San Francisco Bay Area is one of Earth's most beautiful places, but the traffic is an ugly picture — and getting worse. There is an urgent need to alleviate traffic congestion and improve mobility if we are to head-off major social, environmental and economic problems. Most of the recommended remedies, however, have very steep price tags and very long timelines.

Water transit is different. Unlike rail, expanded ferry service can be launched quickly, at low initial cost and with great flexibility. Unlike buses, ferries are not hindered by traffic congestion on roads and highways or in tunnels.

This Implementation and Operations Plan (IOP) shows how Bay Area ferry service can be safely expanded to bring new service to new places and add more service to existing routes. It details a ten-year timeline for this expansion, the project's cost and where the funds will come from. This IOP also discusses findings from a Final Program Environmental Impact Report (FEIR) and describes the added disaster-response capability that expanded water transit can bring to San Francisco Bay.

Water transit can reduce congestion along a number of the Bay Area's worst traffic choke points. It can be environmentally responsible, by every reasonable criterion. As a public policy choice, it is affordable compared to other transit investments, with operating costs per seat and subsidy per passenger that compare favorably to Bay Area rail and bus services. And studies show that a well-planned, well-thought-out and effectively marketed expansion of water transit that is convenient and reliable will pull commuters and recreation-seekers out of their cars and onto ferries.

Furthermore, expanded water transit can operate safely and provide the Bay Area with a robust, flexible and effective emergency response capability if the region is hit with a natural or man-made event that disables roads, other transit, bridges or tunnels.

There have been significant, worthwhile public investments in rail systems and bus operations, but the natural advantages of a water-transit system have not been fully appreciated. A more robust water-transit system on San Francisco Bay makes sense.

Water transit expansion must begin today because severe traffic congestion is not simply a problem on the distant horizon — thousands of Bay Area residents see it through their windshields every day, despite the fact that the region's economy has slowed since 2001. Even though nearly 32,000 Bay Area jobs were lost, [1] several highway corridors are often at capacity, just one accident, breakdown, or emergency away from gridlock.

The fact is, for the last 40 years, Bay Area traffic has steadily increased regardless of economic conditions. Traffic levels will continue to increase, in spite of periodic economic downturns.

Caltrans reports that its Bay Area monitoring program found traffic delay nearly doubled from 1992 to 1998 — from 64,100 hours to 112,000 hours. Its 2000 report labels I-80 from Hwy. 4 to the Bay Bridge toll plaza as the most congested

Bay Area freeway — whose travelers suffer 10,340 vehicle hours of daily delay. Meanwhile, the San Mateo Bridge has 4,230 vehicle hours of daily delay, and I-880 from West Oakland into the Bay Bridge Toll Plaza has 3,380 vehicle hours of delay.

Looking ahead, population-growth and job-growth data show even more alarming congestion problems just over the horizon that threaten to choke the region's economy, worsen the air and further erode Bay Area residents' quality of life.

In 1975, the Bay Area (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma counties) population was approximately 4.8 million residents. The 2000 census indicates a population of 6.8 million — nearly two million more people than 25 years ago. Fast-forward ahead another 25 years and there will be an additional 1.4 million Bay Area residents, with 1.2 million new jobs accompanying that population surge.

The Metropolitan Transportation Commission (MTC) expects that between 1990 and 2020, the average hours per day that vehicles are delayed will increase 249 percent. In its 2002 San Francisco Bay Crossings Study, MTC predicts that the next 25 years will unleash a 30 percent increase in region-wide travel and a 40 percent increase in transbay travel in addition to today's congestion.

Examining the worst transbay corridors, MTC expects that Bay Bridge traffic will increase by 50 percent and be "at capacity" for nearly five hours a day during the morning and afternoon rush hours. The San Mateo Bridge will show a 75 percent increase in traffic. Golden Gate Bridge traffic will grow at a lower rate, but will still be 27 percent higher than in 1998. [2]

Figure 1

"People are stretched so far between their home and job that they have no personal life to speak of."

Senator Tom Torlakson of Antioch,
Senate Select Committee on SF Bay Area Transportation, June 3, 2002

Furthermore, MTC predicts that many more Bay Area workers, due to high housing costs, will be living far from their jobs, forced to crawl back and forth along the brutal I-80 corridor commuting and polluting instead of volunteering or parenting. While trips through the Bay Bridge corridor are expected to increase 43 percent by 2025, Carquinez Bridge trips will increase even more (58 percent).

Targeted Water Transit-Oriented Development

Recognizing the growing geographic disconnect between housing and jobs, the Authority has carefully examined efforts to generate Transit Oriented Development (TOD) in the Bay Area.

There are several specific locations where Water Transit-Oriented Development (WaTOD) can make a positive difference for Bay Area residents, such as Jack London Square in Oakland, Alameda Point, Oyster Point and San Quentin (if the state eventually vacates the prison). In each of these locations, studies show that effective water-transit service can generate more desirable TOD, and in turn those non-driving residents and workers will increase patronage on a more comprehensive water-transit system.

Clearly, the first step on the long road to a better Bay Area transportation future must be taken immediately so the region's economy does not choke 20 years from now. But congestion is a serious problem today — and it is simply going to get worse tomorrow.

And because of the immense cost and lengthy time required to put most planned transportation solutions in place, the Bay Area's congestion problems beg for an affordable alternative that also offers some near-term relief.

Bay Area Residents Believe The Problem is Now

People are getting sick and tired of being stuck in traffic. The time it takes and the stress it causes are dramatically changing people's quality of life.

Senator Tom Torlakson of Antioch, a member of the Senate Transportation Committee, identified the essence of today's Bay Area traffic woes when he said, "People are stretched so far between their home and job that they have no personal life to speak of." [3]

Survey research has measured the impact of that reality. In November 2001, merely two months after 9/11, Bay Area residents told Evans/McDonough Company, a respected public-opinion research firm, that traffic remains the region's top concern — not safety and security, just 60 days after the tragedies in New York, at the Pentagon and in rural Pennsylvania. It was not the economy, after 32,000 lost Bay Area jobs in 12 months.

It was traffic congestion.

An update survey was conducted in February 2003. Despite the worsening economy, traffic remained a top concern along with unemployment and the economy, as shown in Figure 2 on page 9. People are so concerned about traffic that seven out of ten said they are willing to pay increased bridge tolls if the money is used for congestion-relief projects. [4] Seventy-six percent of Bay Area residents surveyed in May 2002 by MTC ranked "reducing traffic congestion" among their top-three concerns, just behind spending tax money wisely (86 percent) and improving public education (82 percent). [5]

Congestion today is most acute at the various San Francisco Bay crossings, with the worst in the Bay Bridge and San Mateo Bridge corridors. According to MTC, "continuous stop-and-go conditions" exist on the Bay Bridge (a.m. westbound, p.m. eastbound), the Hwy. 92/San Mateo Bridge (p.m. eastbound) and I-880 from Grand Avenue to the Bay Bridge (a.m. northbound). [6]

Despite the current economic downturn, BART is running at capacity through the Transbay Tube during peak hours. Commuter bus service is dependent upon traffic flow, thus relying on more road capacity and more dedicated High Occupancy Vehicle (HOV) lanes for significant expansion.

1 US Dept. of Labor, Bureau of Labor Statistics, Annual Employment Statistics 2000–2001
2 MTC, Regional Transportation Plan, August 2001, pp. 20–21
3 Senate Select Committee on SF Bay Area Transportation, June 3, 2002
4 EMC, 1400 phone interviews with residents of Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara and Solano counties between November 7–19, 2001; margin of error 2.7 percent
5 J. Moore Methods, Inc., 900 phone interviews with residents of the nine Bay Area counties between May 3–15, 2002; margin of error 3.3 percent
6 Draft Regional Transportation Plan, August 2001, p. 18

Figure 2

MOST IMPORTANT ISSUES FACING THE BAY AREA

Unemployment	19%
Traffic/Transportation	**17**
Economy	15
Education/Schools	8
Affordable Housing	7
Crime/Violence	5
State Budget/Taxes	5
War/Terrorism	4
Poverty/Homelessness	3
Rapid Growth/Overpopulation	3
Higher Cost of Living	2
Government Distrust	1
Environment/Pollution	1
Police Issues	1
Health Care	1
Other	4
NA/DK/Refused	3

Source: Evans/McDonough Company, January 20-29, 2003

HWY. 24 IN OAKLAND

The balance of this Implementation and Operations Plan will detail how water transit can once again play a meaningful role in the economic, environmental and social health of the Bay Area. And it can do so in a manner that is safe and affordable for passengers, cost-effective for policymakers and a sensible investment for taxpayers.

MTC's Bay Crossings Study identified six projects to improve the Bay Area's transportation picture. They include:

- A new BART crossing with new San Francisco stations
- A new Mid-Bay Bridge from I-238 in the East Bay to I-380 just north of San Francisco International Airport*
- Expanded San Mateo Bridge capacity
- Dumbarton Bridge western approach roadways reconstruction
- New and expanded express bus service by expanding and creating new express bus and carpool lanes
- Commuter rail service on a rehabilitated Dumbarton Bridge

Figure 3

Projects to Improve Bay Area Transportation

Bay Crossings Study Projects	20-Year Operating Costs	Capital Cost
New BART crossing	$1.1 billion	$7.1-$10.3 billion
Mid-Bay Bridge (I-238 to I-380)*	$527 million	$6.6-$8.2 billion
Widen San Mateo Bridge	$51 million	$1.9-$2.2 billion
Dumbarton Bridge western approach	$2.7 million	$673M -$1.9B
Express bus service/carpool improvement	$532 million	$653 million
Dumbarton and commuter rail service—expanded service option from Livermore	$284 million	$289 million
Water Transit Authority Plan	**10-Year Operating Costs**	**Capital Cost**
New and Expanded Water Transit	$249 million	$396 million

* MTC Commissioners voted July 24, 2002 to remove this project from further consideration
Sources: MTC Bay Crossings Study and Authority Study

By comparison, this water-transit plan project costs up to $646 million, including new terminals. Deployment of expanded water transit can begin taking cars off the road in three years.

This is a critical point. The Authority's primary objective is to design a water-transit system that *takes people out of cars,* rather than one that simply draws riders from buses, BART or Caltrain.

Thus, this plan shows how well-thought-out, new and expanded water transit that is affordable, reliable, convenient, flexible and clean will get drivers out of their cars and onto environmentally responsible, state-of-the-art passenger ferries.

The vessels and propulsion systems recommended in *The Boats* chapter consist of currently available and affordable technology that reduces pollutants 85 percent below 2007 EPA Tier II engine standards. The EPA Tier II standard is three times cleaner than the existing fleet. A reduction to 85 percent below Tier II is *ten times cleaner* than the existing fleet. That most stringent standard is suggested by the California Air Resources Board (CARB), and is the standard the Authority shall mandate.

Finally, an expanded San Francisco Bay Area water-transit system is not a new idea, but it is a good idea that has worked before and can work again.

Prior to construction of the Bay Bridge and Golden Gate Bridge in the 1930s, when the Bay Area's population was about a quarter of what it is today, ferries on the Bay carried 15 times the passengers carried today. More than 250,000 passengers went through the Ferry Building each day, using more than 320 ferry boat arrivals and departures that connected to streetcars every 90 seconds.

The balance of this Implementation and Operations Plan will detail how water transit can once again play a meaningful role in the economic, environmental and social health of the Bay Area. And it can do so in a manner that is safe and affordable for passengers, cost-effective for policymakers and a sensible investment for taxpayers.

SAUSALITO FERRY PASSING ALCATRAZ

The year-long route selection process was detailed, grounded in the best available data and driven by the principle that a route must prove viable.

Water transit today is a small but growing part of the Bay Area's transportation network. While it carries only a fraction of the total Bay Area travelers, water transit plays a meaningful role in reducing congestion and providing mobility in the key bridge corridors throughout the Bay Area.

2.01 What is the route selection process?

Legislation creating the Authority directs the submission of a plan to increase regional mobility through the development and operation of a "comprehensive water-transit system," its associated landside facilities and related services. This was done through the evaluation of different "systems" of routes, to determine both the economic viability and environmental impact of various investment levels. The different proposed systems are (1) a large comprehensive system such as the Bay Area Council's Water Transit Initiative, (2) a smaller system of routes that could be implemented within the next ten years, and (3) a system that only expands service on existing ferry routes.

Five goals were identified and followed in planning this proposed water transit system:

1. Enhance regional mobility via a water-transit system, its landside facilities and complementary intermodal service
2. Create a transit option that is an attractive alternative to the automobile
3. Recognize and minimize environmental issues associated with water transit, its landside facilities and complementary intermodal services
4. Offer a transit option that can be initiated in a timely and cost-effective manner
5. Provide water-transit service that is reliable, safe and fully accessible

To build a comprehensive system, the year-long route selection process was detailed, grounded in the best available data and driven by the principle that a route must prove viable over the long term in order to be proposed. If a route passed the viability test, it faced two more hurdles in order to be recommended for further detailed study:

- Is the route a good transportation investment?
- Does the route have fatal environmental flaws?

Viability

The route-selection approach combines the world's best transit-planning expertise, application of proven private-sector market research and good old-fashioned common sense.

The Authority began with the latter by establishing the requirement that potential routes must have a minimum level of ridership to be considered viable. This is a concept employed by most transit agencies and recognizes that without a minimum level of ridership:

- The fare box recovery would be unreasonably low, requiring an unacceptably large public subsidy
- The fare would be so expensive it would discourage ridership
- The service would be so infrequent it would discourage ridership

Potential routes were studied with the understanding that water transit that only benefits a small segment of Bay Area residents would be a poor use of scarce transportation dollars. Additionally, routes with small ridership would fall short of the mandate to improve Bay Area mobility.

A review of 2000-2001 data from existing Bay Area transit agencies, including ferries, showed a viability range of successes and concluded that new water-transit routes able to perform in that range or better should be considered as potentially viable. This level of viability varied between 450 and 1,650 passenger trips per day. (See Figure 5 on Pg. 15, "Cost-Effectiveness Measures For Bay Area Transit Operators.")

Predicting Water-Transit Ridership

Predicting ferry ridership has historically been difficult because water-transit riders often choose their travel mode based on factors other than the ride's time and cost. Most forecast models place a premium on time and cost, ignoring factors like reliability, the need for flexibility, stress, sensitivity to "personal space" and a desire to help the environment.

The ridership study conducted for this plan takes a different approach, using private-sector, market-based techniques to identify how these factors affect commuters' travel-mode choices through more than 3,000 on-board ferry passenger surveys and 850 random-sample phone interviews of Bay Area commuters.

Ridership Model Peer-Review Panel

	Title	Affiliation
Moshe Ben-Akiva	Professor	Massachusetts Institute of Technology
Elizabeth (Betty) Deakin	Director Transportation Research Center	University of California
James (Jim) Ryan	Deputy Associate Administrator for Planning	Federal Transit Administration
Charles L. Purvis	Senior Transportation Planner/Analyst	MTC
Ray Deardorf	Planning Director	Washington State Ferries
David Burch	Senior Environmental Planner	Bay Area Air Quality Management District
Frank Milthorpe	Transport Modelling Manager	NSW Department of Transport
Ezra Rapport	Consultant Senate Select Committee on Bay Area Transportation	California Legislature Senator Don Perata
Chris Wornum	Principal	Cambridge Systematics
Maren Outwater	Project Manager	Cambridge Systematics
Steve Castleberry	Manager, System Planning	Water Transit Authority

From this data, the ridership model identified distinct "markets" of select commuters. These markets are intended to reflect how different commuters select travel modes. Eight statistically significant markets were identified depending on commuters' values about time, concern for the environment and stress. The inclination of commuters to select ferries varies with their sensitivity to each of these values.

Using MTC's regional transportation model as a base, the market data was correlated to census track data to develop ferry ridership forecasts based on Association of Bay Area Governments (ABAG) projections of 2025 land uses and the constrained Regional Transportation Plan (RTP) investments. This is extremely important because future transit ridership will depend not just on changes in population, but also on changes in demographics.

Finally, these market segments were correlated to the demographics of each geographic area around the Bay. This allowed the modelers to evaluate the effect of the various sensitivities on each individual ferry route.

The result of this effort is a ridership forecast model that recognizes the portion of the population that selects commute modes for reasons beyond time and cost of the trip. While this portion of the overall population may be small, it can represent a significant reduction in peak-hour trips in key bridge corridors.

Since these market-based techniques traditionally have not been used for public transit, the Authority took two steps to ensure the forecast procedures and results were appropriate. First, a peer review panel of modeling experts was formed, with members drawn from the Massachusetts Institute of Technology, MTC, the Federal Transit Administration, Washington State Ferries and the UC-Berkeley Institute for Transportation Studies.

That review resulted in a number of improvements that were incorporated into the model.

Second, the model's ability to predict the future was validated by testing how well it forecasts current commute conditions. Validating to an extensive set of existing conditions, the results were within 5 percent of existing observations.

Finally, the model's sensitivity to headways, parking costs and toll increases was tested and ridership to other potential routes was examined. The forecasts, with the different sensitivity analyses, are shown in Figure 4 on page 14 [Water Transit Ridership Sensitivity Analysis]. Also, conservative forecasts were used for this analysis (frequent headways, with ferry parking charges, but no toll increase or parking charges for other transit modes).

Figure 4

Water Transit Ridership Sensitivity Analysis of Routes Studied

	Ferry Route by Bridge Corridor	Existing (1998) Ridership	VARIATIONS (2025 DAILY RIDERSHIP) 1. Unconstrained Ferry Demand	2. Parking Charges at Terminals	3. Changes in Headways	4. Headways & Bridge Tolls	Routes Meeting Minimum Demand Criteria
Bay Bridge Corridor	Oakland to San Francisco	1350	4506	2540	2067	2327	Yes
	Harbor Bay to San Francisco	350	2672	1451	509	679	Yes
	Berkeley to SF-Mission Bay	—	3612	2776	1995	2357	Yes
	Richmond to San Francisco	—	2751	1854	1573	1780	Yes
	Alameda Point to Mission Bay-SF	—	2211	2135	1504	1705	Yes
	Berkeley to Treasure Island	—	675	477	478	493	For Future Study
	Oakland to Treasure Island	—	761	539	498	535	For Future Study
	San Francisco to Treasure Island	—	3495	3587	2478	2485	Yes
	Hercules/Rodeo to San Francisco	—	1256	903	772	933	Yes
Bay Bridge & Carquinez Bridge Corridors	Vallejo to San Francisco	1900	5001	4220	3516	4411	Yes
	Martinez to San Francisco	—	1879	1261	1275	1250	For Future Study*
	Antioch/Pittsburg to San Francisco	—	1124	1000	1016	762	Yes
Golden Gate Bridge Corridor	Sausalito to San Francisco	2650	5833	5329	5089	5118	Yes
	Tiburon to San Francisco	1100	2384	2823	2669	2649	Yes
	Larkspur to San Francisco	4300	10264	7820	6604	6576	Yes
	Sausalito to Fisherman's Wharf	—	179	—	—	—	—
	Port Sonoma to San Francisco	—	2206	1392	1634	1657	Yes
Bayshore Corridor	South San Francisco to San Francisco	—	3077	2187	2345	2496	Yes
	Redwood City to San Francisco	—	2576	1477	1392	1420	Yes
	Moffett Field to San Francisco	—	1223	529	591	590	For Future Study
Airport Service	OAK to SF	—	62	—	—	—	For Future Study
	OAK to SFO	—	5	—	—	—	For Future Study
	SFO to SF	—	110	—	—	—	For Future Study
	SFO to Moffett Field	—	74	—	—	—	For Future Study
Others	San Leandro to San Francisco	—	1996	1378	1623	1848	For Future Study
	Harbor Bay to So. San Francisco	—	801	465	306	324	For Future Study
	Harbor Bay to Redwood City	—	190	98	61	50	For Future Study
	Harbor Bay to Moffett Field	—	86	54	32	35	For Future Study

* Separate Martinez and Benicia routes for future study

Source: Authority Ridership Study

Cost Effectiveness

The next hurdle for these routes is cost-effectiveness — whether they are a good transportation investment and comparable to other transit modes when considering factors such as implementation costs, operations and environmental mitigation.

Historically, Bay Area water-transit service has compared favorably with other transit modes considering several traditional key measures of cost effectiveness. The following table shows ferry service compared to other similar successful transit services in the Bay Area. It is important to note that the evaluation of transit systems using limited numerical measurements often ignores many of the benefits provided by transit. However, using the key measures of farebox recovery and subsidy-per-passenger, the Vallejo and Alameda/Oakland ferry services perform as well or better than many other transit services.

Comparisons of the effectiveness between future transportation investments are difficult because each transit mode offers widely varying benefits and its own particular problems. Fixed rail investments, such as BART and Caltrain, provide reliable, safe and desirable service to both urban and suburban commuters. However, these modes require high initial investments and take a long time to implement. On the other hand, express bus service can be deployed quickly and cheaply, but buses share the bridges with other traffic, so its service is affected by — and can contribute to — roadway congestion. This plan evaluated the cost effectiveness of ferry expansion, both qualitatively and quantitatively, to address these differences between modes.

The comparison in Figure 6 focuses on the effectiveness of specific ferry routes under consideration. In consultation with MTC and environmental organizations, the Authority identified "comparable" investments in other modes to serve the same destinations as the proposed ferry service.

In general, these "comparable" investments were express buses. Where possible, existing bus expansion plans were used for comparison. Where no plans existed, bus service running at similar headways from similar origins was compared. Actual bus service would likely be implemented differently than analyzed here, serving slightly different origins on different routes. The intention of this comparison is only to identify order-of-magnitude differences.

The cost differences between implementing buses can be small, with buses being cheaper to purchase and operate and

Figure 5

Cost Effectiveness Measures for Bay Area Transit Operators

Service (Trips)	Daily Ridership	Annual Operating Cost ($M)	Farebox Recovery	Operating Cost per Passenger	Operating Subsidy per Passenger	Subsidy per Seat per Hour
All Bay Area Fixed Route Transit	1,374,000	$1,364	32%	$2.72	$1.85	—
Alameda/Oakland Ferry	1,500	$3	71%	$5.76	$1.67	$0.44
Harbor Bay Ferry	300	$1	36%	$11.73	$7.51	$2.05
Golden Gate Ferry	5,100	$15	37%	$7.94	$5.00	$1.54
Vallejo Ferry	2,000	$5	69%	$7.11	$2.20	$0.67
AC Transit (all)	185,000	$184	24%	$2.72	$2.07	$1.72
AC Transit (Transbay)	14,000	—	60%	—	—	—
BART	266,000	$310	63%	$3.19	$1.18	$0.75
Caltrain	23,900	$51	41%	$5.85	$3.45	$1.89
Golden Gate Buses	26,100	$50	31%	$5.21	$3.59	$1.87
SF Muni	114,000	$92	26%	$2.22	$1.64	$1.80
Santa Clara VTA	21,700	$39	10%	$4.98	$4.49	$2.72
Altamont Commuter Express Rail	1,800	$8	32%	$12.12	$8.24	$3.41

Sources: MTC Statistical Summary of Bay Area Transit Operators; Alameda/Oakland and Harbor Bay Ferry Reports; AC Transbay Statistics based on October 2000 reports and do not include deadhead time; 2000 National Transit Database, San Joaquin Regional Rail Commission.
Assumptions: Ferry seating per USCG certification; other modes include some standees.

Figure 6

Water Transit Cost Effectiveness vs. Other Transit Investments

Ferry Route	Ferry Ridership (2025 Daily Trips)	Investment for Comparison	Ridership on Alternative Investment	Cost per New Ferry Transit Rider	Cost per New Alternative Investment Rider
Vallejo–San Francisco	4,411	—	350	$13	—
Antioch/Pittsburg to Martinez to San Francisco	2,038	Express Buses to Pleasant Hill BART Station	616	$17	$24
Hercules/Rodeo–San Francisco	933	Express Buses to Del Norte BART	550	$24	$22
Richmond–San Francisco	1,780	Express Buses from Richmond Ferry Terminal	1,796	$10	$9
Berkeley–San Francisco	2,357	Express Buses from Gilman	770	$9	$15
Alameda Point–Mission Bay–San Francisco	1,705	Express Buses from Alameda Ferry Terminal	1,198	$13	$18
Oakland–San Francisco	2,327	Express Buses from Oakland Ferry Terminal	118	$6	$110
Harbor Bay–San Francisco	679	Express Buses from Harbor Bay Ferry Terminal	545	$7	$11
Sausalito–San Francisco	5,118	Additional Buses from Mill Valley and Sausalito	480	$2	—
Tiburon–San Francisco	2,649	Additional Buses to Tiburon Ferry Terminal	810	$6	—
Larkspur–San Francisco	6,576	Additional Buses from Larkspur and San Rafael	1,478	$3	—
Port Sonoma–San Francisco	1,657	Express Buses (including Novato Narrows HOV project) from Novato and Petaluma to Larkspur Ferry Terminal	741	*	*
So. San Francisco–San Francisco	2,496	Caltrain	662	$6	$6
Redwood City–San Francisco	1,420	Caltrain	included in SSF Ridership	$22	$6
San Francisco–Treasure Island	2,485	Additional MUNI Service	3,180	$6	$2

* Further study needed to determine costs.
Source: Authority Ridership Study

ferries having higher passenger capacity, generally shorter routes and longer effective lives. Figure 6 on page 15 shows that the majority of new ferry routes are cost-effective investments. For the Hercules/Rodeo-to-San Francisco and Richmond-to-San Francisco routes, the cost effectiveness for buses is better than the comparable ferry service. Investments made in both modes were also compared to see if the investments could be complementary. In every case, it was found that bus and ferry investments are complementary and that the traffic reductions resulting from investments in both modes is greater than the reduction from investment in one mode or the other.

The comparison in Figure 7 uses information developed for MTC's Bay Crossings Study to provide an order-of-magnitude comparison between transportation investments. That study investigated a number of improvements in the Bay Bridge, San Mateo Bridge and Dumbarton Bridge corridors. Those alternatives included bus, BART and highway expansion. Figure 7 compares the transit alternatives in that study with the portion of the proposed water-transit service that also would serve those corridors.

Figure 7 shows the trade-offs between different modes, with ferries generally having a low capital investment cost per rider and a potentially higher operating subsidy per rider. However, sensitivity analysis performed on the ferry ridership indicates the operating costs can be reduced by optimizing ferry headways. The analysis shows the operating cost could potentially be reduced by half, with a subsidy-per-rider ranging from $5 to $8-per-rider, depending on the route.

It is worth noting that the proposed water-transit service expansion has a higher cost-per-rider than several of the existing ferry operations. Among the reasons:

- New environmental monitoring
- Planning and implementing good connections with landside transit
- Current water-transit riders are the "low-hanging fruit" with the lowest patron-acquisition costs

Therefore, these costs are initially higher, but will incrementally decrease as new routes mature and the system achieves economies of scale.

Finally, the overall impact on bridge corridors was analyzed to identify ferry impacts to other transit providers as well as the effectiveness of removing cars from those corridors.

In the Bay Bridge Corridor, ferry riders would come primarily from highway users, with some shifts also from BART, but essentially no impact on AC Transit. The alternative mode investment (primarily buses) would take riders from the existing ferry services and BART, with few of the new riders coming from cars.

In the Golden Gate Corridor, ferry and bus expansion would have a similar effect on reducing highway traffic. An expanded bus service would also depend heavily on adequate capacity of the ferry service,

Figure 7

Comparison of Water Transit Plan and Bay Crossings Study Alternatives

Project Description	Annual Ridership	Capital Cost (million $)	Annualized Capital Cost (1) (million $)	Capital Cost/Rider	Annual Operating Subsidy (million $)	Operating Subsidy/Rider	Total Cost/Rider
Bay Crossings Alternative 1 Operational, Express Bus, and BART Capacity Improvements in the Bay Bridge and San Mateo-Hayward Bridge Corridors [1]	3,868,400	$547	$50	$13	$18	$5	$18
Bay Crossings Alternative 2 New BART Tube [2]	4,545,000	$7,108	$622	$137	$57	$12	$149
Bay Crossings Alternative 3	**Highway alternative not comparable**						
Bay Crossings Alternative 4	**Highway alternative not comparable**						
Bay Crossings Alternative 5 – Dumbarton Rail Improvements	844,800	$180	$16	$18	$3	$3.80	$21.80
WTA Plan* Transbay Ferry Plan [3]	9,639,000	$440	$38	$4	$50	$5	$9

[1]Ridership based on validated annualization factors (303 BART, 323 AC Transit). Excludes investments in Dumbarton Bridge Corridor
[2]Ridership based on validated annualization factors (303 BART). Capital cost reflects low-range estimate
[3]Annual ridership based on weekday and weekend forecasts
* Includes ridership on existing routes
Sources: MTC Bay Crossings Study, Other MTC Sources and Authority Studies

A general comparison between the costs of new and expanded service suggests that the limited investment in new routes proposed in the WTA plan would be a cost-effective approach, at least for the initial ten-year period.

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as it would deliver additional riders to the ferry system.

In the U.S. 101 San Mateo corridor, water-transit service would primarily take traffic off the highway, with a smaller shift from existing transit systems.

Environmental Impacts

The third hurdle is the environment. Are there any "fatal" environmental flaws? If not, will a route have a significant impact on the Bay — and if so, what will it take to mitigate that impact?

The FEIR, as mandated, provides an overall environmental assessment of four system alternatives, and thus valuable guidance regarding the impact of the proposed routes. However, site-specific environmental study will be required to determine each route's specific impacts.

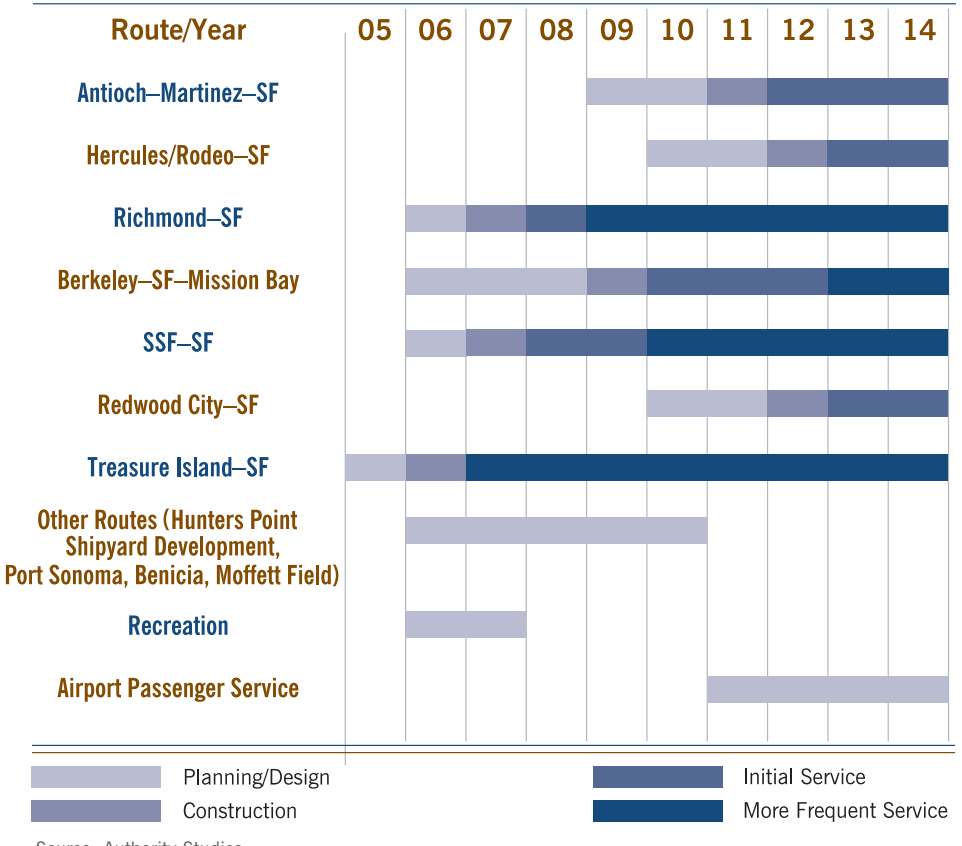
Local Support and Commitment

Local support and demonstrated commitment are necessary to create new water-transit routes. For the potential new routes that the studies and criteria show to be viable, the Authority is working in partnership with the localities that would help build and host terminals. In that spirit, hundreds of meetings with elected officials throughout the Bay Area were held to obtain their input for this plan and to discuss specific route recommendations and implementation issues once viable routes were identified.

Implementation of recommended new water-transit service will first occur on routes where (1) the environmental impacts are either insignificant or most easily mitigated, and (2) where localities are most committed to supporting ferry service with matching funds for planning, design work and capital funds for terminals.

Figure 8

Estimate for Implementation of New Routes



Source: Authority Studies

Deliverability Continuum

All of these factors, plus cash-flow through identified funding pipelines, will determine the timeline for rolling out these routes. Both within and beyond the initial ten-year horizon, there will be a "deliverability continuum" whereby proposed routes go through the journey of studies, permitting, terminal planning and construction, vessel acquisition and the many other steps required to launch water-transit service. Sites with environmental impacts or significant community opposition will take longer to deliver (if they can or should be delivered at all) than sites without these challenges.

This plan estimates that the first new service could be started within two years of receiving funding. Assuming a typical permitting process, some of the sites could take up to eight years before service could begin.

It is important to note that the delivery of water-transit service could be significantly accelerated using a number of industry techniques, such as:

- Design-build construction of terminals and vessels
- Staff dedicated to focusing on permitting issues common to all terminals (such as the San Francisco Bay Conservation and Development Commission [BCDC] and the U.S. Army Corps of Engineers)
- Use of consultants as needed to make sure lack of staff availability does not affect project delivery
- Aggressive leveraging (or advancing) of local funds
- Development of system-wide mitigations to address site impacts

In the highway and transit construction industries, these techniques have shortened delivery times by a factor of years.

2.02 What is the existing system?

Water transit today is a small but growing part of the Bay Area's transportation network. While it carries only a fraction of the total Bay Area travelers, water transit plays a meaningful role in reducing congestion and providing mobility in the key bridge corridors throughout the Bay Area. The Vallejo, Alameda-Oakland and Harbor Bay ferry services carry 1,000 peak-hour passengers — almost a half-lane of traffic that might otherwise be using the Bay Bridge. The Larkspur, Sausalito and Tiburon services carry nearly 1,700 peak-hour passengers, which adds up to nearly a full lane of bridge traffic.

The five existing publicly sponsored or operated routes, plus the privately run Tiburon service, comprise the current Bay Area commuter ferry service. These routes are supplemented by a number of recreation and tourist routes that operate between San Francisco's Ferry Building and Pier 41 (Fisherman's Wharf) and Sausalito, Tiburon, Alcatraz and Angel Island. There are also a number of "dinner cruise" boats, general excursion vessels and special PacBell Park service

Figure 9

Profile of Existing Bay Area Water Transit Services

Route	Distance (Nautical Miles)	Sponsor/Operator	Travel Time	Number of Daily Round Trips	Daily Ridership***
Larkspur – SF Ferry Building	11	GGBH&TD	36 kt catamaran: 30 min. 20 kt monohull: 45 min.	20	5,000
Sausalito – SF Ferry Building	6	GGBH&TD	30 min.	9 or 10 (summer)	1,400
Sausalito – Tiburon – SF Fisherman's Wharf*	6	Blue & Gold Fleet	SF – Tib: 20 min. SF – Saus: 20 min.	8	1,400 **
Tiburon – SF Ferry Building	6	Blue & Gold Fleet	20 min.	7	850
Vallejo – SF Ferry Building*	24	City of Vallejo/ Blue & Gold Fleet	55 min.	11	2,500
Alameda/Oakland – SF Ferry Building/Wharf	6	City of Alameda & Port of Oakland/Blue & Gold Fleet	Alameda – Ferry Bldg: 20 min. Oakland – Ferry Bldg: 30 min.	13	1,650
Alameda Harbor Bay – SF Ferry Building	8	City of Alameda/ Harbor Bay Maritime	25 min.	6	450

* Data reported for trips to and from Fisherman's Wharf. Some trips also serve SF Ferry Building.

** Per Blue and Gold Fleet, Tib commute = 850 per day, 260 days/year. Remainder is Saus/Tib/Wharf ridership. Tib – FB ridership = 221,000. Tib–Saus-Wharf = 373,000+366,000-221,000 = 518,000.

*** Daily ridership numbers are for the year 1999-2000.

Source: Ferry Operators

to Giants games from Larkspur and Oakland.

Figures 9, 10 and 11 summarize information about the existing ferry services.

Each of these existing routes plays a key role in the mobility of those living in the communities they serve:

Bay Bridge Corridor

The Alameda-Oakland water-transit service also consistently ranks near the top-performing Bay Area transit services, when measured by fare box recovery and subsidy per passenger. It provides convenient commuter service from Alameda and Oakland to San Francisco, as well as midday recreation service to and from Jack London Square in Oakland.

Harbor Bay to San Francisco is an excellent example of a transit system designed to fit the surrounding community. Because of its location in the heart of a residential development, people can easily walk or ride bicycles to and from the ferry.

Bay Bridge and Carquinez Bridge Corridors

The Vallejo to San Francisco ferry service is one of the most efficient transit systems in the Bay Area. It has consistently generated more than 70 percent of its revenues from fares. Strong demand from commuters not only led to increased water-transit service, but also increased ridership on Vallejo's commuter buses to San Francisco.

Golden Gate Bridge Corridor

The Sausalito to San Francisco service is the best Bay Area example of a ferry service whose passengers leave their cars at home. Nearly all its riders either walk, ride bicycles or take shuttle buses to the Sausalito terminal.

The Larkspur to San Francisco route is the flagship water-transit service in the Bay Area. It provides unparalleled service to Marin County commuters. The Golden Gate Bridge, Highway and Transportation District (GGBH&TD) has tied the service to a network of free connecting shuttles, providing one of the best Bay Area examples of good transit connections.

The Tiburon to San Francisco water-transit service is one of the oldest ferry services in the Bay Area. It operates without public subsidy.

Individually, each of these transit operators provides good service. However, each offers service without the advantage of a regional plan to coordinate with each other or with other operators' landside transit. The proposed new water-transit system includes expanded service on existing routes, service on seven new routes, and the institutional framework, authority and funding to begin coordinating these services.

Figure 10

Bay Area Annual Ferry Ridership Trends

Year	Golden Gate Transit		Blue & Gold Fleet		Vallejo	Alameda/ Oakland	Alameda/ Harbor Bay	Total (Commuters)	Alcatraz	Angel Island #	Total Ferry (Rec/Commuter)
	Sausalito	Larkspur	Sausalito	Tiburon							
1988–1989	556,811	937,937	383,614	300,715	160,419	N.A.	N.A.	2,339,496	N.A.	200,000	2,539,496
1989–1990	526,625	1,096,894	350,301	277,713	290,813	65,511	N.A.	2,607,857	N.A.	200,000	2,807,857
1990–1991	496,586	1,009,303	364,832	267,369	269,023	187,234	N.A.	2,594,347	N.A.	200,000	2,794,347
1991–1992	521,310	1,002,153	412,710	266,188	236,600	235,174	23,842	2,697,977	N.A.	200,000	2,897,977
1992–1993	491,197	974,858	413,144	301,432	221,222	248,543	87,139	2,737,535	N.A.	200,000	2,937,535
1993–1994	484,805	941,445	393,713	305,641	193,692	270,093	92,033	2,681,422	2,500,000	200,000	5,381,422
1994–1995	434,918	897,348	354,328	300,806	209,015	319,319	93,429	2,609,163	2,500,000	200,000	5,309,163
1995–1996	475,876	956,329	393,556	350,757	256,724	375,185	104,060	2,912,487	2,500,000	200,000	5,612,487
1996–1997	495,336	1,014,547	412,366	379,451	265,845	439,254	97,606	3,104,405	2,580,000	200,000	5,884,405
1997–1998	487,421	1,067,062	430,949	401,312	546,527	509,395	98,756	3,541,422	2,660,000	315,800	6,517,222
1998–1999	448,909	1,220,967	350,000	350,000	613,100	462,582	113,664	3,559,222	2,660,000	310,200	6,529,422
1999–2000	453,811	1,408,340	364,328	362,910	735,938	522,132	124,757	3,972,216*	2,720,000	306,000	6,998,216
2000–2001	434,381	1,451,237	322,161	348,137	800,956	540,695	130,145	4,027,712	2,611,678	296,000	6,933,712

\# Includes Tiburon, San Francisco, Alameda/Oakland and Vallejo service
* Includes 28,000 for Richmond-San Francisco

Source: Ferry Operators

Studies indicate a much greater affinity for water transit by people who choose to live by the water. Martinez, as well as Pittsburg and Antioch in Eastern Contra Costa County exemplify those types of waterfront communities.

Figure 11

Bay Area Ferry Operating Costs and Revenues 2000–2001

	Golden Gate Transit Larkspur & Sausalito	Vallejo	Alameda/ Oakland	Alameda/ Harbor Bay
Annual operating cost	$13,020,500	$6,200,680	$3,076,600	$1,444,900
Fare revenue	$5,586,500	$5,061,000	$2,184,600	$478,400
Farebox ratio	43%	78%	71%	33%
Subsidy sources				
▪ Bridge tolls	$4,971,700	$1,380,700	$590,000	$519,000
▪ TDA/transit funds	$2,462,200	$15,000	N/A	N/A
▪ local funds	N/A	$22,000	$302,000	$348,000
▪ concessions/ charters/misc.	$186,000	$7,000	N/A	$99,400

Source: Ferry Operators

2.03 What is the proposed new system?

Bay Bridge Corridor

Berkeley to San Francisco to Mission Bay — Water-transit service to-and-from Berkeley is forecast to have one of the highest riderships of new routes within the Bay Area. However, depending upon the location, development of a terminal in Berkeley may offer some environmental challenges, including addressing impacts to the adjacent Eastshore Park from both vessels and vehicles accessing a potential terminal. Despite these challenges, one cannot ignore the projected ridership of 2,276 daily passenger trips in 2025. This reflects the increasing congestion on both I-80 and BART, as well as the need for additional transit alternatives to serve communities such as Emeryville that are along the East Bay shoreline.

Richmond to San Francisco — The Richmond waterfront is ideally suited for water transit to San Francisco. Richmond has an existing terminal site, as well as substantial development potential in and around the waterfront that could complement ferry service. The 2025 forecasts estimate 1,854 daily passenger trips between Richmond and San Francisco and service could begin quickly due to the existing infrastructure. Comprehensive waterfront planning could tie together walk- and bike-access between residential development and the ferry terminal, minimizing the need for expensive parking facilities. Additionally, the proximity of new development, such as the art community moving into the old Ford Plant, allows water transit to serve both commuters and non-commuters.

Treasure Island to San Francisco — Development on Treasure Island could create a significant demand for transit services between the Island, San Francisco and the East Bay. The ridership model forecasts 3,587 daily passenger trips to San Francisco in 2025 and 1,000 trips to the East Bay. These forecasts will change depending on evolving development plans proposed for Treasure Island.

Bay Bridge and Carquinez Bridge Corridors

Martinez-Antioch/Pittsburg to San Francisco — Studies indicate a much greater affinity for water transit by people who choose to live by the water. Martinez, as well as

Pittsburg and Antioch in Eastern Contra Costa County exemplify these types of waterfront communities. Initial 2025 ridership forecasts identified 600 daily Martinez passenger trips and 1,000 Pittsburg/Antioch passenger trips.

However, a potential combined service not only delivers greater ridership to-and-from San Francisco, but also provides a connection between the two areas that could take county workers traveling to Martinez, the Contra Costa County seat, off the congested Hwy. 4 corridor. Additionally, these communities could potentially offer good connections to Amtrak that would complement ongoing waterfront planning.

Benicia — Like many of the Bay's historic waterfront communities, Benicia offers a number of features that could potentially benefit new water-transit service. It has an attractive downtown close to the

Figure 12

Figure 13

Ridership Results/Recommended Routes

Corridor	Ferry Route	Future (2025) WTA Plan*
Golden Gate	Larkspur-San Francisco	6,576
Golden Gate	Sausalito-San Francisco	5,118
Bay Bridge/Carquinez	Vallejo-San Francisco	4,411
Golden Gate	Tiburon-San Francisco	2,649
Bayshore	South San Francisco-San Francisco	2,496
Bay Bridge	San Francisco-Treasure Island	2,485
Bay Bridge	Berkeley-SF-Mission Bay	2,357
Bay Bridge	Oakland-San Francisco	2,327
Bay Bridge/Carquinez	Antioch/Pittsburg-Martinez-SF	2,038
Bay Bridge	Richmond-San Francisco	1,780
Bay Bridge	Alameda Point-Mission Bay-SF	1,705
Bayshore	Redwood City-San Francisco	1,420
Bay Bridge	Hercules/Rodeo-San Francisco	933
Bay Bridge	Harbor Bay-San Francisco	679
Total Daily Ridership		**36,974****

* Includes ridership on existing routes
** Passenger trips

Source: Authority Ridership Study

waterfront, an affordable housing stock to attract Bay Area commuters, and adequate land on the waterfront for terminal and parking development. Forecasts show an estimated patronage of 600 daily passenger trips in 2025. This patronage is less than would be expected from this type of waterfront community. However, the presence of the nearby Vallejo ferry service undoubtedly affects Benicia's ridership. While ferry service may not be viable at this time, changes in Benicia's waterfront could significantly increase the viability of water transit from Benicia — thus further study of this site is recommended.

Hercules/Rodeo — Hercules is undergoing an incredible transformation. Historically, Hercules has been a bedroom community, housing residents who worked and shopped in other Bay Area cities and towns. Applying principles of new urbanism, city leaders are developing a new commercial and residential area immediately adjacent to the waterfront. This area, coupled with potential redevelopment in nearby Rodeo, provides a new potential market for water transit. The ridership forecasts for a Hercules/Rodeo ferry terminal predict 903 daily passenger trips in 2025. Placing a terminal in the Hercules/Rodeo area would be critical and could significantly affect the potential ferry patronage. Continued study in partnership with local agencies is recommended to capitalize on a potential ferry terminal at this site.

Figure 14

Golden Gate Bridge Corridor

Port Sonoma to San Francisco — There is significant interest among local and county elected officials, as well as business and civic leaders, for water transit to help relieve traffic congestion in northern Marin County, as well as Napa and Sonoma counties. The ridership model shows a demand of 1,392 daily passenger trips from Port Sonoma to San Francisco in 2025. Authority staff held eight meetings with local stakeholders over an 11-month period, examining three suggested sites to attract commuters from Santa Rosa, Petaluma, Sonoma and Novato. As a result of these meetings, it is recommended that Port Sonoma on Hwy. 37 undergo further study, including ridership, conceptual site design, a site-specific EIR (including studies of wetlands and endangered species) and cost-effectiveness analysis.

Bayshore Corridor (U.S. 101 in San Mateo and Santa Clara counties)

South San Francisco to San Francisco — This route will serve commuter traffic between the Peninsula and San Francisco, as well as potential trips to the growing number of businesses in South San Francisco east of U.S. 101. Employers in this area include Genentech, Hitachi, Toshiba and United Parcel Service. Many water-transit passengers using a new ferry terminal near Oyster Point Marina will use shuttles and SamTrans buses that already serve Caltrain and eventually will connect with the new BART extension. Ridership forecasts for 2025 predict 2,187 passenger trips to-and-from South San Francisco. Development of water transit to South San Francisco also will provide future flexibility for service to San Francisco International Airport and emergency access to the Peninsula.

Redwood City to San Francisco — Water transit from Redwood City will carry commute traffic between the Peninsula and San Francisco. The Peninsula-to-San Francisco corridor along U.S. 101 and I-280 is the most heavily traveled in the Bay Area, and even small improvements in mobility can provide significant relief during commute periods. Forecasts predict 1,477 daily passenger trips to and from Redwood City in 2025. A Redwood City terminal also will serve the city's growing waterfront business and residential communities. The Pacific Shores Center development, located immediately adjacent to one of the potential terminal locations, currently provides more than 1.5 million square feet of office space. In addition, water-transit service to potential development sites like Abbott Labs, adjacent to the Port of Redwood City, could easily link employees living in the East Bay to jobs on the Peninsula.

Other Possible Expansion

Recreation Service — Planning for a recreation water-transit loop, which would serve Golden Gate National

People riding Bay Area ferries are riding the region's safest form of public transit. Water-transit passenger safety is better than rail, and significantly better than roadway transit.

Recreational Area (GGNRA) sites such as Fort Mason, Fort Baker and Crissy Field (Torpedo Wharf), is now underway. These routes are being developed by GGNRA and would provide transit access to many of the Bay Area's most treasured and pristine natural resources. In addition, they would reduce congestion and improve mobility on weekends, which are increasingly matching weekdays for the duration of traffic congestion. The Authority will continue to work with GGNRA to develop and deliver this expanded recreational service.

Airport Service — This will serve water-transit passengers between downtown San Francisco, Oakland International Airport and San Francisco International Airport — including direct water-transit service between the two airports. The Authority believes that the ridership model underestimates potential demand for this service. Thus a specific study of airport-to-airport service using a more appropriate transit model is recommended.

Others — Several other routes also were investigated, but ridership forecasts using current ABAG data show that they are only marginally viable or have other factors that would seriously affect the performance of ferry service. The Authority is moving forward with additional planning activities for:

East Bay-Peninsula – In addition to recommending routes from Oyster Point and Redwood City to the San Francisco Ferry Terminal, the Authority will conduct other studies of service from these two cities directly to the East Bay.

Hunters Point Shipyard Development – In the future, ridership demand may increase with the development of new residential and commercial projects. The City of San Francisco is completing its negotiations with the Navy on the transfer of this former base for redevelopment. As this project progresses, the Authority will work with the City and its development team to update ridership studies and provide the technical assistance needed to plan ferry service out of Hunters Point.

Moffett Field – Changing circumstances in the proposed land use and management of the former naval air station may merit additional ridership study. The Authority will continue to monitor this site and work with local officials to conduct that study if circumstances merit.

Expanded Service on Existing Routes — The Authority's enabling legislation directed this plan to focus on new ferry routes. Expanded service on existing routes can only be implemented with the concurrence of the existing public provider of the ferry service. However, expansion of service on existing routes, in some cases, holds great potential for increasing ridership. While the Authority has no ability to expand service on existing routes, both the ridership and environmental effects of expansion on the Vallejo, Larkspur, Alameda-Oakland, Harbor Bay and Sausalito routes have been investigated. That work is incorporated into the studies included in this plan. This plan also includes programmed funding for future vessels, facilities and operating expenses, which are funds greatly needed by existing water-transit operators who have limited funds for expansion.

Future Routes — Several sites hold great promise for future water-transit expansion. One example is San Quentin, which is being considered for reuse by Marin County should the state decide to close the prison. San Quentin offers potentially unconstrained land-use flexibility, unequaled water-transit access and the potential for excellent transit connections. As a result of these benefits, the Authority will continue to work closely with Marin County and the GGBH&TD to study a future San Quentin Ferry terminal. Figure 8 on page 17 summarizes the route implementation schedule.

Water Taxi Service – The focus of this plan is on routes that are viable public transit services. Several local governments and businesses are expressing an interest in water taxi service to enhance recreational, tourism and economic development projects. In the future, the Authority may consider operating this type of service or be a resource to entities interested in starting and funding water taxi service by providing expertise in areas such as system planning, vessel design and terminal planning.

2.04 What is the safety plan?

Safety Plan

Passenger ferries share the 548-square-mile Bay with commercial shipping, cruise ships, fishing boats, excursion boats, the U.S. Navy, recreational sailors, power-

boaters, kayakers, windsurfers and boardsailers. The U.S. Coast Guard (USCG) is responsible for vessel traffic safety, and the existing water-transit operators have been full and active partners in efforts to maintain a safe operating environment on San Francisco Bay.

Preparation of this plan included detailed risk-analysis of existing traffic on the Bay, as well as computer simulation of the proposed routes and headways to measure the impacts of increased ferry service and identify where potential problems may lie. Working with the Coast Guard, California Maritime Academy and others, the Authority is putting forth a plan that meets all regulatory and operational requirements.

Bay Area Water Transit Is Safe

People riding Bay Area ferries are riding the region's safest form of public transit. Water-transit passenger safety is better than rail and significantly better than roadway transit (buses, shuttles, trolleys, cable cars — heretofore referred to simply as "buses").

The Federal Transit Administration (FTA) reports that there were no fatalities on Bay Area ferries between 1997 and 2000. Meanwhile, there were four reported patron fatalities on buses in 2000 and, in 1999–2000, there were ten reported patron fatalities on rail.

Analysis of 1997–2000 data from the Federal Transit Administration (FTA) shows the rail-passenger injury rate was more than double the rate for water transit. The bus passenger injury rate was five times higher than ferries.

TIBURON FERRY

Work is continuing with the existing operators, the Coast Guard and others to ensure Bay Area water transit is not only safe on a day-to-day operational level, but also is secure from outside threats.

From 1997–2000:

- Bay Area water transit averaged .3065 patron injuries per million passenger miles (Alameda-Oakland, GGBH&TD, Vallejo Transit)
- Rail averaged .67025 patron injuries per million passenger miles (BART, Caltrain, SF MUNI)
- Buses averaged 1.55425 patron injuries per million passenger miles (AC Transit, BART motor bus ['97–'98 only], GGBH&TD bus, SamTrans bus, SF MUNI cable car, SF MUNI trolley, SF MUNI bus, Vallejo Transit bus)

Increased Safety for Expanded Water-Transit Service

Because water transit is regulated by the Coast Guard, it is subject to rigorous safety standards. In order to properly prepare for increased ferry service, a work group of operators, regulators and other stakeholders — including the Coast Guard — was formed to review current practices and procedures so the Bay can be made even safer for everyone. This Safety Plan, which is included in the Appendix, was compiled by following the "Risk-Based Decision-Making Process" used by the Coast Guard. This plan accounts for traffic coordination with all commercial shipping and recreational boating within the Bay. It includes findings derived from sophisticated computer traffic simulations conducted as part of this study.

After a series of intensive workshops, the Safety Plan Work Group proposed a number of recommendations and best practices that are in the Safety Plan. Those recommendations include:

- Develop and exercise vessel mutual assistance plans
- Develop and enforce standards for emergency training and conduct drills that meet or exceed Coast Guard standards
- Develop, implement, enforce and audit standard procedures for emergencies, adverse weather and normal operating conditions
- Consider installing closed-circuit TV cameras in unmanned engineering spaces with monitors on the bridge
- Design and implement a preventive maintenance system that meets or exceeds manufacturer's service requirements
- Require a licensed master to complete an extended familiarization training program aboard the hull and route before being qualified as master-in-charge

Heightened Security Following 9/11

The Coast Guard, the existing Bay Area water-transit operators, the maritime unions and harbor and port officials acted quickly following 9/11 to ensure that maximum safety procedures were in place and followed. Beginning immediately after 9/11, and spelled-out in response to a Coast Guard directive, the operators increased security on all passenger ferries. The steps taken include:

- Ensuring that access to all vessel operational areas, including machinery spaces, pilothouse and gear lockers, remain locked at all times and accessible only to authorized crew
- Posting night watch security guards at terminals
- Conducting diligent onboard inspection for unattended passenger bags, briefcases and packages after each run, before the next boatload is allowed to board
- Creating coded signals and responses to report suspicious activity
- Requiring positive identification before allowing any contractors, vendors or others access to vessels
- Providing additional security training to crew
- Developing a security plan to account for potential threats, outlining preventive measures and detailing an action plan in the event of a threat or actual emergency

Additionally, the Coast Guard is deploying armed, uniformed "sea marshals" on passenger ferries.

Work is continuing with the existing operators, the Coast Guard and others to ensure Bay Area water transit is not only safe on a day-to-day operational level, but also is secure from outside threats.

People who do not ride transit are clear about their reasons. First and foremost, it is the lack of good connections.

By definition, Bay Area water transit begins and ends at the shoreline. Since most people don't live or work at the water's edge, they must travel from home to the ferry, and from the ferry terminus to their trip destination.

3.01 How does the San Francisco Bay Area water-transit system fit into the overall transit system?

By definition, Bay Area water transit begins and ends at the shoreline. Since most people do not live or work at the water's edge, they must travel from home to the ferry, and from the ferry terminus to their trip destination.

The challenge is to create a convenient water-transit system that effectively serves these people while recognizing the huge land-use challenges that constrain large-scale parking at many of those terminals.

This plan acknowledges the state mandate to integrate water transit into the Bay Area's overall transit system in order to build ferry ridership. A manual summarizing the transit industry's best practices to achieve those connections is in the Appendix to this plan. The new service recommended, and the suggested enhanced service on existing routes, fully accounts for that need.

The Authority is pursuing three objectives:

1. Good connections to terminals through walking, bicycling and transit use
2. Appropriate parking at terminal locations that achieves a balance between maximizing water-transit ridership and minimizing the impacts from driving vehicles to the shoreline
3. Sensible land use to complement ferry terminals and encourage ridership via Water Transit-Oriented Development (WaTOD)

Good Connections

Partnerships with other transit providers are essential to deliver potential riders to ferry terminals. However, a well-designed and situated ferry terminal can also generate riders through good connections to existing pedestrian and bicycle infrastructure.

Pedestrian Access

Pedestrian access at terminals for both commuters and recreation-trip passengers will be linked to existing and planned paths and trails, such as the Bay Trail.

Pedestrian access design should include wide sidewalks, trees, lighting, seating and public open spaces with views. Far from an amenity or "extra," this pedestrian orientation is an important investment in growing transit ridership and is as valuable as funds spent for other transit connections.

Pedestrian access at terminals for both commuters and recreation-trip passengers will be linked to existing and planned paths and trails, such as the Bay Trail.

Bicycle Access

Most, if not all, of the Bay Area's bicycle network stops at the shoreline. Bike connections across the Bay currently depend on limited access to existing bus or rail transit. For example, BART prohibits bikes during peak hours and limits them to only some cars during off-peak hours. Buses can carry only two bikes at a time.

Ferry routes extend the bike network across the Bay. Ferries are able to carry 25 or more bicycles, significantly expanding capacity for bikes to traverse the Bay. It is therefore essential that the ferry terminals connect to the Bay Area bike network. To ensure the safest possible connections, the Authority will encourage that class one (bike or multi-use paths) or class two (bike lanes) will be provided at ferry terminals, as well as on roads leading to terminals. Terminal design will include safe bicycle storage for those who do not take their bikes onto the ferry.

Transit Access

To effectively build dedicated ridership in the real world of California's "auto-culture," neither the Authority nor any other San Francisco Bay Area transit operator can significantly increase ridership without building "intermodal transit." This means creating good connections by coordinating with other transit modes to ensure that their service comes together at the same place and time. This ensures that riders are quickly, easily and safely transferred from one mode to the other.

Good connections can refer to multiple transit agencies' service converging on a single location. An example is the San Francisco Ferry Building where water transit, SF MUNI's "F" Line streetcar and GGBH&TD buses all converge. Or, it can be a single operator such as GGBH&TD coordinating its own feeder buses to the Larkspur Ferry Terminal with the arrival and departure of GGBH&TD boats.

The fact is, only a small percentage of Bay Area residents can travel from home to their desired destination via a single public transit mode. No one transit operator can succeed alone, which means good connections are needed if we are going to increase transit ridership and subsequently reduce traffic congestion.

< Sources: ABAG and Authority Studies

When it comes to Bay Area transit, the sum is truly greater than the parts.

Transit operators including BART, GGBH&TD, AC Transit, SamTrans and SF MUNI have joined the Authority in this effort. All who participated in the Intermodal Working Group recognized the importance of good connections, and shared their experiences of the difficulties related to accomplishing this task. As the Authority moves forward, it intends to continue working with the other Bay Area transit agencies and MTC because this work will be among the most important in getting more people onto public transit.

This new water-transit system includes an expanded land-transit system to serve ferry terminals. It was developed in cooperation with existing transit agencies and provides additional buses and service hours. Overall, nearly one-quarter of the estimated operating costs go to the land-transit connections that will bring riders to the ferry terminals.

The lack of good connections for most transit riders, combined with California's strong driving culture, remain the greatest barriers to increased transit use.

Recent studies by BART and MTC reinforce this point. The "1998 BART Station Profile Study" shows that nearly half of all BART passengers (49 percent) drive from home to BART, compared to 26 percent who walk, 23 percent who take another transit mode and 3 percent who bicycle.

For those who use transit for the majority of their commute between home and work, MTC's "Commute Profile 2001" found that 40 percent drive to and from the transit portion of their commute, while 12 percent carpool, 28 percent take another form of transit (such as bus to BART) and 20 percent walk or bike.

Another key factor that feeds people's perceived need to drive is the geographic disconnect between jobs and housing. Bay Area housing costs will remain beyond the reach of many people who work in the region, creating the need for long commutes until more effective land-use and transit strategies are introduced.

Appropriate Parking

Parking demand at the proposed ferry terminals is dependent upon adjacent land use, the size of the terminal's ridership catchment area, the ability to operate effective transit feeder service and the local communities' views about parking.

However, a ferry system should maximize walk, bicycle and transit access, and minimize the need for parking lots, in the spirit of the San Francisco Bay Plan.

Thus, when ferry terminals need parking lots, they should be sized appropriately and should provide attractive options that encourage walking, bicycling and the use of bus or rail to reach the ferry terminals. Measures to minimize the demand for parking spaces could include car-parking charges, car-share programs and preferential parking for car- and van-pool users.

Maximize Land Use — Water Transit Oriented Development (WaTOD)

As discussed in *The Demand* chapter, water transit can play a significant role in enhancing land use in select Bay Area locations where it is desirable to create mixed-use neighborhoods along already developed waterfront. Clearly, placing ferry terminals close to large job centers and residential areas means more people can reach water transit via foot, bicycle or shuttle, which is the experience in cities like New York, Vancouver and Sydney.

Creating effective WaTOD will create more viable transit choices for people who would rather not drive. They can choose to live and work in locations that make it easy to leave their car at home — or to not own a car at all.

While many world-class water-transit systems, such as Vancouver and Sydney, effectively integrate ferry service into surrounding land uses, one of the best examples of complementary land uses serving water transit can be found in the San Francisco Bay Area.

The Sausalito Ferry Terminal is located adjacent to a waterfront business- and shopping-area that attracts both Bay Area residents and visitors arriving by ferry. Surrounding the commercial area is a relatively dense residential community that is extremely desirable due to its waterfront location. Little parking is provided at the ferry terminal, and the available parking is expensive, so this community reaches the ferry terminal via free shuttle buses, a short walk or a bicycle ride.

The result is a transit service that is used primarily by non-drivers, reducing both the capital cost of the terminal parking and the impact of that parking on waterfront scenery. Most Bay Area residents view Sausalito as unique. However, through effective waterfront planning, many of Sausalito's qualities can be duplicated at other ferry terminal sites around the Bay.

Case Studies

The application of these principles will vary greatly depending on the opportunities and constraints of the individual terminal sites. The following case studies effectively demonstrate how the principles can be applied.

Two sites — Jack London Square in Oakland and Oyster Point in South San Francisco — hold great promise for WaTOD and improved transit connections. Another location, Hunters Point Shipyard Development in San Francisco, could become a model urban WaTOD site if proposed development plans are approved. Additionally, locations such as the Port of Redwood City, Martinez, Alameda Point and Antioch are good candidates. At each, effective water transit can be an enormous asset for those who live, work, shop and recreate there.

Frankly, it is difficult to find consensus among Bay Area transportation stake-holders, but one point everyone agrees on is the desire to increase the number of transit riders who leave their cars at home. Sensible WaTOD, particularly as part of a transit system that makes good connections, is the best way to increase the number of travelers who consistently use transit.

WaTOD Examples

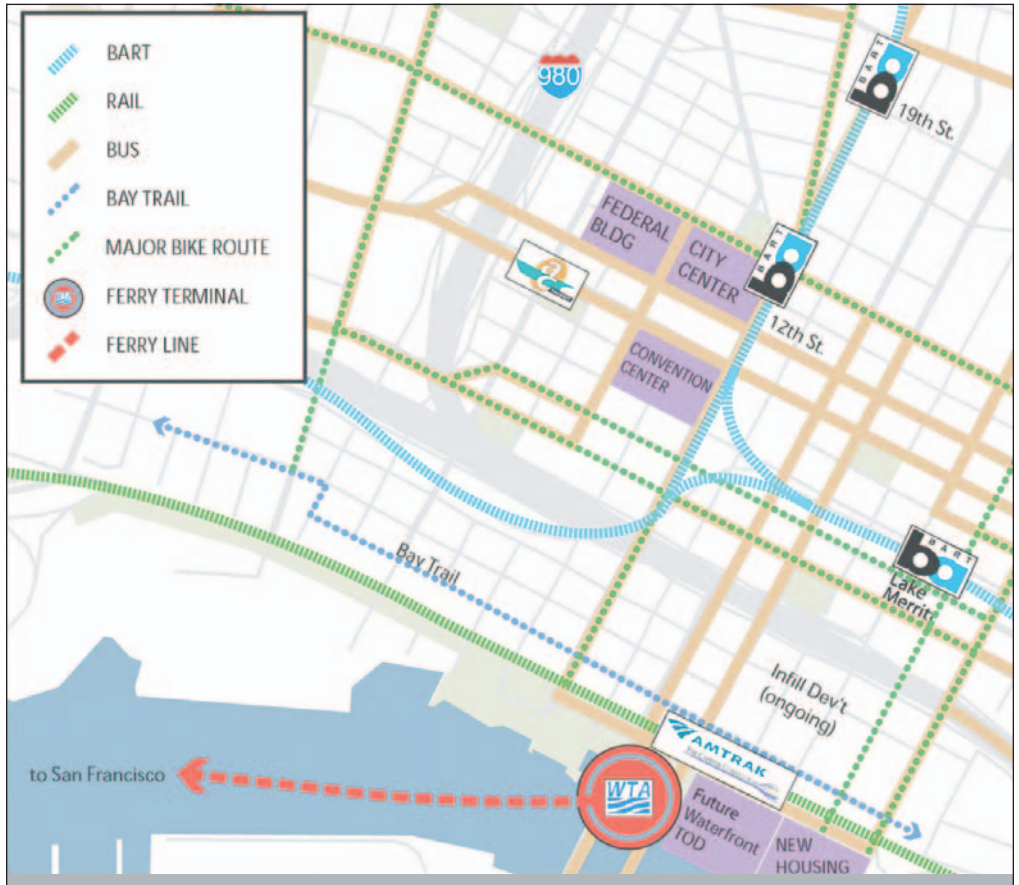
Jack London Square

Development of the Jack London Square ferry terminal provides a great opportunity for connectivity because it is Oakland's gateway for two transit systems — Amtrak/Capital Corridor train and the ferry. Nearby connections also are available to BART and AC Transit, potentially linking major regional and inter-regional transit services in one location.

Additionally, Jack London Square is undergoing a renaissance that will provide the opportunity to integrate these transit systems directly into new development. Approximately 900 housing units have been built in the area in the last three years, and about 300 more units are planned. More hotel, retail and entertainment space also will be built.

A number of different ferry terminal sites within the Jack London Square area, including the current Clay Street location,

Figure 16

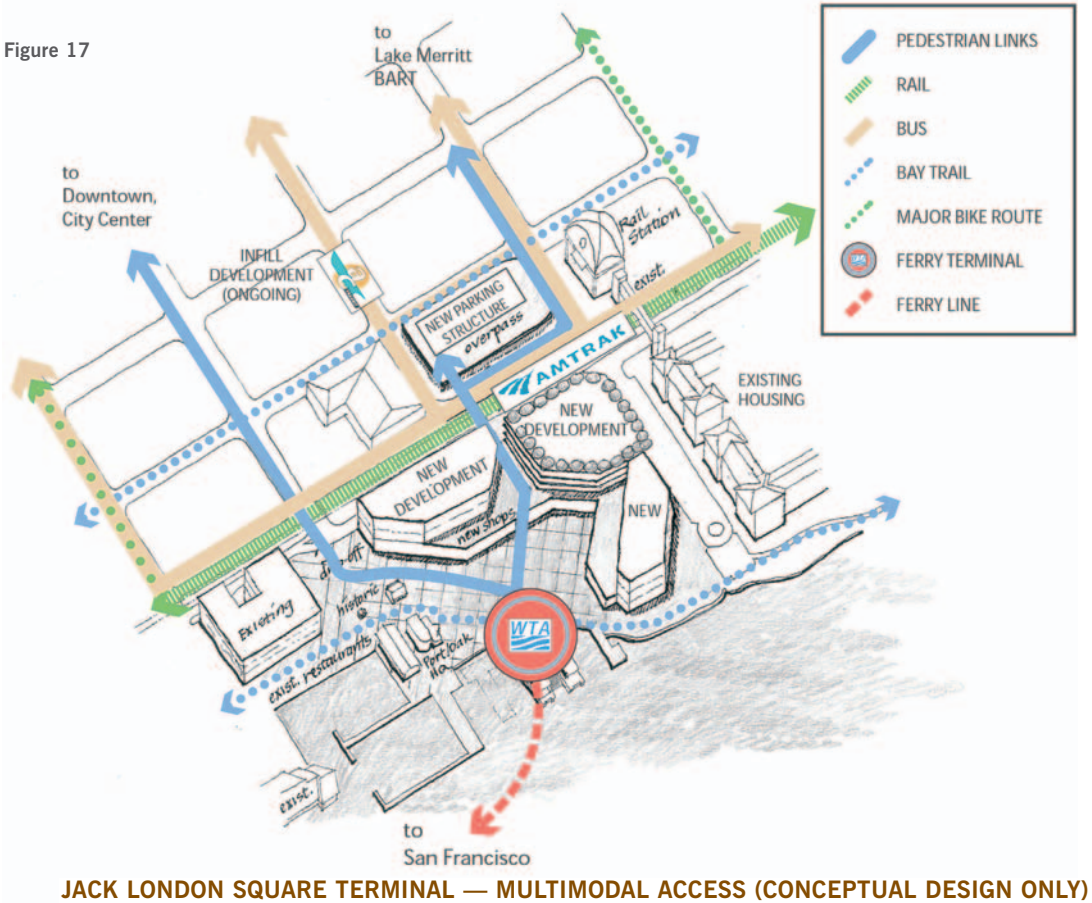


JACK LONDON SQUARE TERMINAL — TRANSIT CONNECTIONS (CONCEPTUAL DESIGN ONLY)

Source: Authority Study

A key to the development of an intermodal terminal at Jack London Square will be connections to rail and AC Transit's bus network.

Figure 17



JACK LONDON SQUARE TERMINAL — MULTIMODAL ACCESS (CONCEPTUAL DESIGN ONLY)

Source: Authority Study

were reviewed for opportunities to improve water-transit connectivity. Each of the sites investigated offers both advantages and disadvantages to ferry service.

The ultimate location of a ferry terminal must be included in a comprehensive planning process that balances local and regional needs. To demonstrate the principles of connectivity, the Authority studied a ferry terminal location further south than the Clay Street location, near the foot of Harrison Street. This demonstration site was chosen because of its proximity to the Amtrak station, adjacent housing and future development.

Currently, the terminal at Jack London Square serves primarily commute and recreation trips from the East Bay to San Francisco. However, downtown Oakland has the second greatest job density (behind the San Francisco Financial District) in the Bay Area. That job density, coupled with new development along the Jack London Square waterfront, highlights Oakland's unfulfilled potential as not just an origin, but also as a destination for water transit.

Therefore, a key to the development of an intermodal terminal at Jack London Square will be connections to rail and AC Transit's bus network. These connections must duplicate the frequent and convenient connections provided by SF MUNI at the San Francisco Ferry Terminal to fulfill the ridership potential. This AC Transit service would connect the water-transit system to downtown Oakland employers such as Caltrans on Franklin Street, state and federal employees on Clay Street, and private sector businesses such as Clorox and APL Limited on Broadway.

As shown in Figure 17, the ferry terminal must overcome the barrier established by the railroad tracks that bisect the Jack London Square area. The sketch shows a direct pedestrian connection over railroad tracks between the ferry and a new bus hub located at the existing Amtrak station. That connection also ties the three transit systems (Water Transit, Amtrak, AC Transit) to established bike and pedestrian access, allowing all transit modes to benefit from a single infrastructure investment.

POTENTIAL OYSTER POINT TERMINAL SITE NEAR GENENTECH

Oyster Point

Like Oakland, the Oyster Point terminal is forecast to serve primarily people commuting into San Francisco — in this case from South San Francisco. However, water transit could be a significant commute option into South San Francisco for employees at waterfront companies such as Genentech.

At Oyster Point, Genentech and surrounding light industrial companies, like UPS, employ thousands of people who live in San Francisco and the East Bay — enough to potentially make water transit viable. By putting a ferry terminal near Genentech and UPS, it will be easier and more desirable for workers to ride ferries instead of driving across the Bay Bridge, the San Mateo Bridge, and up and down U.S. 101.

Again, the key to the success of this service will be providing good connections between water transit and the workplace. Many Peninsula commuters are using shuttles to travel to and from Caltrain, and they are eager to do the same with water transit. The map of the Oyster Point vicinity (Figure 18) shows how shuttle bus service could effectively and conveniently tie water transit to employers and other transit systems. In addition, the terminal would fit into the planned Bay Trail, allowing a direct transit connection along the shoreline for bikers and pedestrians.

Figure 18

OYSTER POINT TERMINAL — INTERMODAL CONNECTIONS

Source: Authority Study

Creating a water-transit system is achieved by standardizing the way passengers move through the terminals, buy their tickets and receive information.

Ferry terminals are historic gateways to waterfront communities, and the character of the terminals can and should be a central element in defining each unique waterfront community. The terminals are also on the shoreline of a beautiful bay, and must be in harmony with their surroundings.

Providing a direct transit connection is just one of the essential functions that water-transit terminals must fulfill. New water-transit terminals on the San Francisco Bay shoreline will also:

- Tie the ferry system together by providing standard, predictable features for passengers
- Enhance shoreline access for both passengers and non-passengers
- Display the host community's desired visual aesthetics

Ferry terminals are historic gateways to waterfront communities, and the character of the terminals can and should be a central element in defining each unique waterfront community. The terminals are also on the shoreline of a beautiful bay, and must be in harmony with their surroundings.

However, the terminals also form the backbone of the ferry system, turning a series of separate ferry routes into a ferry system — and connecting water transit to landside transit.

Creating a water-transit system is achieved by standardizing the way passengers move through the terminals, buy their tickets and receive information.

Like other large transit systems such as BART and SF MUNI, passengers will know what to expect so they can move through the terminals quickly and without confusion.

When considering ferry terminals serving the Bay, special consideration must be given to the San Francisco Downtown Ferry Terminal, which serves as the hub for nearly all of the planned water-transit expansion.

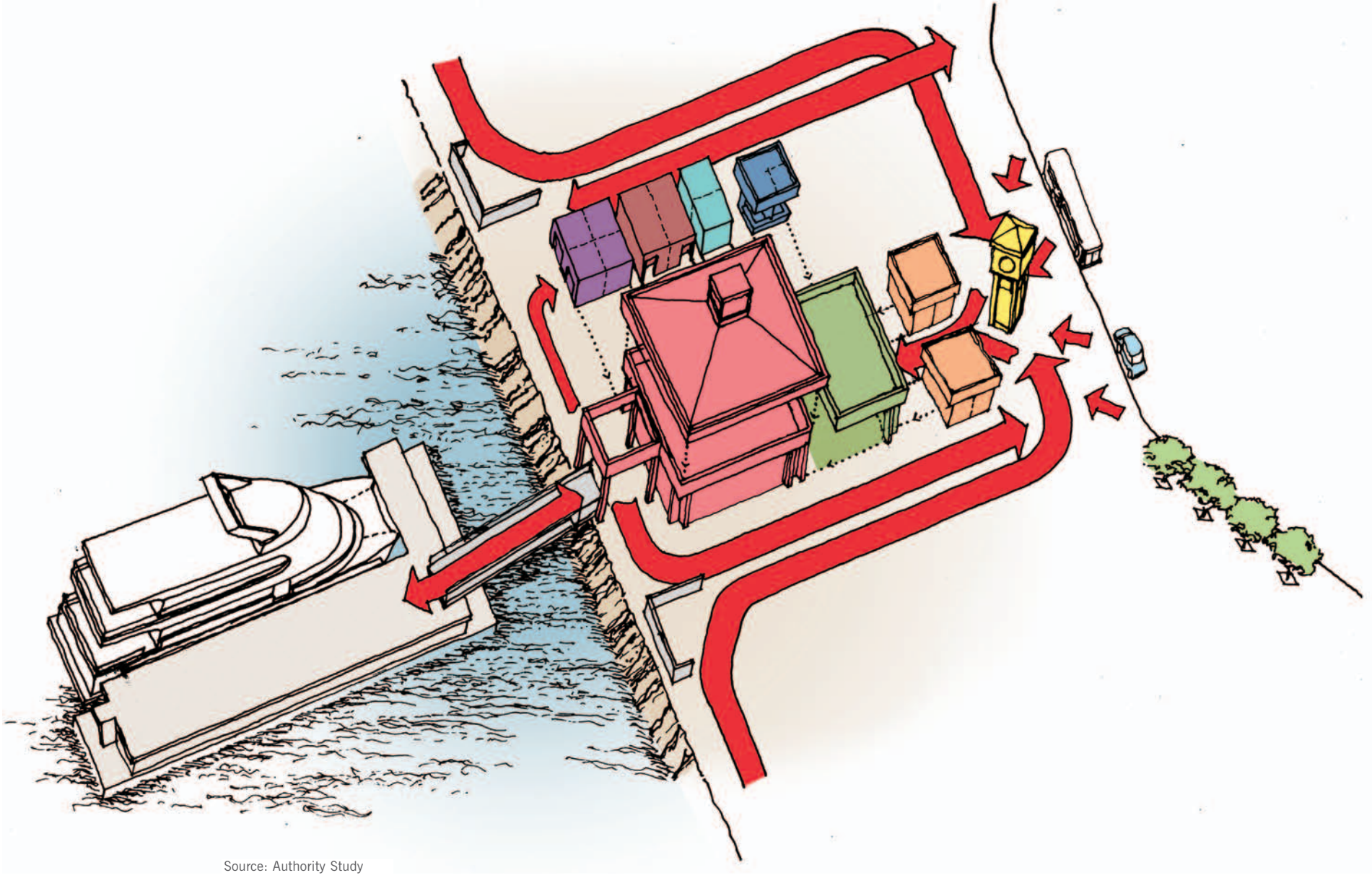
The terminal could see ferry operations nearly five times higher than today. Therefore, adequate accommodation for passenger movement and queuing must be made.

With the expected growth, the existing terminal facilities will be operating at over capacity. Further study is needed to analyze the alternatives. Planning must include the many interested and affected parties, especially the Port of San Francisco, the GGBH&TD, which has a longterm leasehold at the Ferry Building, and the other existing operators. The costs to expand facilities at the Downtown Ferry Terminal are included in the Authority's financial plans.

LARKSPUR FERRY TERMINAL

Figure 19

STANDARD MODULAR FERRY TERMINAL — CONCEPTUAL DESIGN



Source: Authority Study

Community Experience

The ferry terminals will serve as welcoming gateways to each unique waterfront community. The concept is to propose a generic modular design (see Figure 19) that includes those elements required to meet the system's operational needs. In later stages of planning, this modular design will serve as the starting point for detailed work with each community to develop a terminal tailored to each location. The character of a terminal will highlight its unique purpose and features, as well as blend in with the local architecture to create a positive maritime focal point.

Shoreline access and viewpoints will continue to maintain the positive bond between the community and the Bay. The terminal buildings and the areas around them will be created with people and their needs in mind. They will be comfortable and aesthetically pleasing for all passengers, whether they are in a hurry or have time to simply watch the boats come and go.

The generic modular design allows each terminal to fit into site-specific constraints and become operational in a cost-effective manner. It can be reconfigured as passenger traffic and vessel activity increase.

VALLEJO FERRY TERMINAL

Passenger Experience

For passengers, the terminals will be a critical part of their commute or recreational trip, and will provide the safety, efficiency and comfort in an attractive setting that they expect. Terminals will be designed for maximum efficiency of communication and movement, and these design features will be standardized in all terminals. The standardization will apply to traffic flow, organization and display of information, and the processes for ticketing and boarding. The terminals will provide a pleasant experience that is an extension of the ferry ride itself: beautiful views, comfortable work and reading space, food service and places to sit and chat with friends.

Each step in the passengers' journey has been considered in light of their needs. Passengers arriving by bus, shuttle or private vehicle will have short walks from parking or drop-off locations close to the terminal. Bicyclists will be provided with bike racks, lockers or check-in facilities. Pedestrians will enjoy tree-lined walks that are well lighted and marked by helpful signs.

Ensuring passengers' understanding of the timetables, ticketing and boarding process is also critical. Upon entering the terminal, passengers will have access to tickets, route maps and directions for connecting to land-based transit.

The terminal buildings and the areas around them will be created with people and their needs in mind. They will be comfortable and aesthetically pleasing for all passengers, whether they are in a hurry or have time to simply watch the boats come and go.

The terminals are designed to handle standardized ticketing, such as TransLink®, that connects with other transit. A "proof of purchase" system for ticketing and boarding will be further studied. This will allow passengers to board quickly and allow the ferry crew to concentrate on vessel handling rather than passenger handling.

Because the Coast Guard mandates strict passenger load limits, the secure waiting area is designed to accommodate no more than one boatload of people. Those waiting will be protected from the weather in an area with comfortable seating, restrooms and large windows with views of the dock and the Bay. If the boarding area is full, passengers will queue in a covered waiting area until the secure waiting area is available.

Moving passengers on and off boats quickly and safely is necessary to minimize trip times and maximize the popularity of the system. When boarding, the walk from the waiting area to the boat will be safe and as short as possible. Passengers will leave the boarding area, cross over to the floating dock (float) on a pedestrian bridge (transfer span), pass through a turnstile and board the vessel.

The ticketing system combined with the turnstile responds to Coast Guard regulations requiring accurate counts of passengers on board. The passageways are designed with a minimum number of turns, and are wide enough for two people to walk and board comfortably side by side. For passengers in wheelchairs or needing special assistance while boarding, the transfer span will comply with the Americans with Disabilities Act (ADA) at all tidal levels.

Bicycle commuters will be able to comfortably load through a separate boarding and disembarking area in the rear (aft) and side of the vessel. This will avoid conflicts between bicycles and other passengers, and provide additional time for cyclists to board. The bikes will be stored in racks at the rear of the vessel.

System Needs

The ferry system operational needs include:

- Safe and fast vessel docking
- The ability to dock both bow-(front) or side-loading vessels
- The flexibility to interchange boats of various sizes on the various routes
- Vessel maintenance
- Crew and passenger safety

The most important aspect of these needs is the design of the floating dock. The existing ferries on the Bay are all side-loading, but bow-loading vessels are being considered as an option for the new routes. By accommodating both types of vessels, the system will provide maximum flexibility to move and dock boats as needed. This adds value for day-to-day operations, as well as for disaster-response capabilities.

There are additional advantages. The floating dock needed for side-loading ferries allows for faster loading of bicycles during bow-loading of other passengers.

Similarly, the float needed for bow-loading ferries allows the boat to dock and tie-up more quickly than for side-loading. Finally, the standard vessel door locations used by the water-transit system will make it easier to use any boat on any route to any terminal.

The Authority found a propulsion system that is ten times cleaner than existing ferries and can be operational within three years of funding approval.

Flexibility is just one of several critical factors addressed in the recommended designs for new passenger ferries on San Francisco Bay. New passenger ferries will be affordable, and the vessel research-and-development program will aggressively pursue the goal of deploying zero-emission ferries (ZEFs) as quickly as possible.

Flexibility is just one of several critical factors addressed in the recommended designs for new passenger ferries on San Francisco Bay. New passenger ferries will be affordable, and the vessel research-and-development program will aggressively pursue the goal of deploying zero-emission ferries (ZEFs) as quickly as possible.

In fact, the vessel research, design and acquisition programs will lead the Bay Area from the existing passenger-ferry fleet to one that is ten-times cleaner, using cutting-edge marine technology.

New passenger ferries on San Francisco Bay will be compatible to both existing and new terminals. Because these vessels will be able to load and unload passengers quickly and efficiently, water transit will be an even more attractive and convenient travel option that draws more riders. These boats will accommodate bicycles, baby carriages and wheelchairs, provide the highest degree of safety, and maintain their utility as the water-transit system evolves.

The Authority's studies report a number of breakthroughs accomplished in the past year:

- Creation of an in-service emissions monitoring protocol for passenger ferries
- Identification of five propulsion options that meet one of the most stringent emissions targets ever placed on a public-transit agency — one of which is immediately deployable
- Creation of affordable vessel designs that are environmentally responsible
- A plan for a smooth and economical transition from the existing fleet to a new fleet that will more efficiently and effectively transport water-transit passengers to more locations throughout San Francisco Bay

The Goal: ZEFs

The course plotted to put clean passenger ferries on San Francisco Bay begins with budgeting more than $1 million in research to reach a significant milestone: build and deploy affordable boats propelled by technology far cleaner than the U.S. Environmental Protection Agency's (EPA) 2007 Tier II standards for marine engine emissions.

From that milestone, the course will follow continued research and development until the goal of zero-emissions ferries is reached and those "ZEFs" are plying the waters of San Francisco Bay.

The Authority is proceeding along that course. Federal design and construction funds totaling $2.6 million have been awarded to help pay for an R&D project: a demonstration hydrogen fuel-cell powered passenger ferry.

Alternative Fuels and Emissions

This year-long study examined 39 combinations of fuels and propulsion systems. The Authority's Clean Marine Ad Hoc Work Group of state and federal regulators, environmental advocates, scientists and naval architects found one propulsion system made of existing off-the-shelf technology that today can affordably achieve emissions reductions that are at least 85 percent below EPA's 2007 Tier II engine standards. This is the reduction level CARB suggests as the proposed standard and one the Authority will mandate. This propulsion system is ten times cleaner than existing ferries and can be operational within three years of funding approval.

Clean Marine Ad Hoc Work Group

Name	Job Title	Affiliation
Bill Zeller	Senior Program Manager	Pacific Gas and Electric Company
Bruce Hutchison	Principal	Glosten Associates
David Kranking	Commander USCG	U.S. Coast Guard, Marine Safety Office, SF Bay
Chris B. McKesson	Program Manager	John J. McMullen Associates, Inc.
Chris Weaver	President	EF & EE
Clark Aganon	Clean Air Program Coordinator	Department of the Environment
David Lewis	Executive Director	Save the Bay
Debbie Drake	Director	National Audubon Society
Geoff Potter	Captain USCG, retired	Baykeeper
Ernest Sanchez	Manager	Alameda - Oakland Ferry Service
Jim Sweeney	Manager, West Coast Office	Seaworthy Systems
Joe Burgard	Director of Operations	Red and White Fleet
Linda Weiner	Communications Director	American Lung Association® of the East Bay
John Boesel	President	CalSTART
Marina V. Secchitano	Regional Director/WTA Board Director	Inlandboatmen's Union of the Pacific
Mark O. Kasanin	Chair WTA TAC	McCutchen, Doyle, Brown & Enersen, LLP
Mike Savidge	Director, Strategic Planning	Golden Gate National Recreation Area
Mike Daley	Conservation Coordinator	Sierra Club
Erik Olafsson	Senior Planner	SamTrans-Caltrain
Pat Eckhardt	Audubon Society Representative	Golden Gate Audubon Society
Paul Milkey	Staff Air Pollution Specialist	California Air Resources Board
Peggy Taricco	Manager, Technical Analysis Section	California Air Resources Board
Rick Fernandez	General Manager	AC Transit
Roxanne Johnson	Environmental Protection Specialist	USEPA, AIR-2
Russell Long, Ph.D.	Executive Director	Bluewater Network
Spencer Schilling	Naval Architect	Herbert Engineering Corp
Teri Shore	Campaign Director, Clean Vessels	Bluewater Network
Paul Bishop	General Manager	Harbor Bay Maritime
David Clark	Manager, Ferry Division	GGBH&TD
Charles Walther	Principal	Walther Engineering
Joe R. Wyman	Manager, Planning and Development	Hornblower Cruises & Events
Carl Friedrich	Operations Manager	Blue and Gold Fleet
Minji Kim	Risk and Marine Sciences	URS
Loretta K. Barsamian	Executive Officer	SF Bay Regional Water Quality Control Board (RWQCB)
David Burch	Senior Environmental Planner	Bay Area Air Quality Management District
Rebecca Wessling	Terminal Operations Superintendent	GGBH&TD
Marty Robbins		Baylink

Technical studies presented to Clean Marine found four other propulsion systems made from existing technology that also achieve CARB's suggested reductions, but regulatory and technical hurdles remain before they can be deployed.

Clean Marine's work produced additional key findings:

- Current diesel-powered passenger ferries on the Bay produce significantly less pollution (hydro-carbons [HC], nitrogen oxides [NOx] and particulate matter [PM]) than previously reported
- Several environmentally responsible propulsion alternatives are suitable for paving the way to a "fuel-cell future" that eventually will allow us to run fully electric ZEFs on San Francisco Bay
- Implementation of these propulsion technologies, coupled with the forecast reduction in car trips, will reduce the region-wide level for most significant pollutants

Existing Fleet

The water-transit fleet currently operating on San Francisco Bay is cleaner than previously reported. In-service emissions monitoring protocol — so-called "in-situ" monitoring — was used to test three existing vessels with different engine types during their normal operations. The monitoring, conducted between March and June 2002, helped determine the actual performance of current passenger ferries.

In-situ monitoring was done for another important reason: to create a protocol or methodology to measure future ferry emissions, ensuring that boats are performing as expected and environmental impacts are carefully scrutinized.

"The Water Transit Authority is really trying to jumpstart new technologies that will produce the cleanest fleet in the world. There's still a lot of work to be done to implement this vision, but Bluewater Network looks forward to working on this. This planning process has shown the great benefits of collaboration between government, industry and the environmental community."

Russell Long, Executive Director, Bluewater Network

Figure 20

In-Service (In-situ) Emissions

Actual vs Published Emissions

grams per brake horsepower-hr

Ferry Engine	Actual			Published		
	NOx	PM	HC	NOx	PM	HC
Caterpillar 3412TA	▼ 6.6	▼ 0.06	▼ 0.04	8.51	0.33	0.16
MTU 16v396TE74L	▼ 5.7	0.08	▼ 0.18	6.40	0.06	0.24
Cummins KTA 50	▼ 5.5	0.11	▼ 0.04	6.08	N/A	0.12

Source: Authority Emissions Testing Study

Note: various sizes and speeds of vessels impact results

This protocol passed muster with CARB, the Bay Area Air Quality Management District (BAAQMD) and EPA. As a result, the Authority is presenting an in-service emissions monitoring protocol for passenger ferries and recommends that it be instituted on San Francisco Bay.

New Vessels

Fuels and Propulsion

Among the five propulsion options that reduce emissions at least 85 percent below the 2007 standards, one can be used today on passenger ferries: a diesel engine with selective catalytic reduction (SCR) and a particulate trap (PT), running on diesel fuel and using mechanical-drive propulsion.

This propulsion suite can be the "first-generation" technology that will allow the Authority to build a water-transit system that reduces congestion and improves air quality at a cost that is both financially and environmentally responsible.

Meanwhile, the vessel research and development program will continue pushing forward on the regulatory and technology design fronts so that ZEFs can begin operating on the Bay as quickly as possible.

Course to Cleaner Passenger Ferries

The process to recommend these propulsion alternatives is fully described in the Appendix in the "New Technologies and Alternative Fuels Study."

To summarize, the Clean Marine Ad Hoc Work Group sought propulsion technology that meets CARB's suggested emissions goal and also is:

- Technically feasible
- Environmentally responsible
- Economically practical

Marine propulsion has three components: the engine, the fuel and the drive that propels the boat. Thirty-nine components — ranging from sail to mainstream marine technology to new hybrid fuels — were studied. Then, 14 combinations of engines, fuels and drives were identified by Clean Marine to model in order to learn how they perform on the types of boats needed for Bay Area water transit:

- 400-passenger traveling at 35 knots for 25 miles
- 400-passenger, 25 knots, 15 miles
- 149-passenger, 25 knots, 15 miles
- 149-passenger, 15 knots, 10 miles

As a result, Clean Marine's study identified five propulsion alternatives that meet CARB's suggested emissions standards. (See Figure 22 on page 39.)

However, issues remain before four of these alternatives can be used:

- Natural gas fuel does not yet have regulatory approval for use on U.S. passenger ferries
- The electric drive is not cost-effective for all sizes and speeds of vessels
- Battery electric also requires additional research and development before it is small enough and powerful enough to work for water transit

Figure 21

Alternative Fuels & New Technologies Study 39 Components

Diesel Engine Modification (Internal & External)	Fuel Alternatives	Alternative Propulsion Systems
Injection-Timing Retard	Bio-Diesel	Battery Electric
Engine Gas Re-circulation	Compressed Natural Gas	Flywheel Generator
Thermal Barrier	Liquid Natural Gas	ICE Generator Electric
Increased Fuel-Injection Pressure	Liquid Propane Gas	Fuel Cell Electric/Fischer-Tropsch
Fuel Injector Modifications	Diesel Additives	Fuel Cell Electric/Gasoline
Electronically Controlled Fuel System	Diesel & Water Mixtures	Fuel Cell Electric/Hydrogen
Water Injection	Diesel with Water Injection	Fuel Cell Electric/Methanol
Particulate Trap (PT)	Dual Fuel (Diesel/Natural Gas)	Fuel Cell Electric/Natural Gas
Selective Catalytic Reduction (SCR)	Fisher-Tropsch	Fuel Cell Electric/Diesel
Oxidation Catalyst	Methanol	Gas Turbine/Diesel
Nitrogen Oxide (NOx) Absorption Catalysts	Ethanol	Hybrid Sail-Photovoltaic-Battery-Generator
Humidification Air Intake System	Hydrogen	Photovoltaic Electric
Non-Thermal Plasma Arc	Ultra-Low Sulfur Diesel	Sail

Figure 22

Propulsion Alternatives That Meet CARB's Suggested Emissions Standards

ENGINE	FUEL	DRIVE
Diesel w/SCR	Diesel	Mechanical
Diesel w/SCR	Natural Gas	Mechanical
Gas Turbine	Natural Gas	Mechanical
Gas Turbine w/SCR	Diesel	Electric
Battery Electric	—	—

Source: Authority New Technologies and Alternative Fuels Study

Work has begun to overcome those technology challenges. The research and development program's initial project is leveraging a $100,000 federal grant to begin the design work needed to deploy fuel-cell technology as rapidly as possible. In addition to this development of a small fuel cell-battery-electric vessel for Treasure Island service, the Authority will pursue funding to design and build a second experimental vessel testing hybrid diesel/electric technology to serve as a bridge between diesels and the fuel-cell future.

Vessel Design

These aggressive emissions standards not only effect propulsion systems — they have a significant effect on vessel designs as well. Existing passenger-ferries cannot support the required emission-control systems, but the Authority has developed cost-effective designs that will.

For the first ten years, the Authority recommends building two vessel sizes that meet Coast Guard regulations, and may consider applying International Maritime Organization (IMO) regulations where applicable. These vessels will meet the requirements of both the shorter- and longer-distance routes:

- 149-passenger/25 knot for the shorter routes
- 300–350 passenger/30–35 knot for the longer routes

The Draft Vessel Request for Proposals (RFP) in the Appendix sets environmental impact goals that the designers must meet — such as emissions, noise and wake impacts — and allows them the freedom to create a successful design. It also provides financial incentives for

beating the standards, and levies financial penalties for failing performance commitments. The key Owner's Requirements address:

- emissions
- passenger capacity
- dock interface
- wake
- service speed
- passenger access

Design Specifications and Rationale

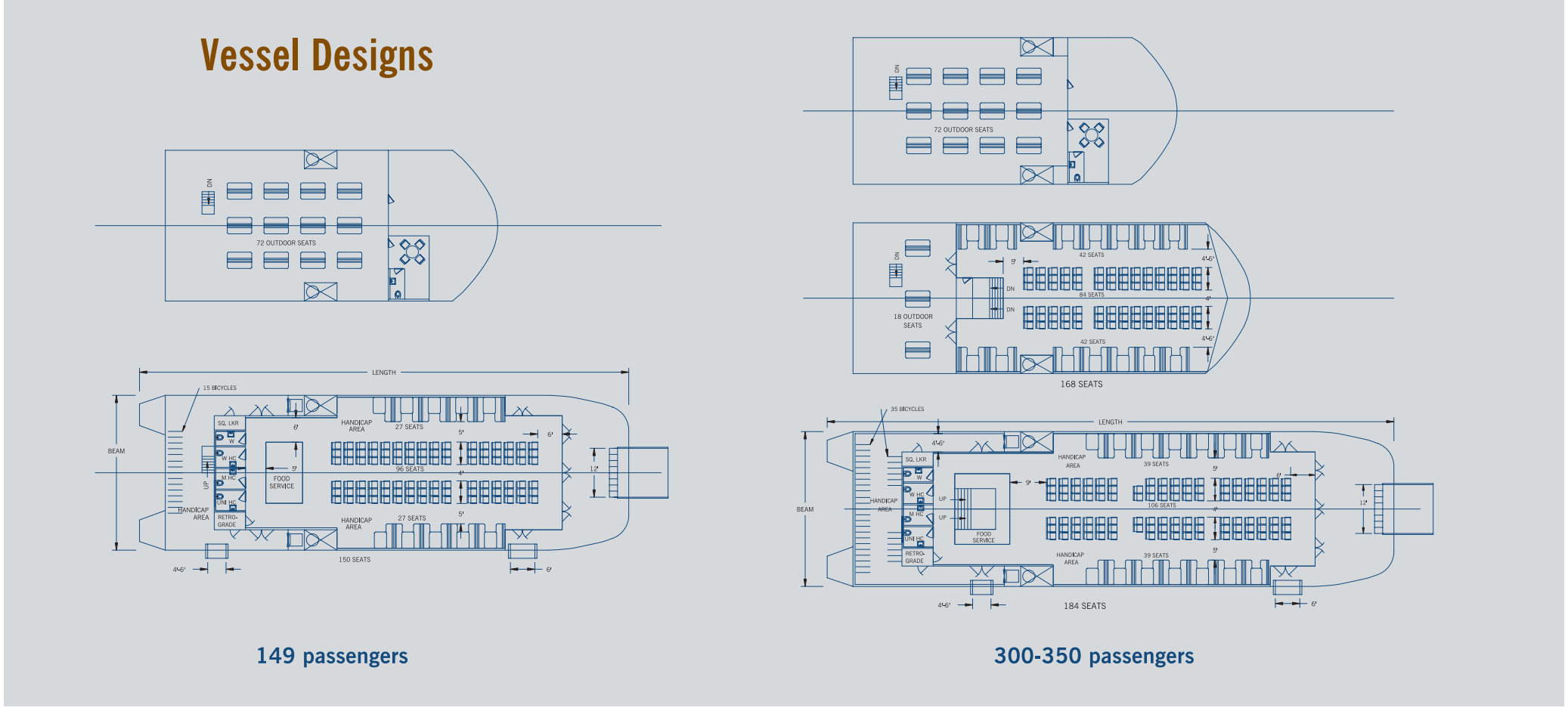
The bulk of the new vessels' design requirements are detailed in applicable rules and regulations by the Coast Guard, the American Bureau of Shipping and the IMO. The design requirements not spelled out by those bodies include:

- The aforementioned emissions restrictions
- Passenger access that meets the standards of the ADA
- Wake-impact limits the Authority is imposing
- Dock interface compatibility with existing and new terminals

To fulfill the mission of attracting drivers and getting cars off congested roads, these vessels must help make the water-transit system run as efficiently as possible.

Rapid loading and unloading can reduce total trip time by up to ten minutes — a significant time reduction to time-sensitive travelers on a trip of 30 minutes or less. After extensively studying a number of methods used by water transit around the world, the Authority selected the best practices for Bay Area water transit, where currently only side-loading vessels are used.

Figure 23



Source: Authority Vessel Performance Specs & Draft RFP

For example, that study of other ferry systems identified advantages and shortcomings of ferries that load through the bow compared to those that load through doors on the side. Bow-loading operations allow ferries to tie up quickly and unload passengers with a minimum of bottlenecks. Side-loading operations allow bike and pedestrian passengers to load and unload without disruption to each other and to operate with the existing Bay Area passenger ferries and terminals.

To capture the advantages of both, there are design specifications for vessels and terminals to accommodate both side-loading and bow-loading operations. This flexibility will allow new vessels to serve both new and existing terminals, and to handle passenger flow in a variety of ways.

Vessel Acquisition Plan

New boats will be acquired using standard procurement procedures outlined by state and federal regulations. It is important that issues beyond the initial purchase cost be considered, such as emissions, safety, wake, operating cost, maintainability, transit-cycle times and life-cycle cost.

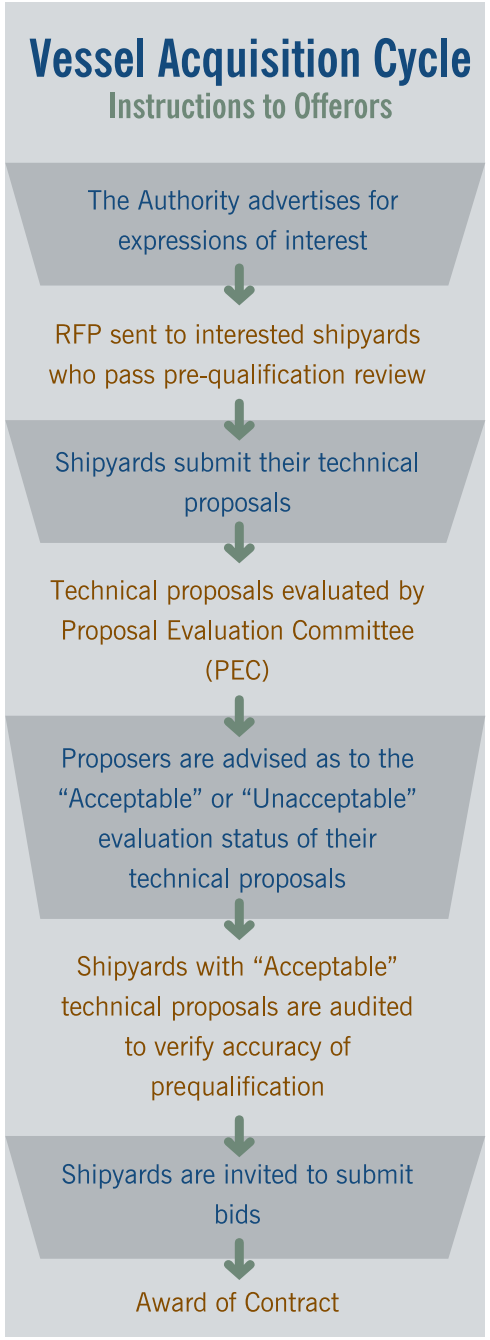
Thus, the boat with the best value may not turn out to be the least-expensive to buy, but rather the one with the lowest emissions or the fastest passenger loading and unloading times that is also competitively priced.

Federal law requires that U.S. flag passenger ferries be built in the United States. Existing U.S. shipyards that are capable of building boats were surveyed to the recommended standards and 11 were found to possess the following necessary capabilities:

- A management team with experience leading the manufacturing operations for high-speed aluminum or composite catamaran and monohull vessels capable of speeds of 25 knots or greater
- A technical team, either in-house or with a close subcontractor relationship, with the capability to design and production-engineer light aluminum or composite vessels 80 feet or longer
- An efficient production facility and organization capable of manufacturing and constructing the vessel designs as proven by competitive pricing and delivery schedules in the high-speed ferry boat market
- Demonstrable financial strength with reasonable ability to obtain bonding
- The ability to build a production series of ferries at a competitive price with relatively short times between deliveries

Currently, there is no California builder that meets all these requirements, but the Authority will continue to monitor the industry and ensure that all qualified builders are able to compete for these contracts.

Figure 24



Source: Authority Vessel Performance Specs & Draft RFP

Vessel Maintenance

This study identified two major points: several levels of maintenance facilities are needed, and very little maintenance can be performed at passenger terminals.

Therefore, this plan includes funds for building overnight layover berths. The size and extent of these facilities ultimately depends upon the size of the water-transit system, the number of boats operating in it and the number of operators.

The Authority recommends studying the possibility of establishing a shipyard facility capable of any level of maintenance, including dry-docking and re-engining — configured to service about 75 percent of the fleet, with the remainder going to other shipyards. This strategy, to be implemented when the water-transit fleet reaches the appropriate size, would lessen the dependence on outside contractors, reduce the impact of low-demand periods, and would justify such a facility that is tailored to efficiently service the latest technology vessels. There also would be efficiencies of scale for the overnight lay berths and stationary maintenance shops.

With the planned increase in the number of vessels to be serviced, however, there likely would be a market for increased repair capability in the Bay Area.

There are a number of repair alternatives worth studying, such as a floating dry dock or marine railway capable of hauling boats onto Mare Island, roving repair trucks and a maintenance barge. The former naval shipyard at Hunters Point may also be suitable for ferry maintenance.

In 23 years, ferries have been utilized six times in the Bay Area to replace other transportation links — sometimes for a few hours or days, and sometimes for a few months.

Ferries have a history in the Bay Area and throughout the world of assisting with emergency transportation following natural or man-made disasters.

6.01 What is the disaster response plan?

Water transit not only has a responsibility to be safe and secure in its daily operations, but also to provide vital transportation support in response to a natural or man-made disaster.

Implementation of the Authority's plan to expand Bay Area water-transit will significantly increase the region's emergency response capacity. County emergency services officials point out that the 31 proposed new bow- and side-loading ferries and eight new terminals will greatly enhance the ability of first-responder emergency personnel and equipment to reach disaster sites, as well as evacuate civilians and restore regional mobility.

Additionally, after consultation with MTC, the Coast Guard and others, it is clear that the WTA can play a valuable role in regional emergency-response planning by coordinating the maritime portion of the Bay Area Trans Response Plan — the comprehensive multi-modal transportation response to a Bay Area regional emergency.

Ferries have a history in the Bay Area and throughout the world of assisting with emergency transportation following natural or man-made disasters. Experience shows that ferries' flexibility and size are enormously valuable for moving large passenger loads efficiently. The most notable recent examples are the role ferries played following the 1989 Loma Prieta Earthquake and the 9/11 disaster in New York.

For years, Bay Area disaster planning has focused on earthquakes and the likely road closures that result. A recent ABAG study showed how extensive travel disruptions can be throughout the Bay Area. (See Figures 25 and 26, pp. 44-45.)

While this investment will reduce the probability of damage in the future, it cannot eliminate the potential for disruption of fixed transportation links. The Authority recognizes the need to move people and goods about the Bay Area until disruptions can be alleviated, as well as the potential immediate need to move emergency personnel. The Bay Area, New York and the Istanbul-Izmit region of Turkey all have witnessed catastrophic events in which ferries were an essential element of immediate and short-term response.

The Bay Area

The geography of the Bay Area, with population centers clustered near the Bay, makes water transit a natural component of its transportation system. Water transit was the only way to cross the Bay before the completion of the first bridges in the late 1930s. The gradual re-establishment of ferry service and additional docking facilities for those routes provide a built-in flexibility that is lacking with bridges and BART.

In 23 years, ferries have been utilized six times in the Bay Area to replace other transportation links — sometimes for a few hours or days, and sometimes for a few months. What has been seen repeatedly is that some level of redundancy in our transportation system is essential. The extra choice offered by water transit provides an alternative to the automobile during normal times and provides a critical contingency when disaster strikes.

Bay Area experience with sudden increases in ferry use include:

- 1979 BART transbay tube fire
- 1982 Marin County mudslides that blocked access to the Golden Gate Bridge
- 1989 Loma Prieta Earthquake that blocked access to and damaged the Bay Bridge
- 1997 BART strike
- 1998 power outage that shut down BART
- 2001 terrorism warnings for the Bay and Golden Gate bridges

As Bay Area water transit has expanded, the capacity to respond to emergencies has increased as well. There was no East Bay-to-San Francisco ferry service when a January 1979 fire shut the BART tube for 12 weeks, but excursion vessels were used to establish service from Oakland and Berkeley to San Francisco. In 1982, rain-induced mudslides on Waldo Grade closed the Golden Gate Bridge approach for a day-and-a-half, and the three Larkspur ferries to and from San Francisco carried 12,200 passengers in one day — more than triple the normal ridership.

When the Loma Prieta Earthquake damaged the Bay Bridge and BART temporarily shut down the transbay tube until it could be thoroughly inspected, excursion vessels and dining yachts were the only way to transport workers from San Francisco back to the East Bay for a few hours. Within two days, water-transit service using excursion vessels was established between Oakland and San Francisco to supplement BART. Within a week, temporary routes were established from Berkeley and Richmond, and within two weeks, two additional high-speed vessels were borrowed from Washington State and used to supplement the single-vessel Vallejo to San Francisco ferry service that was operating at that time.

Most recently, the terrorist attacks on New York caused many people to seek the safest way to leave the San Francisco Financial District, and both the GGBH&TD and the Alameda/Oakland ferries ran extra unscheduled service to meet the demand. Extra service also was operated in November 2001 when Governor Davis and the FBI issued threat assessments describing potential terrorist action against the toll bridges. For several days, GGR&HTD water-transit service carried 50 percent more riders than normal.

After the Loma Prieta Earthquake, daily ferry ridership tripled to 20,000 trips a day once the expanded network was in place. Current daily water-transit ridership is now approaching 15,000 trips, and the emergency capacity today could handle many more trips than it did after the earthquake.

In 1989, there were six vessels in the Bay Area used in ferry service — today there are 13. The hourly seat capacity on water-transit routes was 2,500 people in 1989 — today it is more than 5,000. Adding the excursion and dining vessels that could be used effectively on shorter crossings (San Francisco to Oakland or San Francisco to Sausalito), Bay Area water-transit passenger capacity increases from 8,700 people per hour in 1989 to 14,500 in 2002.

New York

In recent years, the private operator New York Waterway developed trans-Hudson water-transit service to augment the PATH train that connects New Jersey and lower Manhattan via two routes underneath New York Harbor, including one with a terminal at the World Trade Center.

The terrorist attacks on the World Trade Center also destroyed the PATH system terminal beneath the complex. Water transit was used to evacuate many people from lower Manhattan to New Jersey, and to bring emergency personnel to the disaster site. The Coast Guard estimates that approximately one million people were moved on 9/11 using ferries and a variety of other vessels.

New York Waterway alone evacuated 160,000 people to New Jersey on 9/11. Normal daily ridership on the fleet of 23 vessels was 34,000 a day. Since the terrorist attacks on the World Trade Center, the system has chartered 11 additional vessels, including whale-watching boats, and is carrying 60,000 passengers a day.

Because the PATH train to lower Manhattan will be out of service for two to three years, this water-transit ridership is expected to continue growing and new vessels have been ordered to replace the chartered vessels.

Other New York ferry operators also have increased service and there are plans to establish additional terminals in lower Manhattan to accommodate the increased service. The New York Waterway terminal at the World Financial Center was closed for several months, and service was diverted to Piers 11 and 16. All New York ferry terminals are now operating again, and the Port Authority has plans to invest $133 million in the next five years to upgrade existing terminals or build new ones. (See "Launching a Flotilla of Ferry Terminals," The New York Times, April 7, 2002, in *The Data [Appendix].*)

Istanbul

In August 1999, an earthquake measuring 7.5 on the Richter scale struck the Istanbul region, leveling more than 100,000 buildings and killing approximately 18,000 people. While bridges across the Bosporus were not affected, access roadways were and the ferry operator Istanbul Deniz Otobusleri (IDO) used its four fast car and truck catamaran ferries (part of a fleet of 26 vessels developed in the past 15 years) to provide rapid relief and rescue services across the Sea of Marmara.

Benefits of Expanded Ferry Network

Recent experience shows that emergency ferry service provides immediate response capability, and operators can place additional vessels in service even before official procedures are formally implemented by MTC, Caltrans and the Governor's Office of Emergency Services. While growth of Bay Area water transit to date has expanded the capacity to carry extra passengers on an emergency basis, the capacity is still well below potential need.

For example, closure of the Golden Gate Bridge is projected to boost peak hour demand to 10,000 passengers between Marin and San Francisco according to the 1999 MTC Regional Ferry Plan Update. That is about three times the capacity of

Figure 25

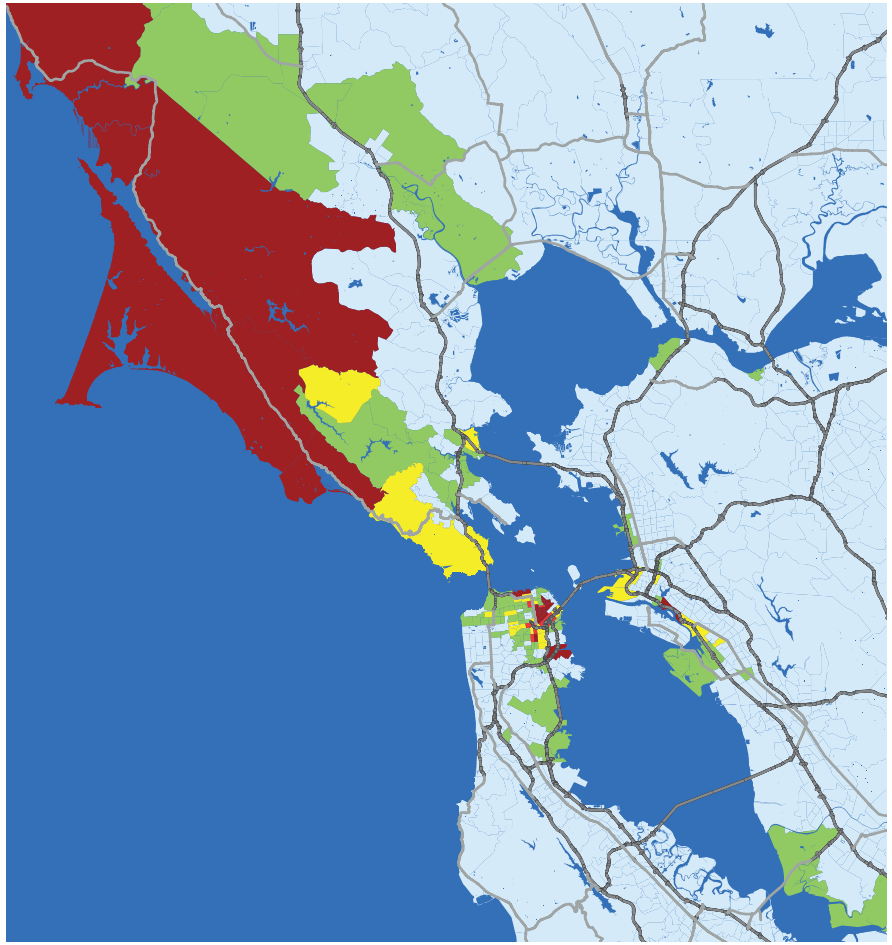
ROAD CLOSURES

North Golden Gate San Andreas Earthquake
Magnitude 7.5

Number of Closures by Census Tract

- Less than 1
- 1 to 2
- 2 to 3
- 3 to 4
- Over 4

This road closure map is not intended to be site-specific. Rather, it depicts the general risk within neighborhoods and the relative risk from community to community. Use this map to estimate the level of disruption of the transportation system in a neighborhood, not to count road closures. Severity of disruption ranges from light blue, indicating insignificant disruption, to brown, indicating major disruption.



Source: ABAG

the combined existing Sausalito, Tiburon and Larkspur water-transit services.

The recommended service level in this plan would lower the gap to 50 percent of the emergency demand level. Then, by using excursion vessels and shifting capacity from other water-transit routes — if facilities were compatible — the emergency demand level could be met.

Because few vessels have the speed to operate efficiently on the 11 nautical-mile-crossing from San Francisco to Larkspur, an emergency plan for the Golden Gate corridor should emphasize service on the shorter crossings to Sausalito and Tiburon. Likewise, emergency service between San Francisco and the East Bay should focus on service to Oakland, Alameda and Berkeley. These cities provide the shortest crossings, and thus the most efficient use of ferries.

For the Peninsula, Oyster Point in South San Francisco is well situated to provide emergency access in case highway travel between San Mateo County and San Francisco is disrupted. The proposed ferry terminal could support the operation of San Francisco International Airport by transporting both passengers and airport workers who otherwise would be unable to reach the airport if the bridges and road approaches are damaged.

Next Steps

The Regional Ferry Contingency Plan, part of the Bay Area Trans Response Plan, has not been updated since 1996. During the past seven years, much has changed around the Bay in terms of available vessels and other emergency response assets, as well as the location of significant job centers where likely emergency evacuations would be needed. The WTA has consulted with MTC, who currently is responsible for the Regional Ferry Contingency Plan, and there is agreement that the WTA should undertake the lead role in this important effort.

The Regional Ferry Contingency Plan must accurately assess current emergency-response assets, develop viable contingencies for a variety of possible emergencies and disasters, and create a workable business resumption plan for the local maritime community, including ferry operators, excursion operators, water taxi, tug and tow operators and commercial fishermen. Then, this plan must be tested and practiced through simulations of the various emergency and disaster scenarios to make sure it works.

The update has begun. Following discussions with MTC staff, the WTA convened an initial meeting on March 5, 2003, where the Coast Guard, ferry operators and excursion vessel operators discussed the next steps required to update the Regional Ferry Contingency Plan, such as:

- Identifying necessary alternative ferry landing sites for first-responder access and civilian evacuation
- Creating a detailed, up-to-date inventory of available resources, including barges, docks, floats, fueling facilities and marine construction contractors
- Developing maritime emergency response plans to determine the logical sequence of maritime response based on various disaster scenarios
- Determining and communicating the levels of authority throughout the Bay Area Trans Response Plan

"We have examined the WTA's plan for Contra Costa County and we believe that the new ferries and terminals proposed will be critical emergency-response assets should there be a natural or manmade disaster that closes key roads or bridges."

Warren E. Rupf
Sheriff, Contra Costa County

Figure 26

Distribution of Road Closures

County	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	Total
Ground Shaking	18	5	8	0	7	4	3	0	10	56
Faulting	0	0	13	0	0	0	0	0	16	29
Liquefaction	5	1	9	0	5	1	1	1	5	27
Water Pipelines	2	1	5	0	4	1	1	0	5	19
Gas Pipelines	0	0	1	0	1	0	0	0	1	4
Landslides	4	5	15	0	6	7	2	1	15	54
Building Damage	6	1	4	0	230	1	0	0	1	244
Hazmat Incident	0	0	1	0	0	0	0	0	0	3
Structural Damage	8	2	4	0	3	2	1	0	5	26
Miscellaneous	8	3	11	0	48	3	1	1	11	85
TOTAL	52	19	69	1	305	20	9	4	69	546

Source: ABAG

- Designating the Authority as the public entity responsible for Master Agreements with private maritime operators in order to ensure they are financially reimbursed for responding to emergencies, and
- Seeking and advocating for funding from homeland security or transportation sources for planning, training and investing in vessels, facilities and equipment.

Over the next several months, the WTA will continue the work necessary to update the Regional Ferry Contingency Plan, with the participation of MTC, the Coast Guard, the U.S. Department of Transportation, the Coastal Region Office of Emergency Services (OES), the National Guard, California Highway Patrol, the Ports of Alameda, Oakland and San Francisco, and the aforementioned maritime operators.

Once the Regional Ferry Contingency Plan is complete, the WTA will serve as coordinator of the ferry portion of the regional Trans Response Plan, working with OES, MTC, Caltrans and others to test the plan through simulation exercises and implement the plan in response to a natural or manmade disaster.

This environmental study is a first step. As routes and terminals are advanced for further consideration, they will be subjected to site-specific studies and evaluations.

This plan was built on two ironclad principles: taking a leadership role in protecting the Bay, and developing clean marine technology. Both principles carry a significant financial cost, and this water-transit plan recognizes and accounts for that cost.

7.01 What are the environmental impacts?

San Francisco Bay is the largest estuary along the Pacific Coast of North and South America. From the Sacramento River Delta to the Santa Clara County marshes, the 548-square-mile Bay is generally less than 18-feet deep, but plunges to more than 350-feet deep at the Golden Gate.

There are about 1,000 miles of shoreline composed of marshes, wetlands and tidal basins, as well as cities and towns built on a century of industry and commerce.

Whales, seals, fish, birds, marine mammals and plants share the Bay with sailors, swimmers, power boaters, windsurfers, kayakers, oil tankers, container ships, fishing boats, cruise ships, military vessels, other commercial craft and passenger ferries.

This complex co-existence of recreation and commerce, humans and other animal species, development and open space, continues under the watchful eyes of regulators, environmental activists, elected officials and all others who recognize that San Francisco Bay is a natural resource and treasure that must be protected.

This plan proposes adding as many as 31 more passenger ferries over the next ten years on the 548-square-mile Bay — and as detailed in *The Boats* chapter (p. 36), making them as clean as possible while developing zero-emissions technology as quickly as possible.

Furthermore, this plan is designed to ensure that the impact of vessels and terminals on the Bay and its habitat are minimized.

But before one new route is created, one new boat is launched on that route or one new terminal is built, extensive site-specific environmental studies must be done to evaluate the potential impacts.

The Final Environmental Impact Report (FEIR) accompanying this plan begins that process. This EIR is programmatic, as directed by the enabling legislation that created the Authority, and it meets the requirements of the California Environmental Quality Act (CEQA).

Rather than study each proposed route or terminal individually and in-depth, this Program FEIR focuses on the impacts and mitigation relevant to the overall program.

CEQA defines a Program FEIR as “an FEIR which may be prepared on a series of actions that can be characterized as one large project, and are related either:

- geographically;
- as a logical part in the chain of contemplated actions;
- in connection with issuance of rules, regulations, plans or other general criteria to govern the conduct of a continuing program; or
- as individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effect which can be mitigated in similar ways.”

Thus, this environmental study is a first-step. As routes or terminals are advanced for further consideration, they will be subjected to site-specific studies and evaluations.

The Program FEIR accompanying this plan evaluated the routes proposed by the Authority for implementation within the first ten years.

Fourteen environmental studies were conducted in the areas of:

- Dredging
- Wake Analysis
- Water Resources
- Cultural Resources
- Noise
- Transportation
- Growth Inducement
- Navigation
- Biology
- Air Quality
- Land Use
- Aesthetics
- Geology
- Energy

The detailed results of those studies are in the Program FEIR. The following is an overview of the Program FEIR's findings about the areas of greatest concern, as expressed in the Program FEIR scoping comments and other feedback during the past 18 months. These topics include:

- Whales
- Dredging
- Plants and Wetlands
- Seals and Sea Lions
- Wake Analysis
- Air Quality
- Birds

Whales

Gray whale sightings have increased over the past several years as the species returns to historic levels, with nearly 50 sightings reported in San Francisco Bay in spring 2000.

According to the National Marine Fisheries Service (NMFS), there have been no documented collisions between gray whales and any type of vessel in San Francisco Bay. The Program FEIR identifies that with an expanded water-transit system, there is the potential, albeit small, of a ferry striking a whale. Existing practices combined with some operational and technical improvements should significantly reduce the possibility of a whale strike.

Most whale sightings are by the captains and crew on ships, including passenger ferries, who make it standard practice to maintain close watch for whales.

Information-sharing is an important step in avoiding vessel collisions with whales. When ship captains see a whale, they radio the Coast Guard who passes along the location to all other ships in the Bay. Ship captains increase vigilance when they receive a whale-sighting report, presuming other whales may be in the Bay. If a whale is sighted, NMFS guidelines require maintaining a distance of at least 100 yards.

The Authority will require that all passenger ferries are equipped with sonar to further ensure that collisions with whales do not occur.

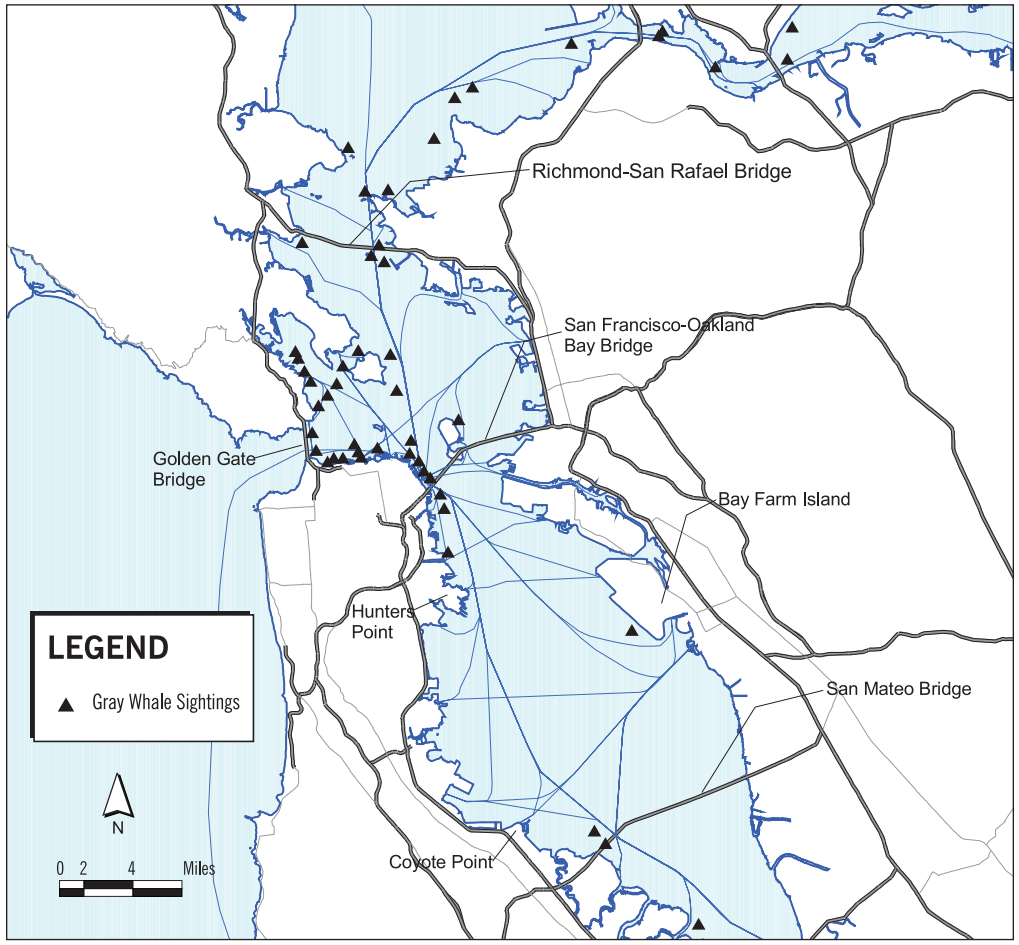
Dredging

Nearly eight million cubic yards of sediment is dredged each year from the bottom of San Francisco Bay. The Long Term Management Strategy (LTMS) for Bay dredging calls for reducing volume and increasing beneficial reuse of dredged materials.

The Program FEIR study found that expanded water transit would require construction and maintenance dredging at some locations. There are several routes that were studied that have very high dredging requirements. However, these routes are not now recommended for implementation.

Figure 27

Sightings of Gray Whales in San Francisco Bay (Spring 2000)



Source: Authority Program EIR

Therefore, with mitigations, the total dredging for the recommended routes would be less than 0.08 percent of the long-term average annual volumes projected in the LTMS.

Plants and Wetlands

Dredging can impact wetlands as well as plants, which are indicator species of potentially serious environmental problems. Protected species such as eelgrass, and wetland areas subject to special protection are located throughout San Francisco Bay.

The Program FEIR found that eelgrass beds are near the entrance to the potential Richmond terminal. Berkeley, Martinez and Port Sonoma all have nearby mudflat habitat.

Site-specific environmental studies of each proposed route and terminal location must be conducted to fully evaluate impacts on these habitats.

Seals and Sea Lions

There are six Harbor Seal feeding areas in San Francisco Bay, and nine "haul-out" sites where seals rest out of the water. There also are two California Sea Lion haul-out sites.

Two seal feeding areas — Castro Rocks at Angel Island and the southern tip of Yerba Buena Island — are near existing water-transit routes. A third, off Coyote Point, is near a proposed route.

The NMFS guidelines suggest that ships should stay more than 150 feet away from seals and sea lions that are in the water, and more than 100 feet away from haul-out sites.

However, research shows that seals and sea lions are flushed by larger vessels, such as ferries, at greater distances. The EIR study recommends that routes be more than 900 feet away from the Castro Rocks and Yerba Buena Island feeding areas. That recommendation will be followed and applied to Coyote Point and any other proposed route location.

Wake Analysis

Wake impact affects more than just animals. Wake can also cause shoreline erosion and other property damage if not properly mitigated.

The most extensive San Francisco Bay wake study in history was performed for the Program FEIR. Measurements were taken at various locations around the Bay, and "hindcasting" was used to take extensive wind data and map the natural waves generated by the Bay Area's gusty winds.

In most places where current and proposed routes are located, both existing and new ferries generate waves that fall within the range of wind-generated waves.

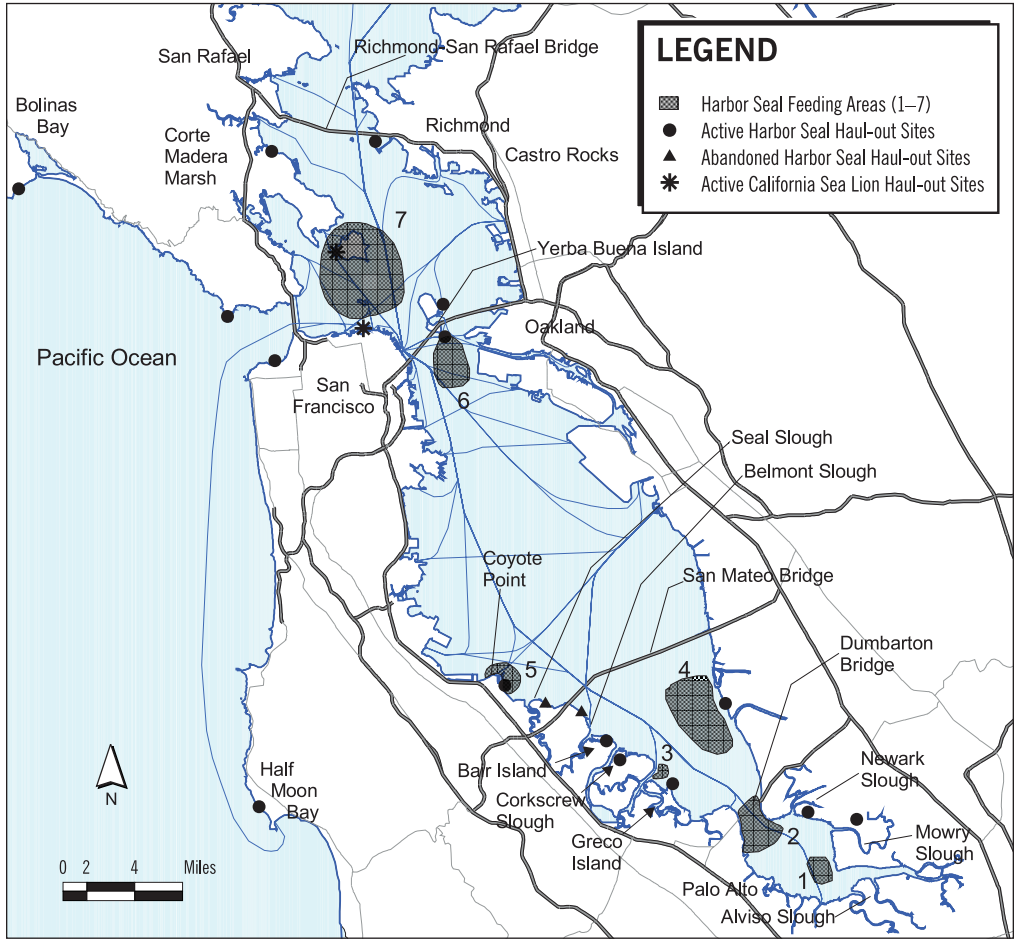
In "soft" shoreline areas that are currently protected from wind, the ferry-generated waves could be more significant. However, the significance can be reduced with effective mitigations, such as speed reduction or "route bending," to push the wave energy away from the shore — which has proven successful in Scandinavia.

In addition, wave impacts are generally less significant if ferries can maintain an adequate distance from the shoreline. Where ferries approach terminals or the shoreline, additional study will be required to quantify site-specific bathometry and various operational requirements of the ferries.

The bottom line is that no new terminal can and will be constructed, and no new route implemented if further environmental study shows wake-generated problems cannot be mitigated.

Figure 28

Harbor Seal and California Sea Lion Haul-Out Sites and Feeding Areas



Source: Authority Program EIR

Air Quality

Because the Authority is fully committed to being the leader in clean marine technology, the Program FEIR critically examined the net impact of water-transit service on Bay Area air quality. Such critical examination will continue with future environmental studies, including the site-specific EIRs required before new terminals can be built.

Furthermore, the Bay Area Air Quality Management District (BAAQMD) conducted an independent air quality analysis of this Plan and concluded that this proposed water-transit system will result in fewer emissions than the current passenger ferries on the Bay.

Additionally, BAAQMD expressed concerns about localized air-quality impacts around the San Francisco Ferry Terminal that the Authority, the Port of San Francisco and the existing ferry operators will take into account as planning continues.

The BAAQMD analysis is included in the Program FEIR.

The studies to date show that this plan eliminates more than 130,000 daily vehicle miles from Bay Area roads. This travel shift from vehicles to water-transit powered by the recommended cleaner engines produces a net decrease in the most harmful emissions of ozone-depleting nitrogen oxides (NOx) and cancer-causing particulate matter (PM).

Additionally, through research the Authority is now conducting on innovative technologies including fuel cells, ferry-emission technology during the next 20 years should yield even more significant reductions in pollutant levels. The Authority will also explore the use of low-emissions technology for vehicles it operates or has jurisdiction over.

By 2025, this plan will cause a net reduction in the most harmful NOx and PM pollutants, and an increase of other less harmful emissions totaling less than 0.3 percent of Bay Area pollution.

There are a number of critical questions that remain about environmental impacts to specific terminal sites. However, through future studies and implementation of the mitigations included in the Program EIR, water-transit expansion on San Francisco Bay can be complementary to the existing Bay environment while effectively serving thousands of Bay Area travelers.

Birds

San Francisco Bay is the most important habitat for migrating birds along the Pacific Flyway. Roughly 120 waterbird species are in the Bay, most of which are waterfowl, gulls, terns, sandpipers and phalaropes (small shorebirds that swim).

The Program FEIR describes the potential impacts of enhanced water-transit on each category of bird. The Program FEIR scoping hearings and ongoing dialogue with regulators and environmental groups reveal that the California Clapper Rail, a state and federal endangered species, was of particular concern, along with rafting birds in general.

Rafting Birds

Rafting birds, such as ducks and gulls, float on the water to rest. During the Program FEIR scoping hearings, a number of organizations expressed concern about frequent vessel traffic — whether from passengers ferries or any other ships and boats — causing more collisions with these birds or making them overly fatigued due to excessive "collision avoidance."

The Authority consulted with the NMFS, Audubon groups and others to develop studies that could effectively evaluate this issue, particularly the expressed concern that "collision avoidance fatigue" could cause a decrease in reproduction and thus possibly threaten one or more species.

After extensive consultation, experts determined that this impact could not be effectively evaluated within the short time frame of the Program FEIR. Additional site-specific studies will be needed.

The expanded ferry system will affect only a very small percentage of the overall surface area of the Bay outside of the existing shipping lanes, which are not currently used by rafting birds. However, through observation, anecdotal evidence and Geographic Information System (GIS) computer mapping evaluation, the Program FEIR was able to identify that if there was an impact to rafting birds, it would generally be limited to routes in the extreme North and South bays.

Ongoing environmental study connected to this plan will continue to examine these issues before any new routes are implemented.

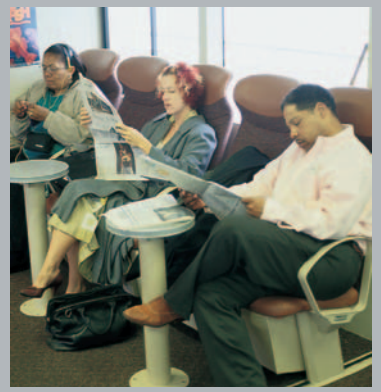
California Clapper Rail

Clapper Rails are year-round residents of the Bay, living in salt and tidal marshlands. The issue with these birds is whether wake from ferries could swamp their nests, destroy eggs or kill chicks.

Studies to date show that Clapper Rails are clever birds that generally build their nests far enough away from the shoreline so that large waves, which ease as they travel through tidal marshes, do not affect the nests.

In most areas, waves generated by ferries do not exceed the naturally occurring wind-generated waves, so Clapper Rail nests should be unaffected by the additional wave energy. However, where ferries approach the shoreline, certain Clapper Rail nests could be impacted by wake-generated waves.

Therefore, more research is needed to accurately identify Clapper Rail nesting sites and determine if effective mitigations exist. Because site-specific environmental study is required before any new water-transit route can be implemented or any new terminal can be built, all bird impacts related to that route or site will be fully examined.



This plan uses extensive market research to evaluate how well-expanded water transit will work and learn about the people who will ride it.

This study found six factors that influence Bay Area commuters' travel choices: need for flexibility, desire to help the environment, need for time savings, sensitivity to personal travel experience, such as a need for "personal space" or quiet, insensitivity to transport costs and sensitivity to stress.

8.01 Who will ride water transit?

The boats operating in the expanded San Francisco Bay Area water-transit system must carry sizable passenger loads in order to operate cost-effectively.

Thanks to the knowledge learned from the ridership model described in *The Routes* chapter (p. 12), plus extensive market-segment research, the Authority will be able to locate and attract the passengers needed to fill the boats and make expanded water transit successful.

This plan uses extensive market research to evaluate how well-expanded water transit will work and to learn about the people who will ride it. The fundamental questions answered are:

- Where are ferry riders originating?
- Why do they choose water transit?
- How can others be drawn out of their cars and onto ferries?

Survey information was collected from more than 3,000 current water-transit riders — basic quantitative data such as where they were coming from, trip purpose and how they arrived at the terminal. In addition, data was collected from a random sample of 850 potential ferry riders living throughout the region, who were asked a number of questions about attitudes towards transit modes. The data from both the on-board surveys and the random-sample surveys was correlated with past MTC surveys and census data, and validated for accuracy, to give the most complete picture of both existing and future riders.

Existing Water-Transit Riders

Existing riders come primarily from areas close to ferry terminals. More than 80 percent of the riders on the longer routes (Larkspur to San Francisco and Vallejo to San Francisco) come from within 15 miles of the terminals. For shorter routes (Sausalito, Alameda, Oakland and Harbor Bay to San Francisco), the riders come primarily from within five miles of the terminal.

Overall, most current ferry riders arrive at the terminal by car. The exception is Sausalito, where the majority of riders walk, bike or ride shuttle buses. Weekday riders are primarily commuters, however a large number of mid-day, non-work trips originate from Jack London Square in Oakland.

This study found six factors that influence Bay Area commuters' travel choices:

- Need for flexibility
- Desire to help the environment
- Need for time savings, which includes the importance of reliability
- Sensitivity to personal travel experience, such as a need for "personal space" or quiet
- Insensitivity to transport costs
- Sensitivity to stress

The research also shows that existing ferry riders:

- Are usually not stressed by their commute
- Select ferries partially because of a desire to help the environment

Further analysis determined that three of these factors — environment, time and stress — can be used to identify statistically significant differences between markets of travelers. Those markets, and their differences, are described in the market segmentation chart below.

Based on this analysis and the information from on-board surveys, the ridership study found that the water-transit market is composed primarily of these three market segments:

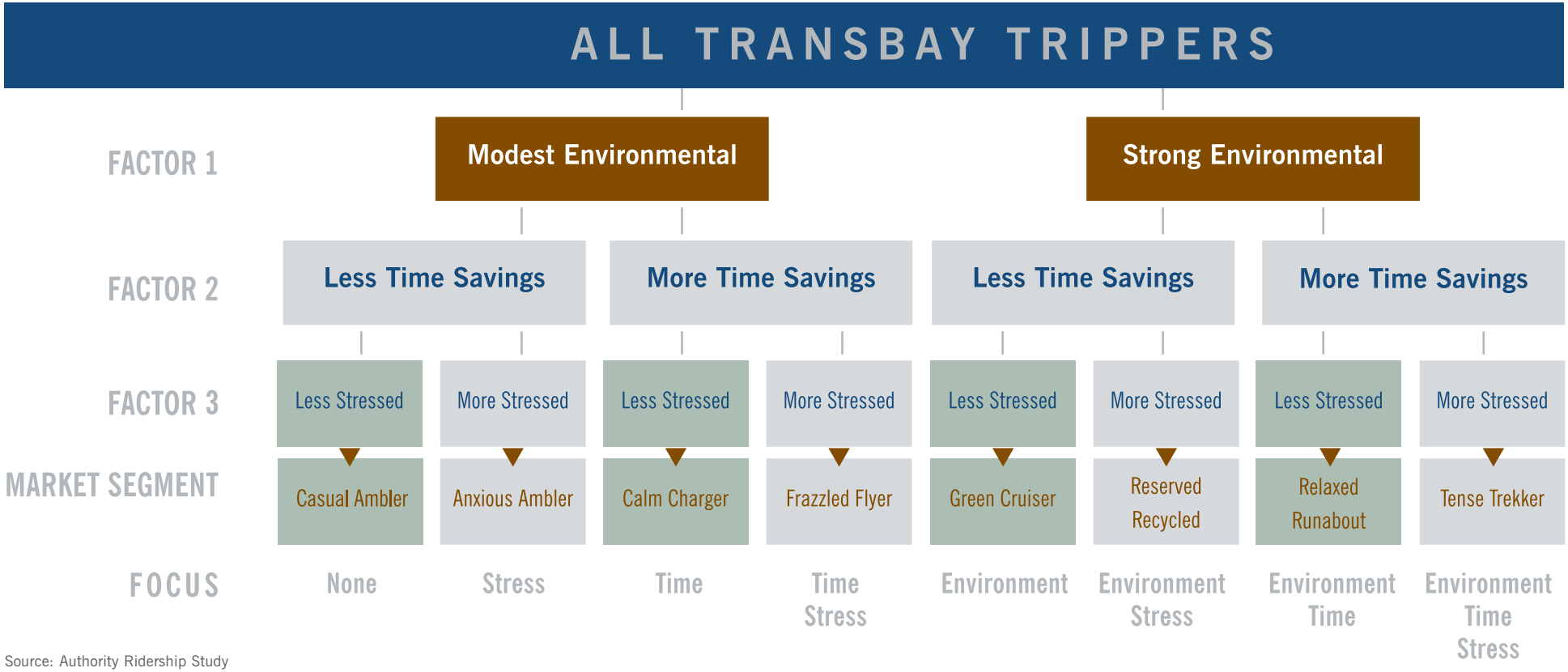
- "Anxious Amblers" who place a premium on their personal travel experience and a stress-free trip. Anxious Amblers are statistically older people, with middle incomes, no kids and only one worker per household.
- "Frazzled Flyers" who care most about their personal travel experience and a stress-free trip, but also need to arrive at their destinations as quickly as possible. Frazzled Flyers are younger people, with middle-to-high incomes. They have small families, but because of their need to save time, usually have more than two vehicles per household.
- "Reserved Recyclers" who place a premium on stress-free and environmentally friendly commutes. These travelers are usually middle-age people from small, lower-income households. Generally, there are two or more workers per household.

The five remaining market segments are:

- "Casual Amblers" who are not concerned with any of the factors. They are the oldest people surveyed, with high incomes and no children. They live alone or with one other person.
- "Calm Chargers" care most about saving time. They are younger, high income and living in households with three or more people, including one child. Calm Chargers generally own two or more vehicles and average one worker per household.

Figure 29

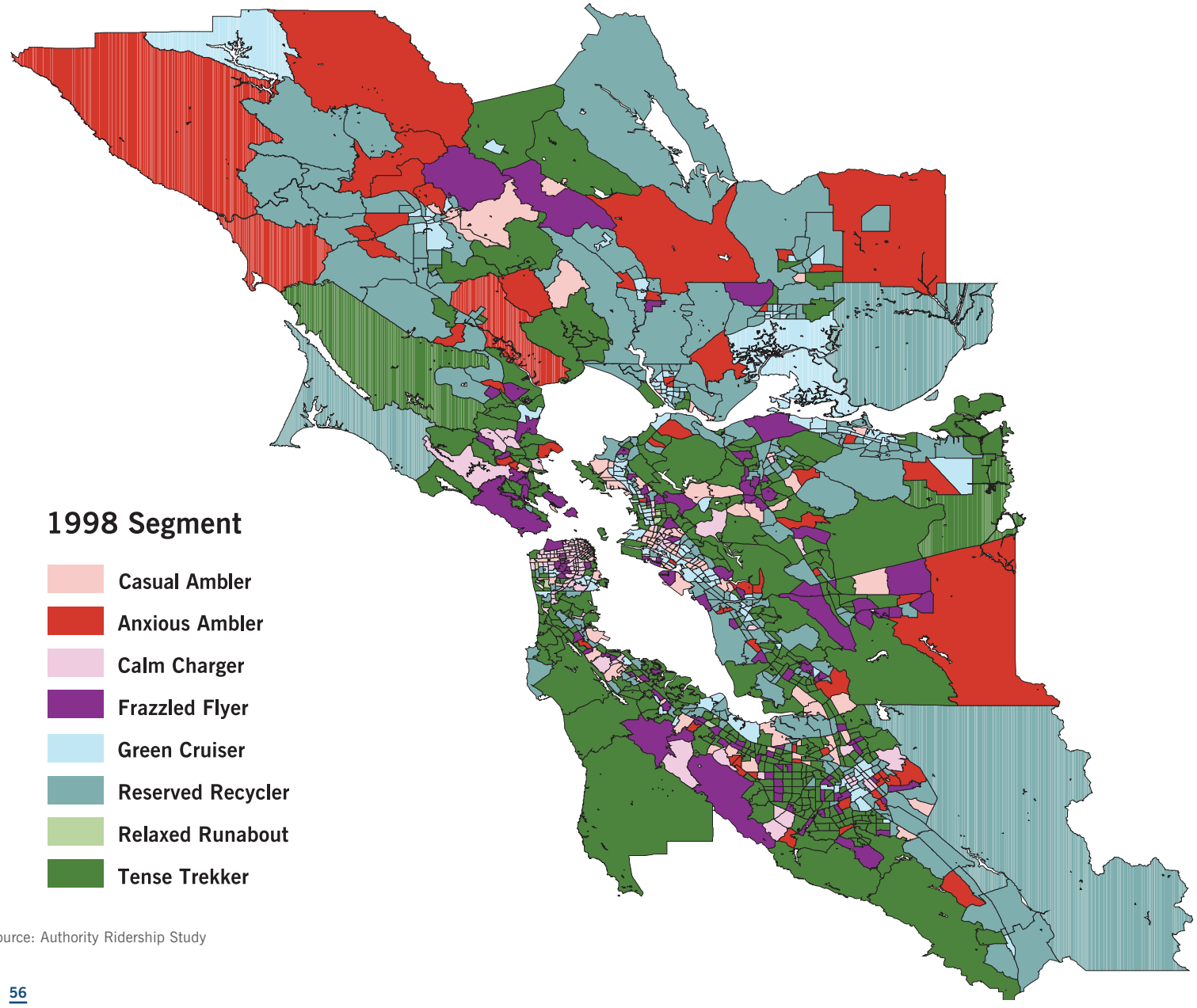
Market Segmentation



Source: Authority Ridership Study

Figure 30

1998 Market Segments for the Bay Area at Traffic Analysis Zone (TAZ) Level



Source: Authority Ridership Study

- "Green Cruisers" focus on the environment. They are high-income older people without children, generally living alone.
- "Relaxed Runabouts" place a premium on saving time and environmentally friendly commutes. They are young-to-middle-age working couples, generally have two or more children, high incomes and two or more vehicles.
- "Tense Trekkers" care about all the factors, but are most sensitive to cost. They are among the youngest market segment — generally middle-income working couples with one child and one vehicle.

The importance of this market segmentation can be seen in the maps. The study used MTC- and census-data to develop a geographical distribution of the different market segments. Using ABAG's projections of future growth, the shifts and changes in the market segments are shown between the 1998 data and the projected 2025 data. (See Figures 30 and 31.)

Future Water-Transit Riders

This geographic and psycho graphic data provides the knowledge to effectively draw more water-transit riders. By knowing the types of people most likely to ride — and keep riding — water transit, where they live and where their destinations are:

- Transit planners can optimize water-transit locations, schedules and fares, as well as good feeder connections
- Marketers can most effectively advertise water transit and brand it into a "top-of-mind" transportation option

The Authority already is using this psycho graphic data for further study of specific water-transit routes.

For example, the Authority is working with the City of South San Francisco and its business community — particularly its fast-growing biotech sector — to determine if there is viable ridership for direct ferry service between Oyster Point and the East Bay.

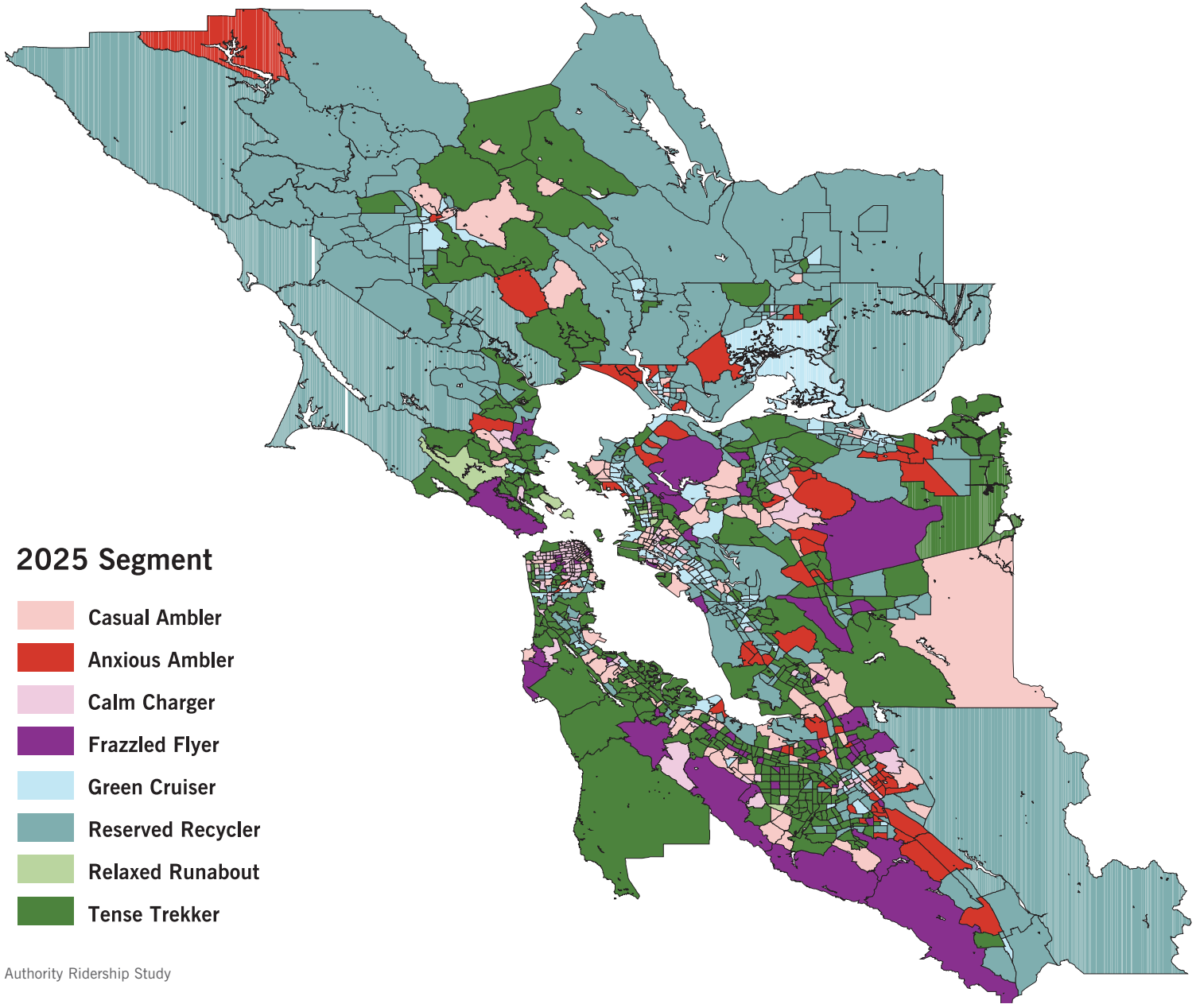
Although there is anecdotal evidence supporting demand for this route, the ridership model failed to identify it, most likely because ABAG data does not account for the rapid job growth around Oyster Point during the past four years. Therefore, the major South San Francisco employers within the likely Oyster Point catchment area will be working with the Authority to design and conduct employee surveys in early 2003.

These surveys will gather data on workers' travel patterns and preferences. That data will be combined with the market segmentation psycho graphic data and processed through the ridership model to generate a more accurate forecast of East Bay-Peninsula ferry ridership.

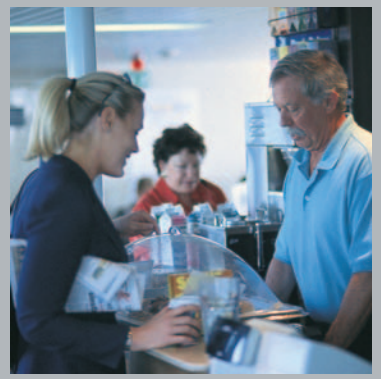
If viable ridership for that route is found, the Authority will be able to proceed with the next system-planning steps as well as launch a highly targeted, cost-effective one-to-one marketing campaign to draw those South San Francisco workers onto ferries.

Figure 31

2025 Market Segments for the Bay Area at Traffic Analysis Zone (TAZ) Level



Source: Authority Ridership Study



The Bay Area has never had a single-focus public water-transit agency. Such a dedicated agency would best ensure accelerated delivery of expanded water transit.

The cost to build and operate an environmentally responsible water-transit system is significant but affordable, particularly when considered in the context of other Bay Area congestion-reduction transit projects' costs, water transit's public support and its environmental payoffs.

9.01 How much will it cost?

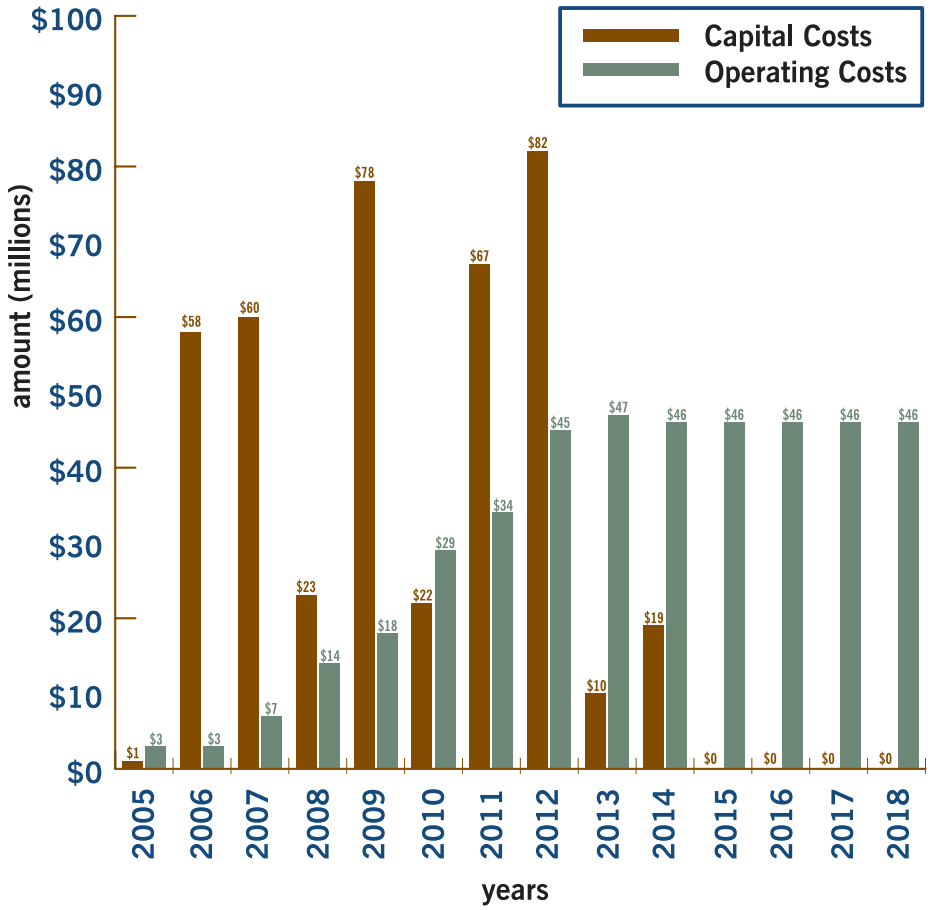
The cost to build and operate an environmentally responsible water-transit system is significant but affordable, particularly when considered in the context of other Bay Area congestion-reduction transit projects' costs, water transit's public support and its environmental payoffs.

This financial plan presents a phased approach to implement expanded water transit that will cost $646 million over ten years, including $396 million in capital costs and operating costs ranging from $3 million in year one, to $46 million in year ten. Twenty-five percent of the estimated operating costs are for improved landside connections. Operating costs also include the administration of the expanded ferry service.

The numbers speak for themselves, but some background about the assumptions and key factors for success tells the story behind the numbers.

The Bay Area has never had a single-focus public water-transit agency. Such a dedicated agency would best ensure accelerated delivery of expanded water transit. Bay Area transit funds have

Figure 32



Source: Authority Study

Figure 33

Financial Plan 2005–2014 (millions)

New Routes		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	TOTAL
Antioch/Pittsburg–Martinez–SF	Terminal	$0	$0	$0	$0	$2	$2	$18	$0	$0	$0	**$22**
	Vessels	$0	$0	$0	$0	$0	$0	$33	$0	$0	$0	**$33**
	Net Annual Operating	$0	$0	$0	$0	$0	$0	$0	$4	$4	$4	**$12**
Hercules/Rodeo–SF	Terminal	$0	$0	$0	$0	$0	$1	$1	$9	$0	$0	**$11**
	Vessels	$0	$0	$0	$0	$0	$0	$0	$22	$0	$0	**$22**
	Net Annual Operating	$0	$0	$0	$0	$0	$0	$0	$0	$3	$3	**$5**
Richmond–SF	Terminal	$0	$1	$5	$0	$0	$0	$0	$0	$0	$0	**$6**
	Vessels	$0	$0	$10	$0	$0	$0	$0	$0	$0	$0	**$10**
	Net Annual Operating	$0	$0	$0	$3	$4	$4	$4	$3	$3	$3	**$24**
Berkeley–SF–Mission Bay	Terminal	$0	$0	$1	$1	$10	$0	$0	$0	$0	$0	**$12**
	Vessels	$0	$0	$0	$0	$10	$0	$0	$0	$0	$0	**$10**
	Net Annual Operating	$0	$0	$0	$0	$0	$3	$4	$3	$3	$3	**$17**
Port Sonoma (Study)	Terminal	$0	$0	$0	$1	$0	$0	$0	$0	$0	$0	**$1**
	Vessels	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
	Net Annual Operating	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
South San Francisco–SF	Terminal	$0	$1	$5	$0	$0	$0	$0	$0	$0	$0	**$6**
	Vessels	$0	$0	$10	$0	$0	$0	$0	$0	$0	$0	**$10**
	Net Annual Operating	$0	$0	$0	$4	$3	$3	$3	$3	$3	$3	**$22**
Redwood City–SF	Terminal	$0	$0	$0	$0	$0	$0	$1	$10	$0	$0	**$11**
	Vessels	$0	$0	$0	$0	$0	$0	$0	$22	$0	$0	**$22**
	Net Annual Operating	$0	$0	$0	$0	$0	$0	$0	$0	$5	$5	**$10**
Treasure Island–SF	Terminal	$1	$10	$0	$0	$0	$0	$0	$0	$0	$0	**$11**
	Vessels	$0	$10	$0	$0	$0	$0	$0	$0	$0	$0	**$10**
	Net Annual Operating	$0	$0	$2	$2	$2	$2	$2	$2	$2	$2	**$13**
Landside Transit	Vehicles	$0	$0	$0	$0	$1	$1	$1	$0	$0	$0	**$3**
	Net Annual Operating	$0	$0	$1	$2	$3	$5	$6	$6	$7	$7	**$37**
System Costs	Facilities	$0	$0	$11	$0	$0	$11	$0	$0	$5	$6	**$33**
	Vessels	$0	$0	$5	$0	$11	$5	$0	$0	$5	$11	**$37**
	Net Annual Operating	$2	$2	$2	$1	$1	$1	$1	$1	$1	$1	**$13**
Subtotal	Terminal	$1	$12	$22	$1	$12	$14	$20	$19	$5	$7	**$112**
	Number of Vessels	0	0	2	6	8	13	13	16	24	25	—
	Vessels	$0	$10	$25	$0	$22	$6	$34	$44	$5	$11	**$157**
	Net Annual Operating	$2	$2	$5	$12	$12	$17	$19	$23	$31	$30	**$153**
Expanded Existing Routes	Terminal	$0	$20	$5	$10	$10	$0	$9	$0	$0	$0	**$54**
	Vessels	$0	$16	$7	$11	$32	$0	$0	$0	$0	$0	**$66**
	Landside Vehicles	$0	$0	$1	$1	$2	$0	$2	$1	$0	$1	**$7**
	Net Annual Operating-Landside	$1	$2	$3	$3	$5	$5	$7	$8	$8	$9	**$49**
	Net Annual Operating-Ferry	$0	$0	$0	$0	$1	$7	$9	$15	$8	$8	**$47**
Total	Terminal	$1	$32	$27	$11	$22	$14	$29	$19	$5	$7	**$166**
	Vessels & Vehicles	$0	$26	$33	$12	$56	$6	$36	$45	$5	$12	**$230**
	Net Annual Operating	$3	$4	$8	$15	$18	$29	$34	$45	$47	$46	**$249**
	Total	$4	$62	$68	$38	$95	$50	$98	$110	$57	$64	**$646**

Source: Authority Study

Clearly, expanded water transit for the Bay Area is a good investment. This plan shows ridership growth will be nearly 12 percent annually. Expanded ferry service will improve Bay Area public transit, which is critical to the region's economic health.

PACBELL PARK FERRY DOCK

traditionally fallen short of meeting needs. Accordingly, even though this plan identifies and quantifies new funding sources, the actual availability of those funds will affect the delivery of a route.

Changes in these factors and those listed below could significantly affect the cost of both building and operating the system:

- The Authority included costs associated with improved emissions controls and safety in its operating budget. Because of this, vessel capital and operating costs are higher than many of the existing ferry services currently operating on the Bay.
- For example, the program includes costs for adding Selective Catalytic Reduction (SCR) and Particulate Traps (PT) to engines, plus research and development of zero-emission ferries (ZEFs) and a new long-term environmental monitoring program for water transit. Additional bridge manning requirements are among the added safety costs.
- The plan also includes costs for development of maintenance facilities, purchase of spare vessels to boost emergency response capability and improvements at existing hub terminals, such as the San Francisco Ferry Building.
- The Authority's enabling legislation discourages the expansion of service on existing routes without concurrence from the existing operator. Since the expansion of those services is affected by a number of factors within the existing operating agency, this plan focuses primarily on adding new routes. However, budgeting for expanded service on existing routes is included on a programmatic level.
- Schedules for implementation are based on current knowledge of deliverability issues at individual sites and reflect a conservative approach to developing terminals. All new routes are scheduled to be up and running within ten years. In many cases, individual routes could be implemented sooner by coordination with adjacent development or streamlining existing permitting processes.
- The plan assumes an average terminal cost of $10 million. These costs include the waterside facilities such as the float, landside facilities including the shelter and other passenger amenities. A limited amount of parking is also assumed. Not included are the costs of land dedication and extensive joint-use parking.
- The plan includes routes with significant opposition or potential environmental impacts that may make service overly expensive or infeasible. These routes are

included for budgeting purposes only and are not intended to reflect on the deliverability of an individual terminal. Nonetheless, if one terminal becomes infeasible, the Authority anticipates needing the budgeted funds for improvements to an adjacent ferry route.

9.02 How will it be funded?

The Authority's enabling legislation directed that an expanded water-transit system must be funded from new transportation dollars. This plan accomplishes that mandate by identifying a variety of sources for new money from the federal, state, county and local levels, as well as from private sources.

The Authority has worked hard to expand transit funds for the Bay Area. Hundreds of discussions and meetings with staff and members of Congress, state legislators, Bay Area county supervisors and local elected officials, as well as with the business community, has led to the expansion of significant political will to make this funding plan a reality.

The previously described budget also includes cash-flow assumptions incorporating the following new funding sources:

- An increase in the amount of the federal Ferry Boat Discretionary Fund in the Transportation Reauthorization bill (TEA) that in turn could lead to annual appropriations and grant awards of $5 million per year from this program
- Local funding of some terminal development costs
- Local funding of some operating costs from developer contributions, employers or other local sources
- Renewal of half-cent sales taxes in Contra Costa, San Francisco and San Mateo counties and new half-cent sales taxes in Solano, Marin and Sonoma counties
- An increase in tolls on the Bay Area's state-owned bridges which would generate an estimated $125 million annually in new revenue starting in 2005

Other revenue assumptions in this budget include:

- Changes in fares, headways and the health of the Bay Area economy could significantly affect the number of commuters expected to take the ferry in the first few years of operation. The financial health of a ferry transit system is heavily dependent on fare revenues. The Authority has used ABAG-developed assumptions that predict significant growth in the next ten years.
- The fare revenues include additional ridership resulting from increases in tolls and parking charges at BART stations. These assumptions are not currently included in the regional transportation model.
- No concession revenue is included, but revenue from paid parking lots is included.

The proposed distribution of funding sources is shown in Figure 34.

9.03 Is it a good investment?

Clearly, expanded water transit for the Bay Area is a good investment. This plan shows ridership growth will be nearly 12 percent annually. Expanded ferry service will improve Bay Area public transit, which is critical to the region's economic health.

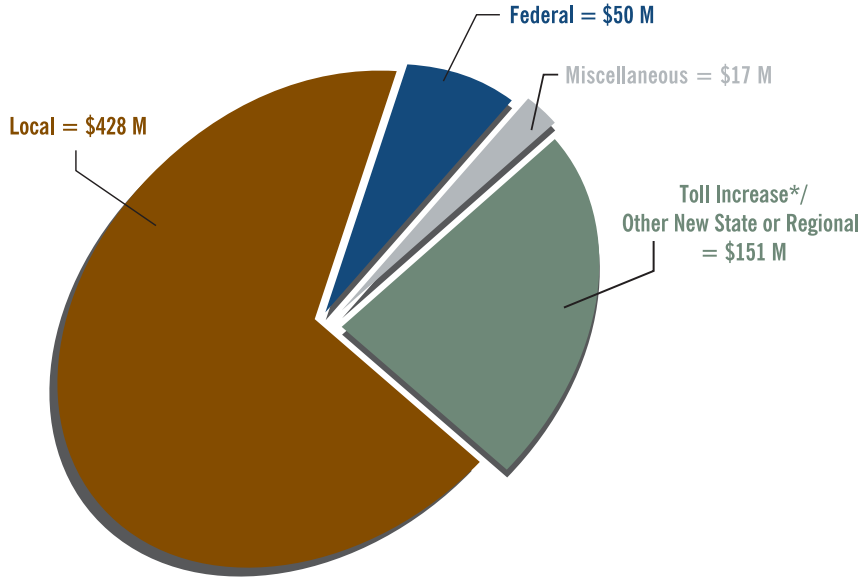
Importantly, this plan shows expanded water transit can be successfully built incrementally. The nature of this system is light on infrastructure, which allows it to be built and deployed as rapidly as resources are available, without the need to engage in extensive, costly and time-consuming land acquisition and construction. And because of water transit's flexibility, it can be easily adapted to changing transportation needs as time goes on.

The Authority's enabling legislation requires this plan's cost effectiveness to be measured against other modes of transit. The results of that study, detailed in *The Routes* chapter (p. 12), show that water transit is a smart and economically responsible public-policy choice. Among the findings:

- The total investment (combined operating and capital funding) per passenger is comparable to the most effective investment in other modes
- The farebox recovery is competitive with other new transit services
- This expanded water-transit system will relieve more congestion for the money than any other form of transbay transit

Figure 34

Expanded Water Transit Funding Mix 2005–2014



* Toll revenues calculated at 2002 dollars.

Source: Authority Study

The Authority will operate expanded water transit safely and cost efficiently. It will also be environmentally responsible.

"The Authority shall operate a comprehensive San Francisco Bay Area regional public water-transit system that includes water-transit terminals, feeder buses and any other transport and facilities supportive of the system."

Section 66540.24, California Government Code

10.01 How will the WTA operate the San Francisco Bay Area water-transit system?

Upon approval of this Implementation and Operations Plan by the State of California, the WTA (the Authority) is charged with the responsibility to provide new water-transit service for the region and to expand or augment existing services where demand has been demonstrated.

The Authority will operate expanded water transit safely and cost efficiently. It will also be environmentally responsible.

The Authority will be a dedicated, focused regional agency that works. It is best positioned to operate Bay Area water transit because:

- It can use the institutional knowledge built while creating this plan to expedite the transition of Bay Area ferry service from a collection of individual routes to a more efficient and valuable water-transit system
- It will focus on ferries and maximize water transit's benefit to Bay Area travelers
- It will successfully attract funding to help ensure water transit's continued viability and value
- The working relationships already formed with community leaders, regulators, public-interest groups and other transit operators are significant, valuable and not easily replicated without losing important time in moving environmentally responsible water transit forward
- The Authority can leverage the investment made in clean-marine technology, advanced vessel design, systems planning, safety and disaster-response planning, ridership forecasting, terminal design and intermodal planning to begin work to reduce congestion and improve air quality

10.02 How will the WTA be structured?

An appropriate organizational structure must be established to manage and control the various activities necessary to efficiently and successfully provide expanded water transit. This organizational structure must be linked to the developing responsibilities of the Authority over time, respond to changes in its operating environment, and above all, operate in the public interest.

The Evolving Organization

The Board

The Authority Board of Directors is the policy-making entity guiding the development of a long-range plan for the implementation of expanded water transit and for updating that plan on a regular basis. It is also responsible for overseeing the operation of the expanded service as new routes are established.

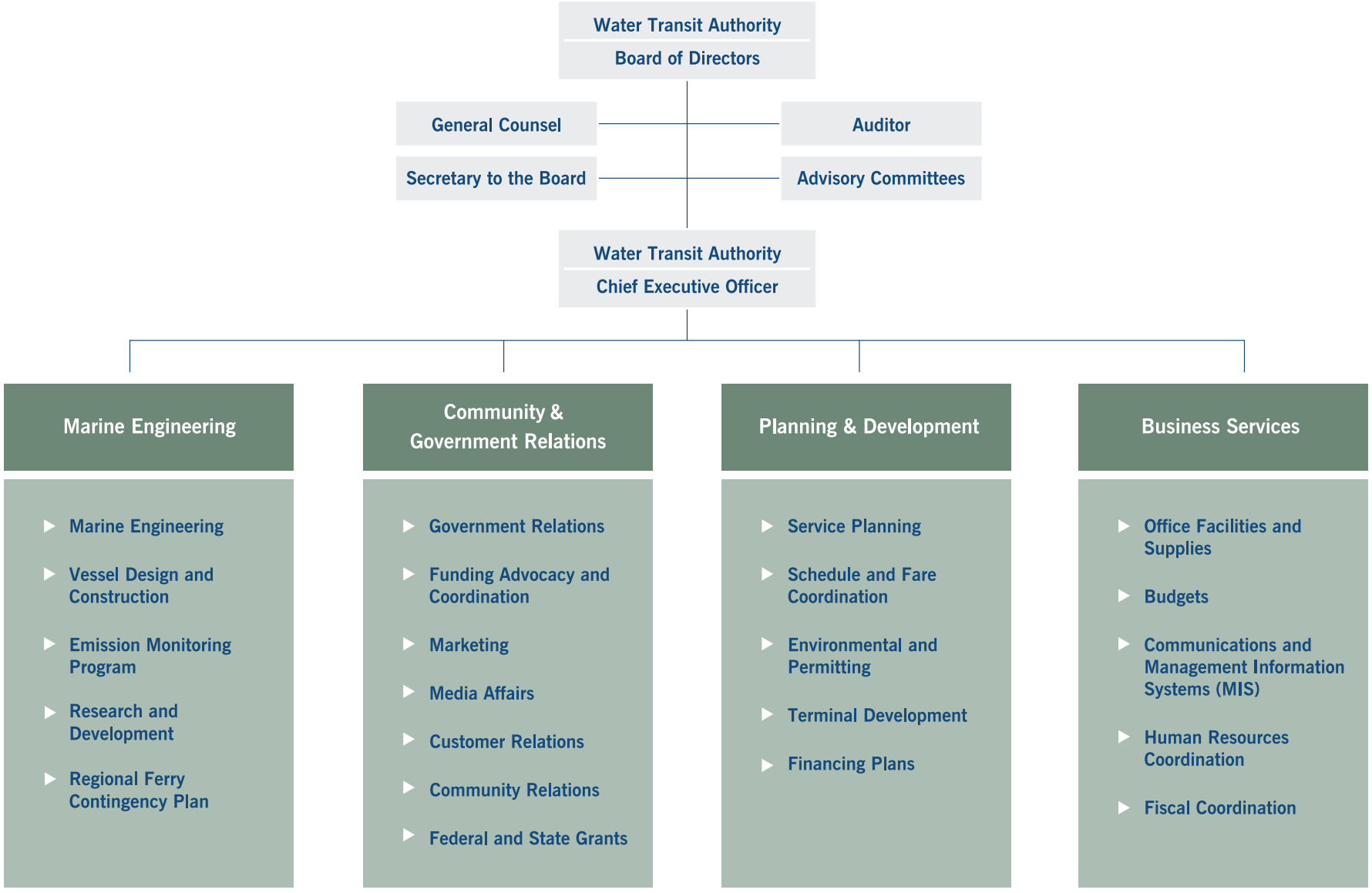
The Board is composed of 11 members appointed by the Governor, the California Legislature and local agencies that currently operate ferry services. They are appointed to eight-year terms. The Authority also has a Community Advisory Committee (CAC) and a Technical Advisory Committee (TAC) to assist them in making their decisions.

Initial Phase

With the enactment of Senate Bill 428 in 1999, the Authority was assigned the responsibility for developing a long-range plan for the implementation of expanded water transit and updating that plan on a regular basis.

Figure 35

Functional Organization Chart—Initial Phase



This planning responsibility is the first item of business for the Authority and includes the current activities of developing both this Implementation and Operations Plan and the Program FEIR.

Upon approval of the IOP, there will be a period of two-to-three years where the primary focus of the Authority will include planning, coordination and development activities. These activities can be classified as system planning and coordination, and infrastructure development. They are considered the continuing activities of the Authority as assigned by legislation, and will always be a permanent part of its responsibilities.

System planning and coordination involves:

- Detailed service planning for prospective new routes
- Collaboration with the existing operators
- Environmental monitoring
- Building good connections with landside transit serving new terminals

Service planning for prospective new routes is the ongoing work necessary to follow up on the route recommendations contained in *The Routes* chapter (p. 12), as well as any new future route recommendations that may be developed.

The Authority's enabling legislation stipulates that it "shall set fares for travel on the water transit system that it operates, and define and set other fares and fees for services related to the water-transit system without the approval of the Public Utilities Commission."

The Authority, in *collaboration with the existing ferry operators*, will address schedule and fare coordination for existing and new routes, advocate for federal and state funds, and market water transit to build awareness of — and greater ridership on — a total Bay Area water-transit system.

Infrastructure development will be accomplished in conjunction with local agencies. As plans for new terminals and routes develop, the Authority will assist local agencies in the design and construction of terminals. This will include capital planning, environmental planning, permitting and financing.

Also, the design and procurement of new vessels will be initiated. In anticipation of new services and new vessels, the Authority will continue its research and development activities to achieve deployment of zero-emissions ferries (ZEFs) as quickly as possible.

Environmental monitoring will be conducted to see that the site specific environmental documents are prepared in accordance with the suggested mitigation measures identified in the Program FEIR.

Building *good connections* with landside transit to serve new terminals involves planning and implementing landside service operated by existing transit operators, employers and the Authority itself, if necessary.

The functional organization structure for this initial phase will be similar to what is in place during the preparation of this plan, as shown in Figure 35. It will be staffed by 12 to 14 people.

Operating Phase

As the Authority initiates new routes or adds service on existing routes, the organization must evolve to properly manage these new responsibilities. The Initial Phase activities remain, and additional responsibilities related to ferry operations and intermodal operations are added under the general identification of Operations. Vessel and facilities maintenance will also be added responsibilities.

As the size of the organization increases, it makes sense to move outsourced functions such as accounting, contracts, risk management and human resources, into the organization as part of the administration function.

Ferry Operations include terminal operations, vessel operations and service planning.

Terminal Operations will be responsible for terminal security, ticketing and fare collection, concessions, customer information and terminal upkeep.

On new routes, Vessel Operations will be responsible for the operation, by qualified personnel, of the Authority's fleet of ferries.

In providing additional service of existing routes, Vessel Operations will take the lead in negotiating with the public operators for increases in their frequency.

In any case, Vessel Operations will be responsible for the provision of services, compliance with regulatory requirements and safe vessel operations.

Ferry Service Planning will use data from detailed patronage forecasts to develop initial operational requirements for service on new routes. It also will monitor performance.

Intermodal Operations will be responsible for bus operations and also community and corporate transit support. Good connections to the terminals will be negotiated with existing transit operators whose service areas include a new terminal. In some cases there may be a need for the Authority to operate its own feeder bus service.

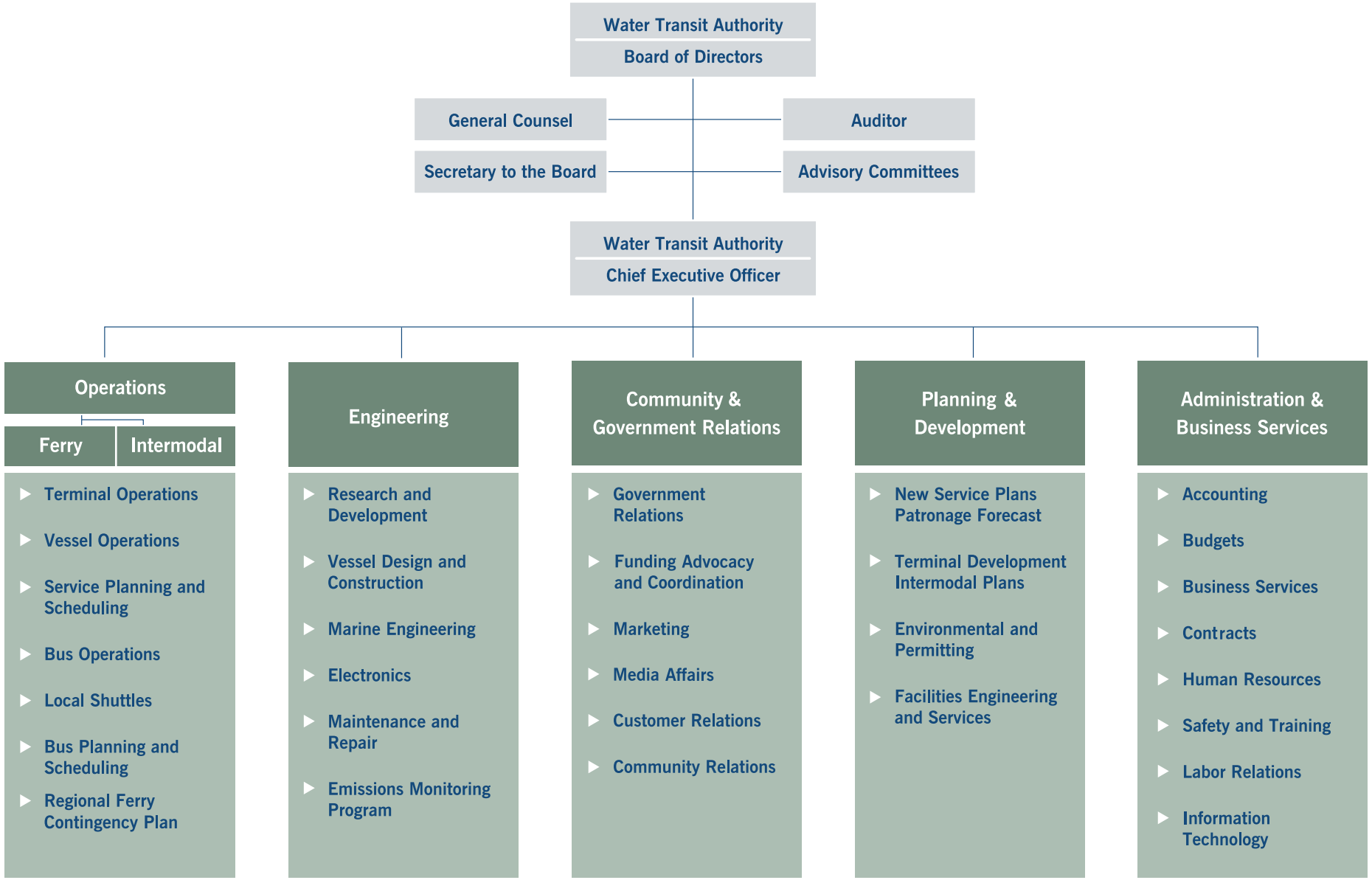
Engineering will be responsible for the design and construction of vessels, vessel and facilities maintenance and repair, electronics, and research and development. Research and Development will continue to investigate new technologies leading to a cleaner and more efficient ferry fleet. Emission Monitoring will continue to verify that the emission standards established for the new fleet of ferries is achieved.

Responsibilities for the Community and Government Relations, Planning and Development, and Administration functional areas are similar to those identified for the Initial Phase and are more completely described in Figure 36.

The functional organizational structure for the Operating Phase of the Authority's development is shown in Figure 36. The number of employees for this phase will be determined by several factors, including the number of new routes, the method of providing the service and the number of vessels in operation.

Figure 36

Functional Organization Chart—Operating Phase



Bay Area residents want congestion relief and are willing to pay for it, provided that they know what they are buying and are convinced it will make a difference.

There is significant support for expanded water-transit service among Bay Area elected officials, members of the business community and the public. The Authority's systems planning and community outreach work during the past two years has laid the groundwork for moving this plan forward and deploying new ferries.

11.01 What are the next steps?

There is significant support for expanded water-transit service among Bay Area elected officials, members of the business community and the public. The Authority's systems planning and community outreach work during the past two years has laid the groundwork for moving this plan forward and deploying new ferries.

Keep Looking for Funding

Bay Area residents want congestion relief and are willing to pay for it, provided that they know what they are buying and are convinced it will make a difference.

Expanded water transit is one program they are willing to fund through a $1 toll increase on state-owned Bay Area bridges. This new funding source is critical for deploying new vessels and routes, not to mention the other worthy projects in the Toll Increase Expenditure Plan.

Therefore, the first step toward expanded water transit is taking a solid, well thought out Expenditure Plan that includes ferries to Bay Area voters in 2004.

The second step is to keep working hard in Washington to ensure that the federal Ferry Boat Discretionary Fund is expanded in the next transportation reauthorization bill and that, like other states, the Bay Area obtains a set-aside for its water-transit system, which already is the nation's third largest.

Third, efforts must continue to find other funding sources. The Authority is partnering with the existing ferry operators and industry groups like the American Public Transit Association to increase available ferry dollars. And discussions continue with Bay Area elected officials regarding county sales tax plans and development contributions to water-transit expansion.

Keep Working the Plan

Concurrently, the Authority will continue working locally with officials to further this plan — studying potential terminal sites, planning good connections with other transit agencies, pursuing public and private funding opportunities, resolving local concerns and preparing site-specific environmental studies. The Authority's institutional knowledge is proving to be a tremendous asset to these officials as they plan their new terminals and shoreline use.The Authority also will continue working with recreational boaters, bicyclists, and park advocates, in the spirit of building a viable transit system that also enhances people's access to the Bay for recreation.

Each community hosting a proposed new terminal is excited and energized by this plan. Local elected officials and community leaders are committed to working with the Authority to move quickly but judiciously to launch their service. The continued involvement of the Authority's advisory committees is integral to moving the plan forward.

Momentum is important for a project like this. The Authority intends to continue working this plan to build an expanded water-transit system. The deliverability continuum described in *The Routes* chapter (p. 12) is underway and progressing.

Keep Exploring Water Transit-Oriented Development (WaTOD)

As discussed in *The Connections* chapter (p. 26), WaTOD can make a huge

Concurrent with taking the existing collection of individual ferry routes and transitioning them into a coherent system, the Authority will plan and execute an integrated marketing and brand-advertising campaign to make water transit top of mind to Bay Area travelers.

difference for the Bay Area. Building sensible in-fill development near ferry terminals helps with the region's two greatest challenges: limited housing and traffic congestion.

In addition to the Jack London Square and Oyster Point case studies, exciting future WaTOD prospects exist in Marin County and on the island of Alameda, as well as in Martinez, Antioch and the Mission Bay section of San Francisco.

Marin County officials are prepared to study WaTOD feasibility at San Quentin should the prison be vacated. Although this project could easily have a 20-year timeline, the Authority is ready to assist county officials in planning water-transit facilities at San Quentin.

On Alameda, development planning underway to convert the Alameda Naval Air Station to public use includes WaTOD at Alameda Point, with the proposed new ferry terminal serving as the transportation hub.

Local officials in Martinez and Antioch are enthusiastic about the economic and lifestyle benefits WaTOD can bring to their communities along the Carquinez Strait. They have been fully engaged on the Community Advisory Committee and are determined to move the planning process through the deliverability continuum.

Moving forward, the Authority will work with BCDC, MTC and all other stakeholders to identify places where WaTOD can make a positive difference for a local community and the Bay Area region.

Market Water Transit

BART's popularity goes beyond the construction and operation of a great transit system. Thirty years of marketing and advertising have successfully created a solid niche for BART in the hearts and minds of Bay Area travelers, whether or not they ride BART. For example, polling shows BART is overwhelmingly popular in Marin County, even though BART does not serve Marin.

Water transit can achieve similar popularity — and commensurate increased patronage — through marketing and brand advertising that highlights both the aesthetic and practical benefits that ferries provide. Concurrent with taking the existing collection of individual ferry routes and transitioning them into a coherent system, the Authority will plan and execute an integrated marketing and brand-advertising campaign to make water transit top of mind to Bay Area travelers.

The extensive amount of ridership data collected and modeled to prepare this Implementation and Operations Plan provides the perfect blueprint for effective, targeted marketing and advertising. The Authority will immediately begin taking steps to launch this program.

Keep Innovating

The multi-million-dollar research-and-development program budgeted in this plan will bring the world's first zero-emission passenger ferries (ZEFs) to San Francisco Bay. It is too soon to predict exactly when the first such ZEF will be launched, but the Authority's commitment to this project, with the invaluable help of concerned advocates like Bluewater Network, will make this environmental breakthrough a reality as soon as possible.

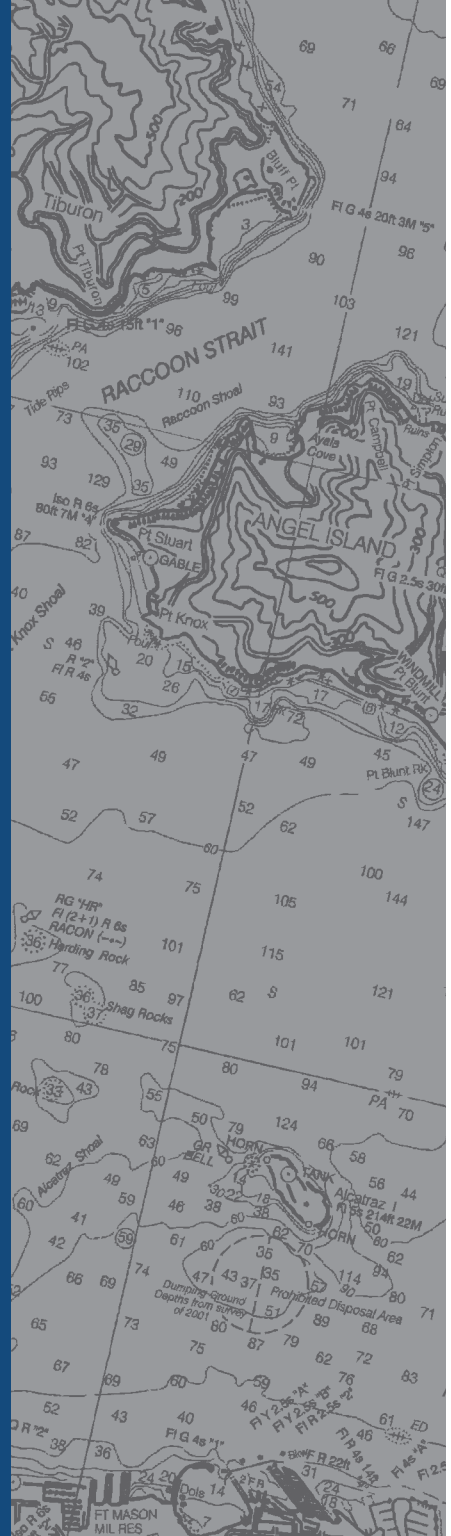
The $100,000 federal grant to design a prototype fuel-cell propulsion plant for a Treasure Island passenger ferry is in hand and the research and development is underway. The Authority is actively seeking additional funds to design and build the prototype vessel that goes with it.

Other cutting-edge vessel research and development will be pursued. Marine engineers and naval architects are studying the use of Surface Effect Ship technology to determine if it makes sense for next-generation Bay Area passenger ferries. Inside and out, the vessels deployed on San Francisco Bay will be the cleanest, safest, most environmentally responsible passenger ferries in the world.

And they will be even more because water-transit innovation will not be limited to technology.

Keep Making a Difference for the Bay Area

The Authority intends to develop creative ways to use water-transit resources to add value beyond its transit mission. For example, joint planning with officials at the GGNRA could lead to historical, cultural and environmental education programs for Bay Area students of all ages.



TECHNICAL STUDIES

1. New Technologies & Alternative Fuels Working Paper — *JJM*A
2. Risk-based Plan for Safe Ferry Operations on San Francisco Bay — *ABSG*
3. Vessel Performance Specs & Draft RFP — *Glosten/Herbert*
   - a. 149 Passenger, 25 knot Passenger Only Ferry RFP
   - b. 350 Passenger, 35 knot Passenger Only Ferry RFP
   - c. Phase 2 Design Report
   - d. Shipyard Evaluation
   - e. Vessel Cost Estimates
   - f. Vessel Profiles
   - g. Maintenance Facilities Report
4. Measurement of Air Pollutant Emissions From In-Service Passenger Ferries - Emission Data Report — *EF&EE*
5. Protocol for Measurement of Air Pollutant Emissions from Ferry Boats — *EF&EE*
6. Intermodal and Terminal Access Study - Terminal Good Practice Design Guidelines — *Arup*
7. Intermodal and Terminal Access Study - Jack London Square Site Study — *Arup*
8. Conceptual Transit Plans — *Arup*
9. Preliminary Terminal Site Assessment Report — *Arup*
10. Terminal Architecture and Engineering - Terminal Design Guidelines — *Parsons Brinkerhoff*
11. Terminal Architecture and Engineering — Generic Terminal Design Prototype — *Parsons Brinkerhoff*
12. Ridership Model Forecasts — *Cambridge Systematics*
13. Ridership Model Calibration and Validation — *Cambridge Systematics*
14. Ridership Model Forecasts - Sensitivity Analysis — *Cambridge Systematics*
15. Market Segmentation for Ridership Forecasting — *Cambridge Systematics*
16. Mode Choice Models — *Cambridge Systematics*
17. Inventory of Bay Area Water Transit Services and Facilities — *PTM*

PUBLIC PARTICIPATION

18. Board Agendas and Minutes
19. CAC Roster, Agendas and Minutes
20. TAC Roster, Agendas and Minutes
21. North Bay Minutes and Agendas
22. Public Outreach Meetings Chronology
23. Working Group Rosters
    - a. Clean Marine Ad Hoc Work Group
    - b. Environmental Organization Ad Hoc Subcommittee of the TAC
    - c. Ferry Operators Ad Hoc Subcommittee of the TAC
    - d. Intermodal Ad Hoc Subcommittee of the TAC
    - e. New Technologies & Alternative Fuels Working Paper Peer Review Panel
    - f. Regulatory Agency Ad Hoc Subcommittee of the TAC
    - g. Ridership Model Peer Review Panel
    - h. SOS Ad Hoc Work Group
24. IOP Public Comments
25. MTC Comments
26. BAAQMD Comments

ADDITIONAL MATERIALS & RESOURCES

27. California Government Code Secs. 66540.72 (Statutes of 2001 and 1999)
28. Final Program Environmental Impact Report (FEIR) Table of Contents
29. Newspaper feature, “Launching a Flotilla of Ferry Terminals,” *The New York Times*, April 7, 2002
30. Glossary of Terms

The Team

The San Francisco Bay Area Water Transit Authority assembled a team of leading firms in environmental planning, transit planning, vessel technology and ridership modeling. Working with the Authority, the project team produced the detailed analysis required to make sound public-policy decisions about Bay Area water transit. The Authority thanks the project team members for their work.

ENVIRONMENTAL ANALYSIS:
URS Corporation

RIDERSHIP MODELING AND MARKETING APPROACH:
Cambridge Systematics

SYSTEM PLANNING AND DESIGN:
ARUP
Nancy Whelan Consulting
Pacific Transit Management
Parsons Brinckerhoff Quade & Douglas

FERRY VESSEL TECHNOLOGY:
ABS Consulting
Engine Fuel & Emissions Engineering
Glosten-Herbert
John J. McMullen Associates
Walther Engineering

PROGRAM MANAGEMENT AND ENVIRONMENTAL QUALITY CONTROL:
CH2M HILL
Jones & Stokes Associates
The Bay Planning Coalition
The Next Generation

PUBLIC OUTREACH AND SURVEY RESEARCH:
Barnes Mosher Whitehurst Lauter & Partners
Carter, Wetch & Associates
Evans/McDonough Company
Laurel Marcus & Associates
Lindsay, Hart, Neil, Weigler
Public Affairs Management
The Roanoke Company
Zell & Associates

COMPUTER/TECHNICAL SUPPORT:
Leon Willard

DESIGN AND PHOTOGRAPHY:
Rory Earnshaw
Bob Ecker
Eileen Collins Graphic Design
Amy Hornick
Chris Purdy
Subset: Carolyn Gerin, Alice Bybee, Ithinand Tubkam
G. Justin Zizes, Jr.

WTA
WATER TRANSIT AUTHORITY

San Francisco Bay Area Water Transit Authority
120 Broadway, San Francisco, CA 94111
415.291.3377 · www.watertransit.org