2000 San Francisco Bay Crossings Study

CONCEPTUAL ALTERNATIVES

Submitted to

Metropolitan Transportation Commission

Submitted by

Korve Engineering

September 2001
# Table of Contents

1.0 Overview.................................................................................................................. 1

2.0 Improvements to Existing Highway Crossings.......................................................... 2

2.1 San Francisco-Oakland Bay Bridge Corridor (I-80)...................................................... 2

   2.1.1 Westbound Grand Avenue On-Ramp – Extension of HOV lane............................... 2

   2.1.2 Westbound I-580 Approach Left-Side HOV Lane Extension.................................... 3

   2.1.3 New Westbound Right-Side HOV Approach/Structure alongside I-580.................... 3

   2.1.4 I-80 Westbound HOV Approach Improvement...................................................... 8

   2.1.5 AM Peak Period Contra-Flow Westbound I-80 Bus Lane........................................ 8

   2.1.6 I-80 Westbound Approach to Maritime (Horseshoe) Off-Ramp.............................. 11

   2.1.7 I-880 Northbound HOV approach Extension to Market/Adeline Street.................. 11

   2.1.8 I-80 New Eastbound HOV lane from Toll Plaza to I-80/Powell............................... 11

   2.1.9 HOV Improvements to First and/or Essex Street Ramps......................................... 15

   2.1.10 Extension of HOV Lane on Bryant and Beale Streets........................................ 15

   2.1.11 Extension of 2nd Street HOV Lane Eastward to King Street............................... 15

   2.1.12 Casual Carpool Restrictions and Formation of Carpooling Unloading Zones.......... 16

   2.1.13 Redesign of Sterling On-Ramp (improved radius) with Improved Signing............. 16

2.2 San Mateo – Hayward Bridge Corridor (SR 92)......................................................... 21

   2.2.1 Widening of San Mateo Bridge Structure/Reversible Lanes.................................... 21

   2.2.2 SR 92 - Toll Plaza Improvements/Expansion..................................................... 23

   2.2.3 SR 92 - Close HOV Gap – I-880 to Hesperian.................................................... 23

   2.2.4 SR 92/I-880 Interchange Improvement............................................................... 23

   2.2.5 Widening I-880 between SR-238 and SR 92....................................................... 24

   2.2.6 SR 238/I-880 Interchange Improvement.............................................................. 24

2.3 Dumbarton Bridge Corridor (SR 84)......................................................................... 29

   2.3.1 Construct East Palo Alto/University Avenue Bypass........................................... 29

   2.3.2 SR 84 - Grade Separation of University/SR 84 Interchange................................... 29

   2.3.3 SR 84 - Toll Plaza Improvement/Expansion....................................................... 30

   2.3.4 SR 84/I-880 Interchange – Direct HOV flyovers.................................................. 30

3.0 New Highway/Multimodal and BART/Rail/Other Fixed Guideway Crossings.............. 34

3.1 New Multimodal Bridge- SR 238 to South of Candlestick Point.................................. 34

3.2 New Multimodal Bridge/Tunnel- SR 238 to I-380...................................................... 36

3.3 New San Francisco BART Subway ................................................................................ 38

3.4 New BART Transbay Tube via Alameda...................................................................... 38

3.5 New BART Mid-Bay Tube or Bridge Connecting Millbrae to Hayward....................... 39

3.6 Reconstruction of Dumbarton Rail Bridge with Commuter Rail Service.................... 44

3.7 Commuter Rail Tunnel – San Francisco to Oakland.................................................. 48

3.8 San Francisco Airport to Oakland Airport Connector................................................ 49

4.0 Express Bus Services................................................................................................. 52

4.1 Express Bus Service on the San Mateo Bridge.......................................................... 52

4.2 Expansion of Dumbarton Bridge Express Bus Service............................................... 57

4.3 Expansion of Express Bus Service on Bay Bridge..................................................... 62

4.4 Expansion of Capitol Corridor Service with LRT Connection to Mt. View/Sunnyvale.... 65

5.0 BART Services............................................................................................................ 66

6.0 Water-Based Transportation Services...................................................................... 67
### 6.1 Water Transit Authority’s Phase I Critical Mass Transit Routes
67

### 6.2 Airport to Airport Hovercraft of Ferry
74

### 6.3 Oakland to San Francisco Freight Ferry
77

### 7.0 Other Operational Options and Strategies
80

#### 7.1 Intelligent Transportation System (ITS) Improvements
80

#### 7.2 Congestion Pricing
84

#### 7.3 Elimination of Toll collection constraint - FasTrak
84

#### 7.4 Free Transbay Bus Service
84

#### 7.5 Expand Bay Bridge Free HOV Period
84

#### 7.6 Increasing Carpool Requirement from 2+ to 3+
85
List of Figures

Figure 1: Westbound Grand Avenue On-Ramp – Extension of HOV Lane................................. 5
Figure 2: Westbound I-580 Approach Left-Side HOV Lane Extension........................................ 6
Figure 3: New WB Right-Side HOV Approach/Structure alongside I-580........................................ 7
Figure 4: I-80 Westbound HOV Approach Improvement............................................................ 9
Figure 5: AM Peak Period Contra-Flow Westbound I-80 Bus Lane........................................... 10
Figure 6: I-80 Westbound Approach to Bay Bridge - Remove Lane Drop..................................... 12
Figure 7: I-880 Northbound HOV Lane Extension to Market Street............................................ 13
Figure 8: Addition of Eastbound HOV Lane - Bay Bridge Toll Plaza to Powell Street................ 14
Figure 9: HOV Improvements to First and/or Essex Street Ramps............................................ 17
Figure 10: Extension of HOV Lane on Bryant and Beale Streets............................................... 18
Figure 11: Extension of 2nd Street HOV Facility........................................................................ 19
Figure 12: Casual Carpooling Restrictions.................................................................................. 20
Figure 13: Reversible Lane on San Mateo Bridge........................................................................ 22
Figure 14: Close HOV Gap - Hesperian Boulevard to I-880 & Jackson/Santa Clara.................... 25
Figure 15: SR 92/I-880 Improvement............................................................................................ 26
Figure 16: Widening I-880: SR 238 to SR 92.............................................................................. 27
Figure 17: Two Lane Ramp from NB I-880 to EB SR 238.............................................................. 28
Figure 18: University Avenue Bypass – East Palo Alto................................................................. 31
Figure 19: Grade Separation of SR 84 at University Ave Intersection.......................................... 32
Figure 20: SR 84/I-880 Interchange HOV Flyovers..................................................................... 33
Figure 21: SR 238 to South of Candlestick Point........................................................................ 35
Figure 22: SR 238 to I-380 Bridge / Tunnel................................................................................. 37
Figure 23: Second San Francisco Subway.................................................................................... 41
Figure 24: New BART Tube - Jack London Square / Alameda Alignment..................................... 42
Figure 25: New Mid-Bay BART Crossing.................................................................................... 43
Figure 26: Reconstruction of Dumbarton Rail Bridge with Commuter Rail Service.................... 47
Figure 27: New Commuter Rail Tunnel - San Francisco to Oakland............................................ 51
Figure 28: San Mateo Express Bus Service.................................................................................. 56
Figure 29: Dumbarton Bridge Express Bus Service Augmentation............................................. 61
Figure 30: Implementation of Water Transit Authority’s Phase I Critical Mass Transit Routes...... 75
Figure 31: Airport-to-Airport Hovercraft or Ferry...................................................................... 76
Figure 32: Freight Ferry - San Francisco to Oakland................................................................. 79
List of Tables

Table 1: Rehabilitation of Dumbarton Bridge ......................................................... 46
Table 2: San Mateo Express Bus Alternatives ....................................................... 52
Table 3: San Mateo Express Bus Alternatives ....................................................... 53
Table 4: San Mateo Express Bus Alternatives ....................................................... 54
Table 5: Dumbarton Express Bus Service Summary ............................................... 57
Table 6: Dumbarton Express Bus Cost Summary .................................................... 58
Table 7: Dumbarton Express Bus Service Summary ............................................... 60
Table 8: Bay Bridge Bus Service Summary ............................................................ 62
Table 9: Dumbarton Express Bus Service Summary ............................................... 63
Table 10: Ferry Option 1 Summary ...................................................................... 67
Table 11: Ferry Option 2 Summary ...................................................................... 68
Table 12: Ferry Option 3 Summary ...................................................................... 68
Table 13: Ferry Option 4 Summary ...................................................................... 69
Table 14: Ferry Option 5 Summary ...................................................................... 69
Table 15: Ferry Option 6 Summary ...................................................................... 70
Table 16: Ferry Option 7 Summary ...................................................................... 70
Table 17: Ferry Option 8 Summary ...................................................................... 71
Table 18: Ferry Options 9 and 10 Summary ......................................................... 71
Table 19: Ferry Option 11 Summary ................................................................. 72
Table 20: Ferry Option 12 Summary ................................................................. 72
Table 21: Ferry Options 13 and 14 Summary ...................................................... 73
Table 22: Water Transit Critical Mass Phase I - Order of Magnitude Cost ............. 73
Table 23: Airport to Airport Hovercraft or Ferry Alternative Summary .................. 74
Table 24: Freight Ferry Cost Summary ............................................................... 78
Table 25: ITS Application: San Mateo Bridge and Dumbarton Bridge ................. 82
Table 26: ITS Application - Bay Bridge and Non-Vehicular Mode ....................... 83
1.0 OVERVIEW

The purpose of this Conceptual Alternatives Report is to provide descriptions of initial options identified for consideration to address existing and projected trans-bay mobility issues identified as a result of the 2000 San Francisco Bay Crossings Study. These options represent a wide range of capital and operational improvements, as well as strategies and geographic areas, identified for dealing with bay crossings issues. The options have been initially organized by category into the following groups:

- Improvements to Existing Highway Crossings (Traffic Operational and HOV);
- New Crossings Highway/Multimodal and Rail/BART/Other Fixed Guideway Crossings;
- Express Bus Services;
- Commuter Rail Services;
- BART;
- Water-Based Transportation Services; and
- Other Operational Options and Strategies.

As the Bay Crossing Study proceeds, these options will be screened. The most promising options will then be combined into packages, which will be evaluated to determine which are recommended for implementation. It is expected that the conceptual options may be refined partly as a result of the screening process and additionally as developed and evaluated in subsequent phases of the study.
2.0 IMPROVEMENTS TO EXISTING HIGHWAY CROSSINGS

Potential improvements to existing highway crossings encompass a wide range of potential improvement options. In the next section (3.0), potential major transbay capacity enhancements such as bridge widening and new crossings are explored. This section explores less intensive options which seek to improve transbay mobility by eliminating bottlenecks on bridge approaches and providing for extensions of the existing High Occupancy Vehicle (HOV) network. Through HOV improvements, the number of transbay person-trips may be increased without bridge/tunnel widening or the construction of new crossings.

2.1 SAN FRANCISCO-OAKLAND BAY BRIDGE CORRIDOR (I-80)

As demonstrated by the Existing Conditions Report, the primary peak hour travel market for the Bay Bridge is from the Oakland/Berkeley area to and from San Francisco, particularly in San Francisco’s Central Business District. More than 80 percent of peak hour Bay Bridge trips either have an origin or destination within the four MTC travel zones which comprise downtown San Francisco.

The primary westbound bottleneck in the Bay Bridge travel corridor is the toll plaza. At this location, three freeways, I-80, I-580, and I-880, feed into the toll plaza. At the plaza, westbound vehicles pay the toll and are metered by a bank of metering lights that exist just west of the tollbooths. The metering lights feed traffic onto the Bay Bridge at just below its capacity, providing for free flow immediately downstream.

In the eastbound direction, the primary bottleneck exists at the western end of the Bay Bridge. At this location, heavily traveled ramps from San Francisco (Bryant Street Ramps, 5th Street, Essex Street, and 1st Street) enter into the main-line traffic flow from the south. At these ramps, substantial queue build up in the evening peak hour, extending for some distance on City streets. On mainline I-80, the eastbound queue extends onto US 101, frequently to the 101/280 junction.

2.1.1 Westbound Grand Avenue On-Ramp – Extension of HOV lane

The vehicular queue on the westbound on-ramp from Grand Avenue into the toll plaza area often extends beyond Maritime Street during the morning peak commute hour. Because of this, carpoleers and buses cannot take full advantage of the downstream right side HOV facility on westbound I-80 due to the lack of a connecting HOV lane on the Grand Avenue on-ramp. This lack of an HOV connection results in many vehicles illegally driving on the existing right-side shoulder from Maritime Street to the downstream HOV lane. Adequate width is provided in the existing shoulder for this movement to be made.

This conceptual alternative, illustrated in Figure 1 would install an HOV lane in the existing shoulder of this ramp. Much of the necessary lane width for this improvement is available by simply re-striping the shoulder to permit HOV travel. However, some widening may be necessary, particularly near Maritime Street. With the improvement, westbound HOVs would be provided with a continuous connection from Grand Avenue at Maritime Street through the Bay Bridge toll plaza. Existing drainage facilities (grates) in the shoulder would need to be modified to accommodate vehicular travel. A possible future extension of the HOV lane further east onto Grand Avenue east of Maritime Street would displace an existing designated bike path on Grand Avenue. Thus, an extension of the HOV lane further east would necessitate provisions for relocating this bike facility. Caltrans has plans to
extend this HOV lane to the I-580 split; however, under this alternative an extension further east would be explored.

Preliminary Issues

- How much widening will need to be done to accommodate this improvement?
- Consistency with Caltrans shoulder standards.
- Coordination with Grand Avenue bikeway plans.
- Provision of appropriate drainage.

2.1.2 Westbound I-580 Approach Left-Side HOV Lane Extension

The existing HOV lane on the westbound I-580 approach to the Bay Bridge toll plaza begins at-grade just west of the I-80/I-580 junction. This alternative, illustrated in Figure 2, would extend this left-side HOV lane structure eastward just east of the Cypress structure. The alternative would extend the existing HOV lane for approximately a quarter mile to a location where the eastbound and westbound lanes of I-580 come together and prohibit the further eastward extension of this HOV lane (approximately to Ettie Street in Oakland). The extension would provide an I-580 HOV approach of approximately 1.25 miles (total). The extension would reduce travel time for HOVs on westbound I-580.

Preliminary Issues

- What is the exact eastern beginning of the HOV lane?
- Does sufficient space exist to thread the improvement under the Cypress structure?

2.1.3 New Westbound Right-Side HOV Approach/Structure alongside I-580

This alternative, illustrated in Figure 3, would provide a new westbound right-side HOV structure alongside I-580 from SR 24 to the Bay Bridge Toll Plaza for SR 24 and MacArthur Boulevard traffic. The length of this new HOV lane would be approximately 1.2 miles. The new westbound HOV structure would begin on SR 24 just prior to the I-580 connection. It would continue westward alongside of the existing westbound I-580 lanes; however, I-580 traffic would not be able to access the facility because of the weaving problems that would result. I-580 HOV traffic would have to use the downstream left side HOV lane. A slip ramp from MacArthur Boulevard to the HOV facility would be provided, allowing HOVs and buses from Oakland to access the structure. This would provide a substantial benefit to buses originating in Oakland which must currently divert to the Cypress Structure (I-880) to access an HOV approach to the Bay Bridge. West of the MacArthur Boulevard slip ramp, the HOV structure would have to be constructed above the I-580/I-80 connector and below the I-880/I-80 connector. Further analysis of this alternative is necessary to verify the feasibility of the project profile, the availability of adequate right-of-way, the point of diversion from SR 24 and the MacArthur Boulevard slip ramp.
Preliminary Issues

- Does a feasible profile through the MacArthur/I-580/Cypress Structure exist for this option?
- Is adequate right-of-way available north of I-580?
- Point of diversion from SR 24.
- Configuration of connection to MacArthur Boulevard.
- Configuration of connection to existing right-side toll plaza HOV lane.
Figure 1

CONCEPTUAL ALTERNATIVES

Grand Avenue On-Ramp - Extend Existing HOV Lane to Maritime Street
CONCEPTUAL ALTERNATIVES

Extend I-580 HOV Approach Eastward to Cypress Structure
ADD NEW WESTBOUND HOV LANE

2000 SAN FRANCISCO BAY CROSSINGS STUDY
Figure 3
CONCEPTUAL ALTERNATIVES
New Westbound I-580 HOV Lane - SR 24 to Toll Plaza
2.1.4 I-80 Westbound HOV Approach Improvement

This improvement alternative, illustrated in Figure 4, would install a concrete barrier between the I-80 westbound HOV lane and the mixed-flow lanes east of the Bay Bridge toll plaza. The purpose of this improvement would be to eliminate weaving between these lanes (mixed-flow vehicles are allowed on the flyover approach during non-peak hours). Existing weaving operations between the flyover approach and the mixed-flow lanes creates congestion and delay to HOVs. The barrier would completely separate the westbound I-80 HOV lane from the mixed flow lanes from the flyover structure to the metering lights. The installation of the barrier may require some minor spot widening on the north side of the toll plaza. The total length of the concrete barrier would be approximately 0.3 miles.

The installation of this alternative would require the modification (simplification) of signage on I-80 Westbound near Powell Street. The existing sign would need to be modified with the installation of the concrete barrier to indicate that the flyover is an HOV facility only. Use of the facility during off peak hours would then require an extension of the free HOV time periods. This alternative would significantly reduce occurrences of HOV lane violation at this location. HOV lane violations occur because of unclear signage and the unusual operation of the flyover. Single occupant vehicles often use the flyover, but then do not exit the lane prior to the toll plaza, resulting in a violation.

Preliminary Issues

- What would be the barrier/shoulder width?
- Is sufficient right-of-way available to implement the proposed spot widening?

2.1.5 AM Peak Period Contra-Flow Westbound I-80 Bus Lane

Currently, I-80 provides three general-purpose lanes and a HOV lane in each direction north/west of the Bay Bridge toll plaza. This alternative, illustrated in Figure 5, would create a new contra-flow westbound I-80 bus-only lane by installing a movable concrete barrier. In the morning peak period, the barrier would be moved to convert an eastbound HOV lane to provide an additional westbound lane on I-80 for buses only.

Conceptually, the contra-flow lane would begin in Albany near the I-580 interchange and terminate in the toll plaza just east of the toll booth area. The western terminus of the contra-flow lane would require the lane to pass through the wide median separating the eastbound and westbound lanes in the toll plaza area to join the left-side HOV lane in the toll plaza. Further analysis of this alternative would require the identification of operational costs as well as the locations for storing the machines that would move the concrete barrier.

Preliminary Issues

- What is the impact of the width of the new barrier on the existing lanes/shoulders?
- With new barrier, additional new shoulder space would need to be provided. Is sufficient right-of-way available?
- Connection to toll plaza.
- Location for machine storage.

Korve Engineering
Figure 4
CONCEPTUAL ALTERNATIVES

I-80 Westbound HOV Lane - Separate from Toll Plaza with Concrete Barrier
Figure 5

CONCEPTUAL ALTERNATIVES

Provide AM Peak Period Contra-Flow Westbound I-80 Bus Only Lane

I-580 to Toll Plaza
2.1.6 I-80 Westbound Approach to Maritime (Horseshoe) Off-Ramp

Currently, the westbound right-side mixed flow lane on the I-80 approach to the toll plaza is dropped just west of the I-580 merge point. Several hundred feet downstream of this lane drop, a lane is added to provide access to the Port of Oakland horseshoe ramp which loops around to provide access to Maritime Street. This configuration causes traffic that wants to use the horseshoe ramp to weave over into the mixed flow lanes, travel several hundred feet in the mixed flow lanes and then weave back over to the horseshoe ramp. This alternative, illustrated in Figure 6, would connect the lane drop directly to the ramp. The modification would significantly reduce delay for vehicles, predominantly trucks, destined for Maritime Street by eliminating this weaving movement.

Preliminary Issues
- Is sufficient unencumbered right-of-way available?

2.1.7 I-880 Northbound HOV approach Extension to Market/Adeline Street

This alternative, illustrated in Figure 7, would extend the existing I-880 northbound HOV lane southward in the existing inside shoulder to Market/Adeline Street. The length of the HOV lane extension would be approximately 1.5 miles. When this portion of I-880 was constructed several years ago, Caltrans left space in the inside shoulder so that the HOV lane could be expanded in this fashion. Observations of the existing queue on the I-880 approach in the morning peak hour indicated that the queue extends far enough south to block HOV access to the existing HOV lane. In future phases of the study, the design of the inside shoulder needs to be reviewed to determine the extent and cost of this improvement.

Preliminary Issues
- Is structural pavement section of existing shoulder adequate to accommodate traffic?

2.1.8 I-80 New Eastbound HOV lane from Toll Plaza to I-80/Powell

On eastbound I-80, the existing HOV lane begins at Powell Street. During the evening peak hour, the segment between the toll plaza and Powell Street is often congested, which results in significant delay for eastbound buses and HOVs. The new eastbound HOV lane, conceptually illustrated in Figure 8, would connect the toll plaza to Powell Street where the existing eastbound HOV lane starts. The length of the new HOV lane extension would be approximately two miles. This improvement is presently under design by Caltrans.

Preliminary Issues
- Start and end points.
- Can HOV lane be threaded through Cypress connector to left-side HOV lane?
Figure 6
CONCEPTUAL ALTERNATIVES
I-80 Westbound Approach to Bay Bridge - Remove Lane Drop; Extend Lane to Port Horseshoe Ramp
Extend HOV Lane South to Market St
Add Eastbound HOV Lane - Bay Bridge Toll Plaza to Powell Street
2.1.9 HOV Improvements to First and/or Essex Street Ramps

The western approach to the Bay Bridge has a limited priority system for HOVs. The HOV system includes a bus-only on-ramp from the Transbay Terminal, and an HOV plus trucks-only ramp at Sterling Street. The restrictions on the Sterling Street and Bryant Street facilities are in effect only during the afternoon peak period (3:30 PM to 7 PM). Vehicles eligible to use these facilities during this period include HOVs with three or more passengers, two-seater passenger vehicles with two passengers, buses and trucks. The casual carpool pick-up area is located on Beale Street between Folsom and Howard.

Currently, a lack of eastbound Bay Bridge queuing capacity in San Francisco results in vehicles backing up on city streets and creating gridlock in downtown San Francisco, especially South of Market. This queuing is common most weekdays from 3 PM to 7 PM.

This alternative would consider a range of HOV improvements to the First Street and Essex Street ramps to the western bridge approach. These alternatives would include converting one of the ramps to an HOV only facility or providing HOV queue-jump lanes to one or both of the on-ramps. Figure 9 illustrates the locations of these potential improvements. Developing casual carpool formation zones and providing other carpool incentives may be necessary for these HOV facilities to be fully effective.

Preliminary Issues

- Which HOV improvement is most appropriate at these locations?
- What is the length/extent of the HOV facility?

2.1.10 Extension of HOV Lane on Bryant and Beale Streets

Many of San Francisco's streets which lead to the Bay Bridge are currently congested during the PM peak period, making it difficult for HOV vehicles to get to the Bryant Street HOV lanes and the Sterling Street on-ramp. As illustrated on Figure 10, this alternative would extend the HOV lane approach on Bryant Street to Embarcadero and install an HOV lane on Beale Street between Bryant and Harrison. In the block of Bryant Street between Main Street and Embarcadero, a lane could be added to Bryant Street by obtaining right-of-way from the Cruise Ship Terminal site. The precise operation and right-of-way necessary to implement this improvement would need to be identified in a later phase of the study.

Preliminary Issues

- What is the exact operation of HOV extension, particularly at intersections?
- How much right-of-way is necessary to implement improvement?

2.1.11 Extension of 2nd Street HOV Lane Eastward to King Street

As noted above, City streets leading to the Bay Bridge are heavily congested by bridge traffic during the evening peak period. This alternative, illustrated in Figure 11, would stripe a designated HOV lane on 2nd Street from Harrison Street to King Street. The extension would be approximately 1,200 feet.
The precise operation necessary to implement this improvement would need to be identified in a later phase of the study.

Preliminary Issues

- What is the exact operation of HOV extension, particularly at intersections?

2.1.12 Casual Carpool Restrictions and Formation of Carpooling Unloading Zones

Currently, morning peak period carpools from the East Bay drop-off passengers on Fremont Street between Howard and Folsom. This drop-off operation at the foot of the off-ramp from the Bay Bridge results in congestion as vehicles stop in the curb-lanes on Fremont Street to unload passengers, delaying vehicles exiting the bridge. This alternative would forbid carpool-drop offs on Fremont Street and create designated carpool drop-off zones on Howard and Folsom. These locations are presented in Figure 12.

As part of the upcoming work on US 101/I-80 in San Francisco, the Fremont Street off-ramp will be reconfigured and relocated by Caltrans. Rather than landing at its current location, the off-ramp will land further west at the Fremont Street/Folsom Street intersection. This alternative would continue to be desirable with the implementation of these geometric modifications.

Preliminary Issues

- Are the identified locations the best for carpool unloading zones?
- Do the locations have sufficient capacity to accommodate the unloading activity?
- What improvements are necessary to implement this option?

2.1.13 Redesign of Sterling On-Ramp (improved radius) with Improved Signing

Several issues currently slow down traffic flow at the Sterling eastbound on-ramp. First, three HOV lanes, approaching from two directions merge into a one-lane ramp before merging into general traffic flow on the Bay Bridge. Secondly, the two eastbound HOV lanes on Bryant Street have the right-of-way approaching the ramp, while a yield sign controls the westbound HOV lane.

The Sterling ramp improvement alternative would modify the existing ramp design and lengthen the merging area. The Bay Bridge retrofit project includes plans to alter the ramp design. The new design of the ramp would provide a smoother merge of eastbound and westbound Bryant traffic, with the westbound to be still yield-controlled. The area where the ramp merges with the Bay Bridge would be lengthened, allowing more room for vehicles to increase their speed before entering the main flow of traffic. According to the San Francisco Bay Bridge HOV Access Project by DKS Associates, these changes may increase speeds on the ramp, and in turn the capacity of ramp itself by 50 to 100 vehicles per hour. Although the alternative would not increase the capacity of the merge area, it would contribute to better service levels in the merge area.

Preliminary Issues

- What is precise definition of alternative?
- Is sufficient right-of-way available?
Figure 9
CONCEPTUAL ALTERNATIVES
HOV Improvements - 1st and Essex Streets
Add Third Southbound Lane with ROW from Cruise Ship Terminal Site

Cruise Ship Terminal

Extend HOV Lane on Bryant to Embarcadero and on Beale to Harrison

Korve Engineering

Figure 10

Extension of HOV Lane on Bryant and Beale Streets
Extend HOV Lane
Eastward to King Street
- Create Designated Casual Carpool Drop Off Areas on Folsom & Howard
- Restrict Casual Carpool Drop Offs on Fremont
- Proposed Realignment of Fremont Off-Ramp
2.2 SAN MATEO – HAYWARD BRIDGE CORRIDOR (SR 92)

The San Mateo Bridge toll plaza and the merge area east of the tollbooths is currently the primary westbound bottleneck in the corridor. Another bottleneck in the westbound direction is the two-lane ramp from southbound I-880 to westbound SR 92. Demand at this ramp regularly exceeds capacity during the morning peak hour, often resulting in standing queues on southbound I-880 extending to SR 238. In the evening peak hour in the eastbound direction, the primary bottleneck exists on the high bridge to low bridge transition where the facility necks from three eastbound lanes to two. However, construction is currently underway on a project that will widen the low, causeway bridge to three lanes in either direction with full shoulders. This project will also add toll booths and improve the merge area downstream from the toll plaza. The improvement will improve eastbound and westbound flows on the bridge.

The HOV facility improvements discussed in this section are important for the successful implementation of express bus alternatives, discussed in ‘4.1 Express Bus Service on the San Mateo Bridge’.

2.2.1 Widening of San Mateo Bridge Structure/Reversible Lanes

As discussed above, the San Mateo Bridge consists of a high-rise portion and a causeway portion. This alternative would widen both high-rise and a causeway portion of San Mateo Bridge by one lane. The widening of the existing high-bridge structure would entail the construction of a new parallel bridge. Engineering studies have identified that widening the structure through the use of a cantilever section is not possible.

As an alternative to bridge widening, a reversible lane could be installed on the high-rise portion of the bridge. The reversible lane would be installed through the use of a movable concrete barrier. The barrier would be used to operate the high rise portion of the bridge as 4 westbound lanes/2 eastbound lanes (AM Peak), 3/3 or 2/4 (PM peak). When construction on the new causeway section of the bridge is complete, two low causeway bridges will exist, one operating in the eastbound direction and one operating westbound, each with three lanes and full shoulders. With the reduction in shoulder widths on the low causeway bridges, four lanes can be provided in either direction on the low portions of the bridge. Thus, with the installation of a reversible barrier on the high-rise portion of the bridge and the use of shoulders on the low-rise portion, the San Mateo Bridge could be operated as a four lane facility in either direction. Figure 13 illustrates a summary of this alternative.

Preliminary Issues

- Where will the machine that moves the barrier be stored?
- Conceptual design of transition areas for lane additions and drops.
- Affects of shoulder loss on transbay capacity.
2.2.2 SR 92 - Toll Plaza Improvements/Expansion

As identified in the Existing Conditions Report the San Mateo Bridge toll plaza and the merge area just west of the toll plaza are major constraint points for westbound transbay travel. This alternative would improve the operation of the toll plaza by adding additional toll booths, increasing FasTrak capacity and/or improving the merge area west of the toll plaza.

Construction is currently underway on the widening of the causeway section of the bridge. In addition, Caltrans has a number of projects in design to improve the toll plaza, the toll plaza approach and modify the merge area west of the plaza. These improvements will likely change the operating characteristics in this area and have an affect on the alternatives and recommendations of the Bay Crossings Study.

Preliminary Issues

- Will the improvements to the bridge that are currently underway obviate the need for this improvement?

2.2.3 SR 92 - Close HOV Gap - I-880 to Hesperian

This alternative, as shown in Figure 14, would add a left-side HOV lane in each direction and fill an HOV gap between Hesperian and I-880. This alternative would change the section from three mixed flow lanes in each direction to three-mixed flow traffic lanes and a HOV lane in each direction. Design is currently underway by Caltrans on a project to extend the HOV lane on this section from its current terminus eastward, several hundred feet west of Hesperian Boulevard. Under this alternative that HOV lane would be extended further east over I-880 to the first signalized intersection on Jackson Street (Santa Clara). The configuration of the tie in on Jackson Street will need to be more precisely defined in a later stage of the study. The affects of this proposal on the I-880/SR 92 interchange as well as the availability of right-of-way on the section of SR 92 between Hesperian Boulevard and I-880.

Preliminary Issues

- Is sufficient right-of-way available?
- How will improvement tie in at I-880 interchange?
- What is eastern terminus of HOV lane?

2.2.4 SR 92/I-880 Interchange Improvement

The southbound I-880 to westbound SR 92 ramp is one of the bottlenecks in the San Mateo Bridge corridor in the AM peak period. This alternative, as illustrated in Figure 15, would widen this ramp from one-lane to two lanes, providing for an appropriate transition on westbound SR 92. The ramp from eastbound SR 92 to northbound I-880, heavily used in the PM peak period would also be widened and possibly reconfigured to provide greater capacity. As part of the interchange improvement, provisions would also be made to provide new direct HOV flyovers that connect 1) eastbound SR 92 to northbound I-880, and 2) southbound and I-880 to westbound SR 92. The existing
westbound HOV lane on SR 92 would be extended from the SR 92 /I-880 junction to the Jackson Street and Santa Clara Street. This HOV extension is approximately 1,700 feet.

Preliminary Issues

- More precise definition of option to be developed.
- Is sufficient right-of-way available?
- Where/how to flyovers take-off and touch-down?

2.2.5 Widening I-880 between SR-238 and SR 92

Due to the bottleneck at the I-880 and SR 92 junction as well as bottlenecks further downstream, standing queues on southbound I-880 can extend to SR 238 during the morning peak period. These standing queues cause significant congestion on southbound I-880 in the morning peak hour. This “Bay Crossings” issue often results in substantial delay for southbound through traffic on I-880 that does not want to cross the bay. Similarly, in the evening peak hour, inadequate capacity on eastbound SR 238 and the ramp from northbound I-880 to eastbound SR 238 create standing queues on northbound I-880. These queues delay northbound through traffic on I-880.

This alternative, as illustrated in Figure 16, would add two mixed-flow lanes to the existing eight mixed flow lanes and two HOV lanes between SR 238 and SR 92. The availability of adequate right-of-way to implement this measure will need to be confirmed in later stages of the study.

Preliminary Issues

- Is sufficient right-of-way available?

2.2.6 SR 238/I-880 Interchange Improvement

The one-lane ramp from northbound I-880 to eastbound SR 238 is a major bottleneck during the evening peak hour. This alternative, illustrated in Figure 17, would widen the northbound I-880 to eastbound SR 238 interchange to two lanes. To provide for a better transition in the opposite direction (westbound to southbound) at the interchange, an auxiliary lane is proposed in the southbound direction. This lane would allow the two-lane ramp from westbound SR 238 to southbound I-880 to receive better utilization, particularly during the highly congested morning peak period.

Preliminary Issues

- Configuration of merge/diverge points on SR 238 and I-880.
Figure 14
CONCEPTUAL ALTERNATIVES
Close HOV Gap - Hesperian Boulevard to I-880 & Jackson / Santa Clara
Figure 15
CONCEPTUAL ALTERNATIVES
SR 92 / I-880 Interchange Improvements
Figure 16
CONCEPTUAL ALTERNATIVES
Widen I-880 to Ten Mixed Flow and Two HOV Lanes
SR 238 to SR 92
Figure 17
CONCEPTUAL ALTERNATIVES
I-880 / SR 238 Interchange Improvements
2.3 Dumbarton Bridge Corridor (SR 84)

As identified in the Existing Conditions Report, the Dumbarton Bridge corridor has two primary bottlenecks. In the morning peak hour, the Dumbarton Bridge toll plaza significantly restricts the flow of westbound traffic. The toll plaza cannot deliver sufficient westbound vehicles to the Dumbarton Bridge.

The second primary bottleneck in the corridor is the University Avenue / SR 84 signalized intersection. This intersection restricts traffic flow in both the eastbound and westbound directions. As indicated by the eastbound and westbound traffic volumes, this restriction is more severe in the eastbound direction. Even if the toll plaza could deliver more eastbound traffic to the Dumbarton Bridge, it is unlikely that the University Avenue intersection could accommodate it.

2.3.1 Construct East Palo Alto/University Avenue Bypass

This alternative, illustrated in Figure 18, would construct a new road that would connect SR 84 with US 101. The construction could potentially occur in two phases. In the first phase, a new road would be constructed connecting SR 84 with Pulgas Avenue. From Pulgas Avenue, vehicles could access the Embarcadero/US 101 interchange to complete their trip. In a potential second phase, a direct connector from SR 84 to US 101 at the Embarcadero interchange, skirting the San Francisco Bay, would be constructed.

A number of sensitive issues would need to be resolved in order for this alternative to be pursued. First, the ability of the Embarcadero Road interchange to handle a substantial amount of new traffic may be an issue. Secondly, the alternative would likely involve a number of environmental issues. The existing University Avenue / Bayfront Expressway intersection is surrounded by areas that are likely environmentally sensitive wetlands. The bypass would also be aligned parallel to the Baylands Nature Preserve and Palo Alto Municipal Golf Course. Finally, the Baylands Athletic Center currently exists on the alignment that would connect a new link with Embarcadero.

Preliminary Issues

- Substantial Bayfront environmental concerns.
- Exact unencumbered alignment is unclear at this time.

2.3.2 SR 84 - Grade Separation of University/SR 84 Interchange

This alternative, illustrated on Figure 19, would separate the eastbound through lanes from conflicting traffic at the University Avenue/State Route 84 intersection. This would be accomplished through the construction of a bridge over University Avenue, allowing vehicles traveling eastward on the Bayfront Expressway (SR 84) to bypass this intersection without stopping. With this improvement, the only remaining at-grade conflicting movements would be the left-turns into and out of University Avenue. However, the left turn from University Avenue to westbound SR 84 is a very light movement and the improvement would allow the heavy left turn from the Dumbarton Bridge to University Avenue to proceed relatively unimpeded by conflicting traffic. Westbound through traffic would flow through the new interchange without stopping and a merge for left turning traffic from University Avenue would be provided west of the intersection.
Preliminary Issues

- Environmental concerns.
- Availability of right-of-way.

2.3.3 SR 84 - Toll Plaza Improvement/Expansion

This alternative would improve the operation of the Dumbarton Bridge toll plaza by increasing the number of toll booths and providing dedicated FasTrak lanes. As previously discussed, the Dumbarton Bridge toll plaza is the primary bottleneck in this corridor, and it cannot sufficient westbound traffic onto the bridge during peak travel periods.

Preliminary Issues

- Number of required toll booths.
- Availability of right-of-way.

2.3.4 SR 84/I-880 Interchange - Direct HOV flyovers

The alternative, illustrated in Figure 20, would provide new direct HOV flyovers from westbound SR 84 to I-880 northbound and I-880 southbound to SR 84 westbound. These HOV flyovers would provide direct connections between HOV lanes on SR 84 and I-880. The implementation of this improvement will require substantial median right of way on both of these freeways. The presence of adequate right-of-way to implement these improvements will need to be confirmed in later stages of the study. The parkway/roadway improvement project planned/under design to the east offers an opportunity to extend the HOV lane eastward at-grade.

Preliminary Issues

- Availability of right-of-way.
- Locations and configuration of flyover take-off and touch-down points.
GRADE SEPARATION OF EASTBOUND THROUGH LANES

Figure 19
CONCEPTUAL ALTERNATIVES
Grade Separation of SR 84 / University Avenue Intersection
CONSTRUCT DIRECT HOV FLYOVERS - NORTH TO WEST & WEST TO NORTH
3.0 NEW HIGHWAY/MULTIMODAL AND BART/RAIL/OTHER FIXED GUIDEWAY CROSINGS

3.1 NEW MULTIMODAL BRIDGE– SR 238 TO SOUTH OF CANDLESTICK POINT

This alternative would include the construction of a new mid bay crossing between the Bay and San Mateo Bridges. As illustrated in Figure 21, the new multi-modal bridge could provide four traffic lanes with full shoulders and potentially two-directional rail travel. This alternative would touch down in the East Bay in San Leandro, providing a direct connection from SR 238. In the West Bay the bridge would touch down south of Candlestick Point at the Lagoon Way interchange with US 101. The total length of the new bridge would be approximately 12 miles. Of the 12 miles, ten would be over the Bay. The bridge would likely be configured in a fashion similar to the San Mateo Bridge, with a low causeway section on the eastern side of the bay and a high bridge crossing the shipping channel on the western side of the bay. The new bridge would be located as to miss the glide-slopes of both the San Francisco and Oakland International Airports.

Preliminary estimates approximate the cost of such a new bridge at $6 billion. The figure does not include costs associated with improving bridge approaches.

Preliminary Issues

- Environmental issues such as the potential impacts on wildlife and air quality are issues to be addressed at the bridge approaches in both the East and West Bay. In Brisbane, the bridge approaches intersect the India Basin shoreline. The east approaches to the bridge intersect the San Francisco Bay Shoreline in San Leandro.

- The addition of rail, either commuter rail or BART, to this alignment would generate an additional set of issues. Of these, the primary issue would be the identification of a logical operating plan. A direct connection to BART would be difficult. BART is located in Daly City several miles west of US 101 at the touchdown area, with significant obstacles located between the two locations. Caltrain is located close to the touchdown point; however, a logical commuter rail operating plan connecting the East and West Bays on this alignment will need to be identified.

- Adequate approach capacity on US 101 may not exist at the western touch-down location. The section of the Bayshore Freeway at Lagoon Way is heavily trafficked by northbound and southbound through traffic during peak periods. This traffic may not allow for the new bridge to be fed in an appropriate manner.
CONCEPTUAL ALTERNATIVES

New Multimodal Bay Crossing - SR 238 to South of Candlestick Point
3.2 NEW MULTIMODAL BRIDGE/TUNNEL – SR 238 TO I-380

Like the previous, this alternative would also include the construction of a new mid bay crossing between the Bay and San Mateo Bridges. As illustrated in Figure 22, the new multi-modal bridge would provide four traffic lanes with full shoulders and potentially two-directional rail travel. This alternative would touch down in the East Bay in San Leandro, providing a direct connection to and from SR 238. In the West Bay the bridge would connect to I-380 at the San Francisco International Airport. The total length of the new bridge would be approximately 13 miles. Of the 13 miles, 11 would be over the Bay. The bridge would likely be configured in a fashion similar to the San Mateo Bridge, with a low causeway section on the eastern side of the bay and a high bridge crossing the shipping channel on the western side of the bay. However, unlike the previous alternative on the western side of the Bay the alignment would include a tunnel under the San Francisco International Airport, connecting to I-380 at US 101.

The tunnel section of the new facility would begin via a portal to be constructed on the eastern end of the new runways proposed as part of the airport expansion project currently under consideration. Figure 23 illustrates the location and extent of the expansion project as well as a potential location for a new bridge/tunnel portal.

Preliminary estimates approximate the cost of such a new bridge/tunnel at $6.5 billion. The figure does not include costs associated with improving the bridge/tunnel approaches.

Preliminary Issues

- Environmental issues such as the potential impacts on wildlife and air quality are issues to be addressed at the bridge approaches in both the East and West Bay. On its West Bay touchdown, this alternative would include an expansion of the bay fill required for the new planned SFO runways. Appropriate mitigation would have to be found to off-set the creation of the tunnel portal in the Bay. The east approaches to the bridge intersect the San Francisco Bay Shoreline in San Leandro.

- The addition of rail, either commuter rail or BART, to this alignment would generate an additional set of issues. Of these, the primary issue would be the identification of a logical operating plan. A direct connection to BART would be difficult. The design of the BART connection to SFO prohibits a direct connection from the east to the BART airport connector (any such connector would conflict with the existing and planned runways).

- Unlike the previous alternative, this alignment would fit well within the existing highway system on both sides of the Bay, providing a direct connection between I-380 and SR 238 for transbay traffic.
CONCEPTUAL ALTERNATIVES

New Multimodal Bay Crossing - SR 238 to I-380
3.3 New San Francisco BART Subway

According to BART and data collected for the Existing Conditions Report, transbay BART travel is currently constrained by the existing stations in downtown San Francisco. To a lesser extent, the transbay tube and Oakland Wye also constrain BART's transbay operation. However, train dwell time in the downtown San Francisco stations is the primary transbay system constraint at this time. Station dwell time is caused by train acceleration and deceleration and train unloading and loading times, which constrain the headways which BART may move trains through the transbay tube. This alternative would eliminate this problem by constructing a second subway in San Francisco, potentially on Mission Street or Howard Street. On either of these roadways the alignment would connect to the new Transbay Terminal. After passing through downtown on one of these streets, the alignment could turn up Geary Street, as presented in Figure 23.

With this improvement, all transbay BART trains would continue to pass through the existing transbay tube, however, a junction would be constructed east of the Embarcadero Station. At this junction, the transbay tube could feed alternating trains into each of the two San Francisco subways. An appropriate operating plan would need to be identified, linking multiple East Bay lines with the two San Francisco lines. To feed sufficient numbers of trains into the tube with this alternative, BART would need to reinstate the dual direction operation of the third track through Oakland, potentially expand train capacity through the Oakland Wye with improved traffic control, and possibly skip-stop West Oakland.

Construction of a new subway station in the South of Market area would cost approximately $100 million. Preliminary estimates approximate the cost of a new City subway as $500 million per mile. A new alignment stretching to the Geary/Van Ness intersection would be approximately 1.7 miles in length on this alignment. Thus assuming four new stations on Mission/Howard and two new stations on Van Ness, the total cost of this improvement would be approximately $1.5 billion.

Preliminary Issues

- Potential archaeological and/or historical impacts that would be associated with tunneling under Mission Street in San Francisco on the west approach of the BART Transbay tube connection are the potential environmental issues.
- Development of an appropriate operating plan.
- East Bay improvements are necessary to feed sufficient trains into the transbay tube.

3.4 New BART Transbay Tube via Alameda

A second phase of transbay improvements for the BART system could include a second subway in San Francisco. In San Francisco, the alignment would follow that described in Alternative 3.3 above, a second subway on Mission or Howard Street with a connection down Geary. However, rather than connecting this new subway to the existing transbay tube, under this alternative a new second transbay tube would be constructed. As illustrated on Figure 24, the concept for this alternative is a new tube connecting to the East Bay via Alameda. Two new stations would be constructed on Alameda. The first would be at the center of the Naval Air Stations redevelopment area and the second would be at the College of Alameda, which is planned as a transit center/hub. From Alameda the new BART alignment would pass underneath the Oakland/Alameda shipping channel to a new Jack London...
Square Station. A new BART Jack London Square Station would allow passenger to transfer to and from Amtrak and Capitol Corridor trains.

In Oakland, this improvement would necessitate the construction of a fourth track through downtown. The BART system was originally designed to include a fourth track through Oakland, but it was removed as a cost saving measure late in the project. The new tube alignment would connect through Oakland to the existing MacArthur station along this fourth track, avoiding conflicts at the Oakland Wye.

A second transbay tube could potentially double BART transbay capacity. Conceptually, the operating plan with the new tube in place would be for Concord/Bay Point trains to run directly to San Francisco via the new Mission/Howard tube, with Richmond, Dublin/Pleasanton and San Jose trains in the existing tube.

Preliminary estimates approximate the cost of such a new tunnel with associated improvements on the East and West Bay sides as $5.5 billion.

**Preliminary Issues**

- There is a question if BART can attract sufficient ridership to support the second transbay tube. While historic ridership growth has been robust, existing East Bay parking terminals cannot accommodate additional vehicles. The addition of new stations and parking facilities has historically been a prime driver of transbay ridership growth.

- The alignment does not provide flexibility. This alternative would require a second stub-end terminal in the West Bay, similar to the Daly City line that would have storage and maneuvering needs.

- The potential archaeological and/or historical impacts that would be associated with tunneling under Mission Street in San Francisco on the west approach of the BART Transbay tube connection are potential issues.

- Construction of a new BART tube under the Bay will require significant dredging. The environmental impacts of this dredging could be substantial.

- Seismic risk of a tunnel is dependent on the soil through which it passes. During an earthquake, it would move no more than the surrounding soil. If the tunnel is stiff, as wide tunnels tend to be, then the movement will be less but the earth pressure on the tunnel's shell would be greater. The costs and benefits tied to seismic behavior will be a significant component in the tunnel type selection.

**3.5 New BART Mid-Bay Tube or Bridge Connecting Millbrae to Hayward**

This alternative, illustrated in Figure 25, would include the construction of a new mid-bay BART crossing. The alternative is envisioned to connect the Hayward and Millbrae BART stations, crossing the Bay on an alignment parallel to the San Mateo Bridge. On an alignment parallel to the San Mateo Bridge the alternative would need to include a bridge over the shipping channel or a tunnel under the shipping channel. In either instance, the alternative would likely include a low-rise causeway bridge on the eastern side of the Bay. Installation of the alternative would complete a circular route that encloses the upper part of the San Francisco Bay. The bridge would provide two tracks.
The alternative would include potential for the displacement of housing, commercial, and recreational uses as well as right-of-way acquisition in San Leandro and Foster City. On either end of the Bay, alignments connecting the new BART crossings with existing BART facilities will need to be identified in later stages of the study.

Preliminary estimates approximate the cost of such a new bridge at $6.8 billion.

Preliminary Issues

- Construction of a new BART tube under the Bay would require significant dredging. The environmental impacts of this dredging could be substantial. A new BART bridge across the Bay would also have substantial environmental concerns, especially in the Baylands at the shore.

- The operating plan and potential market for the alignment is unclear at this time.

- Seismic risk of a tunnel is dependent on the soil through which it passes. During an earthquake, it would move no more than the surrounding soil. If the tunnel is stiff, as wide tunnels tend to be, then the movement will be less but the earth pressure on the tunnel's shell would be greater. The costs and benefits tied to seismic behavior will be a significant component in the tunnel type selection.
Korve Engineering

2000 SAN FRANCISCO BAY CROSSINGS STUDY

Figure 23

CONCEPTUAL ALTERNATIVES
Second San Francisco Subway (Mission or Howard) with Geary Street Extension
Figure 24
CONCEPTUAL ALTERNATIVES
New BART Tube - Jack London Square / Alameda Alignment
3.6 RECONSTRUCTION OF DUMBARTON RAIL BRIDGE WITH COMMUTER RAIL SERVICE

Reestablishment of passenger service across the Dumbarton Bridge offers a potentially cost effective means of increasing the cross bay travel capacities, especially during the commuter peak periods. As many as six commuter trains an hour, operating on ten minute headways, could potentially operate over the bridge, with each train bringing up to 1,400 patrons onto the peninsula. The trains would operate on weekdays only, until ridership and market demand grew. The initial service levels would be trains operating on twenty to forty minute headways during the peak period and some midday service. Each train would consist of a locomotive and three or four cars. The trains would connect with Caltrain at a new South Redwood City station for a cross platform transfer of riders to destinations north or south. The trains may also operate directly from the Redwood City connection to San Francisco or San Jose. Figure 26 illustrates this potential alternative/alignment.

Two alignment options for the bridge's reconstruction have been preliminarily identified:

1. Rehabilitation of current alignment; or
2. Parallel alignment with minimum offset.

3.6.1 Bridge Type

The rail bridge would be a continuous girder bridge. It could be a short span with a swing span, a long span high bridge with a swing span, or a long span high bridge with clearance for airboats. The existing Dumbarton vehicular bridge provides 200 feet of horizontal clearance and 85 feet of vertical clearance.

3.6.2 Potential Operating Plan

A number of studies have been conducted over the years regarding the reestablishment of service over the Dumbarton Bridge. These studies all show that the majority of the transportation needs are for westbound movements in the morning, and eastbound in the evening. The ridership predominately originated in Fremont, Union City, Newark, and Hayward, with destinations between Palo Alto and Redwood City. A number of options have been explored, including starting the trains at Livermore, Union City and Hayward. This study describes a refinement of earlier plans; however, it is important to note that all these plans are conceptual in nature, showing the over-all feasibility of a cross Dumbarton Bridge commuter service, and not final operating proposals.

The later studies included working with the Altamont Commuter Express (ACE) to coordinate traffic between Livermore, Niles Junction and San Jose. ACE operates trains from Stockton to San Jose. Starting with two peak period trains in each direction in October of 1998, the service has significant expansion plans. A third train was added in March of 2001, with others to follow as track and signal improvements are completed. Any trains over the Dumbarton Bridge corridor would need to be scheduled in coordination with the ACE and Amtrak Capitol Corridor services.

The Dumbarton Service trains could start at the proposed downtown multimodal station in Tracy, with “turn-back” services from Pleasanton and Livermore during the peak periods. (A turn-back service is when one train-set returns to an outlying point and makes a second trip during the peak period.) A percentage of the trains traveling through the canyon will turn south at Niles and continue on to San Jose and Coyote Valley points. The remaining trains will continue over the Dumbarton Bridge to Redwood City and the peninsula. Please refer to the attached schedule for a potential morning peak operating scenario.
Trains would stop at Vasco, Livermore and Pleasanton. After traveling Niles Canyon, a new station is recommended at the BART crossing in Union City, providing a connection for patrons from Hayward and other East Bay Points. After the Union City stop trains headed to San Jose stop at Fremont, or Niles for trains headed over the Dumbarton Bridge. Every other train would cross the bay via the Dumbarton Bridge, for forty minute headways across the bridge at service start-up. The frequency of service could increase as the ridership demand grows over time. During the off peak or midday period, at least one train should be operated from San Jose and one over the Dumbarton Bridge. The trains would be scheduled to complement Caltrain and Capital Corridor services along the east and west sides of the bay.

In the evening, the trains would operate in reverse, scheduled to provide a twenty minute headway through Niles Canyon and beyond. The twenty minute headway was selected to provide a number of choices for the passenger. In addition, the schedule allows for some recovery if one train encounters a minor delay. This enhances the reliability of a passenger service.

3.6.3 Preliminary Issues

- The railroad infrastructure on the eastern approach to the bridge will require significant improvement in order to fully utilize the route. The operation of commuter service from the Central and Castro Valleys into the South Bay is currently severely constrained due to the single track infrastructure between Livermore and Niles Junction, via the Niles Canyon. Until the early 1980's, there were two routes through the canyon, the southern side was operated by the Western Pacific Railroad, the northern side by the Southern Pacific Railroad. At that time, the Southern Pacific arranged a trackage access agreement with the Western Pacific wherein it could operate between Fremont and Tracy on the Western Pacific alignment. The SPRR trackage and right of way in Niles Canyon was sold to Alameda County in the mid 1980's. The rails were removed, but the ties between Niles, Sunol and Pleasanton were left for the use of a historic preservation group. The entire track structure was removed beyond Pleasanton to the county line near Livermore. The preservation group has successfully restored the track from Niles Junction to Sunol for use as a demonstration railroad, and has plans to extend the demonstration trackage into Pleasanton.

- In order to provide sufficient track capacity for the freight service and a reliable passenger service, strong consideration should be given to the restoration of the Southern Pacific alignment through Niles Canyon. The right-of-way represents a vastly underutilized public investment at this time. The reinstallation of trackage on the alignment will create a separate passenger route through the canyon, allowing the public agencies to operate as great a number of trains as demand dictates, without having to negotiate trackage agreements with a private carrier. However, by utilizing the already existing time slots on the Union Pacific Railroad, combined with the reinstallation of the track on the former Southern Pacific alignment, the potential exists to create a double track railroad through the canyon. While the UPRR track would be predominately freight, and the rebuilt SPRR track predominately passenger, each track would be available for the use of the other service. Operating in this manner creates a significant amount of flexibility for both the passenger and freight operators.

- The use of the tracks in revenue service could provide funding for track improvements. The use of the tracks by the demonstration railroad would be restricted to the weekends, and potentially occasional weeknight trains, time periods when the commuter trains do not operate.
• In addition, the trackage between Niles Junction and the junction with the Mulford line west of Niles will require reconfiguration to eliminate several sharp curves, and allow for direct routing of trains from Niles through Newark and onto the Dumbarton Bridge route.

3.6.4 Seismic Risk

The trestle portion of the bridge is a candidate for rehabilitation. Further study is required to determine if this option remains on the shortlist since the trestle was designed many years ago and assumed a level of risk that was based not only the state of seismic engineering knowledge at that time, but also did not anticipate passenger service. Currently the existing crossing runs through soil with high to very high susceptibility to liquefy.¹

3.6.5 Environmental Impact

Site disturbance would be at its greatest during the bridge replacement operations. The level of this disturbance would be a function of whether the alignment allows access and work to be staged from the existing structure or not. Otherwise temporary parallel access must be provided in the form of a dredged channel or a temporary trestle structure.

3.6.6 Capital Cost

Table 1 presents a summary of the improvement costs identified in the Final Report, Dumbarton Rail Corridor Study, prepared by Parsons Brinkerhoff Quade and Douglas in September 1997.

Table 1: Rehabilitation of Dumbarton Bridge

<table>
<thead>
<tr>
<th>Segment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the Redwood City junction with Caltrain to the western end of the bridge structure</td>
<td>$20 million</td>
</tr>
<tr>
<td>The bridge structure from the western to water edge of the bay</td>
<td>$50 million</td>
</tr>
<tr>
<td>From the eastern end of the bridge structure to Newark Junction</td>
<td>$20 million</td>
</tr>
<tr>
<td>From Newark Junction to the Fremont-Centerville Capitol/ACE station</td>
<td>$10 million</td>
</tr>
<tr>
<td>From Fremont-Centerville Capitol/ACE station to Union City via Niles Junction</td>
<td>$25 million</td>
</tr>
<tr>
<td>Right of Way from Fremont-Centerville Capitol/ACE station to Union City via Nile Junction</td>
<td>$15 million</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$140 million</td>
</tr>
</tbody>
</table>


¹ USGS open file report 00-44(2000)
Figure 26
CONCEPTUAL ALTERNATIVES
Reconstruction of Dumbarton Rail Bridge with Commuter Rail Service
3.7 COMMUTER RAIL TUNNEL – SAN FRANCISCO TO OAKLAND

Under this alternative a new commuter rail tunnel underneath the San Francisco Bay, connecting San Francisco with Oakland would be constructed. The potential alignment developed for this alternative is illustrated in Figure 27. The new tunnel would connect with Caltrain in San Francisco and the East Bay Rail system in Oakland. In order to implement service, the alternative would require upgrading and electrification to existing rail trackage on both sides of the bay. The new tunnel could be constructed in a manner consistent with ongoing high-speed rail plans.

3.7.1 Description of Corridor

The new passenger rail corridor would extend approximately 11 miles between a Caltrain connection and a new junction in the East Bay with the Union Pacific mainline.

The components of the bridge project and their length are:

- Commuter Rail tunnel from the terminus of Caltrain to the western end of the tunnel structure in San Francisco: 1.0 to 0.5 miles
- The tunnel from the western portal to a portal in the East Bay: 8.1 miles
- From the eastern portal to a new junction with the Capitol Corridor: 1.75 miles

3.7.2 Caltrain

The alignment in San Francisco could be developed if Caltrain is extended to a new Transbay Terminal, or as extension of Caltrain directly from its current terminus at 4th Street in the South of Market area of San Francisco. From San Francisco, the tunnel would proceed east in an alignment that would roughly parallel the BART tunnel by passing south of Treasure Island. On the East Bay the train tunnel would emerge and connect with the Capitol Corridor/Union Pacific main line that runs in a generally north-south direction approximately one-mile from the shoreline of San Francisco Bay in the Oakland-Emeryville area. The commuter rail tunnel alternative would allow trains to travel from San Jose and the Peninsula through San Francisco to the East Bay. The Commuter Rail service conceptualized at this stage of the Bay Crossing Study would serve the predominant commute pattern in the East Bay most readily served by existing passenger rail corridors, namely the I-80 corridor to San Francisco from the East Bay with a north East Bay focus to Emeryville, Berkeley, Richmond, Hercules and Martinez. In addition, intercity trains could travel on this same new corridor to provide much longer distance service between San Jose and Sacramento via San Francisco-Oakland, Emeryville, Martinez and Fairfield.

A commuter rail route up the Peninsula and through San Francisco to go south from Oakland, while possible, would follow a much of the route and travel markets that would be served by taking BART service between Fremont and Millbrae.

3.7.3 Capital Costs

The cost of this improvement has been preliminarily identified as $3.8 billion (2000). This is broken down by segment below.

---

2 Bay Bridge 2000 Nelson & Nygaard

Korve Engineering  48  9/10/01
2000 San Francisco Bay Crossings Study

- Commuter Rail tunnel from the terminus of Caltrain to the western end of the tunnel structure in San Francisco: $150 to $250 million
- The tunnel from the western portal to a portal in the East Bay: $3.4 billion
- From the eastern portal to a new junction with the Capitol Corridor: $150 million

A tunnel with two-tracks for Commuter Rail and two-tracks for BART would be 25% more expensive than a tunnel with two-tracks for Commuter Rail.

3.7.4 Operating Plan Options

Potential operating plans for the new commuter rail service would provide initial connections to Oakland and Richmond, with potential long-term connections to Sacramento and San Jose.

3.7.5 Preliminary Issues

- Seismic risk of a tunnel is the dependent on the level of understanding of the soil through which it passes. During an earthquake, it would move no more than the surrounding soil. If the tunnel is stiff, as wide tunnel tends to be, then the movement will be less but the earth pressure on the tunnel’s shell would be greater. The costs and benefits tied to seismic behavior will be a significant component in the tunnel type selection.
- The feasibility of adding a track in the environmentally sensitive Suisan Marsh segment between Benicia and Suisan-Fairfield is a question
- Yolo Causeway is currently single tracked because of the need for bridge construction.
- The segment from Newark to San Jose is single track that crosses environmentally sensitive wetlands.

3.8 SAN FRANCISCO AIRPORT TO OAKLAND AIRPORT CONNECTOR

This alternative would provide a new connector linking the San Francisco International Airport to Oakland Airport. Conceptually, is alternative includes a new “rail” or “people mover” link between the two airports. The potential exists to provide and East to West Bay connection between BART along such an alignment. If the technology of the SFO Airtrain could be matched to the planned Oakland Airport BART connector, such an improvement could link BART via the airports. Based on information developed for the 1991 Bay Crossings Study, the people mover could capture 3 million annual passenger trips made by East Bay residents and 300 daily truck trips going to the San Francisco International Airport. This connector is envisioned to be a two-track tunnel that would be in a subway section through the runway areas, but could rise above grade at each terminal’s land-side. The connector would be about 13 miles in length.

Preliminary estimates approximate the cost of such a new tunnel would be $6.5 billion.

Preliminary Issues

- The ability to attract a sufficient level of patronage to justify the cost of the system.
- The potential impact on wetlands and sensitive shoreline habitat located adjacent to the Oakland Airport and Oyster Bay Regional Shoreline in the East Bay during construction.
- The feasibility of tunneling through the foundation pilings for the terminals.
- The process of tunneling under the runways due to their Bay Mud foundations and pavement thickness.
- The compatibility of a transbay people mover system with those currently programmed for both airports.
- Handling and movement of baggage and freight.
Figure 27
CONCEPTUAL ALTERNATIVES
New Commuter Rail Tunnel - San Francisco to Oakland
4.0 EXPRESS BUS SERVICES

As previously discussed, many of the HOV facility improvement alternatives detailed in Section 2.0 are required to support the Express Bus Alternatives.

4.1 EXPRESS BUS SERVICE ON THE SAN MATEO BRIDGE

The San Mateo-Hayward Bridge connects the East Bay with the Peninsula (Hayward to Foster City). The facility is about eight miles long, including the causeway and elevated sections. On the east end of the bridge, the toll plaza is about three miles from the junction with Interstate 880.

As with the Dumbarton Bridge corridor, the current San Mateo Bridge transit corridor is extremely problematic due to traffic congestion and lack of investment either in transit facilities or in transit operations. SamTrans attempted to operate several different services across the San Mateo Bridge over a period of more than 10 years. SamTrans currently operates a "shuttle" which leaves the Hayward BART station four times in the morning peak period, with four trips returning in the afternoon. The current service is provided through a substantial (75 percent) subsidy from the City of Foster City—the service is currently averaging about 110 passengers (or about 13 per trip). The fare box recovery is about nine percent and the cost per passenger is almost $11. As with other attempts, the bus service is severely hampered by the same traffic delays (which are substantial) as mixed flow traffic.

Major mid-Peninsula traffic generators include San Francisco International Airport (35,000 to 40,000 jobs), the new Franklin Resources center near Bay Meadows racetrack, the Oracle and Redwood Shores development on the bay front between Ralston Avenue and Holly Street, and Foster City. San Francisco International Airport conducted an employee origin and destination survey in 2000. Of the employees surveyed, about four percent of the employees (representing 1,200 to 1,500 daily round trips) lived in the Hayward/San Leandro area. Workers were present on all shifts. In addition to the airport, additional jobs are located at the hotels south of the airport along Old Bayshore Boulevard, between the Broadway/Burlingame and Millbrae Avenue exits. The hotels informally estimate there are about 2,500 hotel workers in this lodging concentration, and that probably about five percent presently commute over the San Mateo Bridge. South of the San Mateo-Hayward Bridge, large concentrations of employees are in the Redwood Shores area with about 15,000 commuters. Other concentrations include the Foster City area with about 21,000 employees. Origins in the East Bay tend to be scattered, and as a result, there is a many-to-many trip distribution between East Bay origins and Peninsula destinations.

4.1.1 Description of Corridor

A new bus system in this corridor would likely extend from the Bay Fair BART station (which is the first common station for the Dublin and Fremont lines) to three locations on the mid-Peninsula. These potential routes are presented in Table 2.

Table 2: San Mateo Express Bus Alternatives

<table>
<thead>
<tr>
<th>Route</th>
<th>Origin</th>
<th>Destination</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM 1</td>
<td>Bay Fair BART</td>
<td>Redwood Shores/ Oracle</td>
<td>24 miles</td>
</tr>
<tr>
<td>SM 2</td>
<td>Bay Fair BART</td>
<td>Foster City</td>
<td>19 miles</td>
</tr>
<tr>
<td>SM 3</td>
<td>Bay Fair BART</td>
<td>San Francisco International Airport</td>
<td>27 miles</td>
</tr>
</tbody>
</table>
4.1.2 Capital Costs

The capital investment includes vehicles, park and ride facilities and HOV facilities. These items are preliminarily summarized in Table 3.

Table 3: San Mateo Express Bus Alternatives

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Cruiser&quot; buses</td>
<td>27</td>
<td>$11 million</td>
</tr>
<tr>
<td>Park and Ride Spaces</td>
<td>3,000</td>
<td>$45 million</td>
</tr>
<tr>
<td>HOV Facilities</td>
<td>See Section 2.2</td>
<td>To Be Determined</td>
</tr>
</tbody>
</table>

Park and Ride facilities are necessary because the system must group passengers on in the East Bay for carriage to three primary mid-Peninsula locations – Redwood Shores (Oracle), Foster City, and San Francisco International Airport. Park and Ride facilities are estimated to serve about half of the bus passengers. Finally, HOV facilities are required for congestion by-pass to give the bus system a faster overall travel time. Highway travel times over San Mateo Bridge can be characterized as poor.

The I-880/92 interchange will continue to be a major capacity constraint. It is likely that in the afternoon peak period, traffic will back-up from the interchange to the causeway section of the bridge.

4.1.3 Operating Plan Options

In the East Bay, buses would operate from the Bay Fair BART station to the San Mateo Bridge via Hesperian Boulevard. Major park and ride facilities would be located at Bay Fair BART, and at the Hayward Airport and Chabot College. These options are illustrated in Figure 28.

4.1.3.1 Option 1 - Route SM1 Bay Fair BART to Redwood Shores

Route SM1, which would connect Bay Fair BART to the Redwood Shores area via Hesperian, the San Mateo Bridge, U.S. 101, Hillsdale Boulevard, El Camino Real, Ralston Avenue, Marine World Parkway, Twin Dolphin Parkway, Redwood Shores Parkway to Pico Boulevard (San Carlos Airport).

Total trip time would be 50 minutes in each direction, assuming free-flow conditions on Caltrans facilities. Service would be provided 18 hours a day, five days per week with 30-minute headway service from 6am to 11pm. During peak periods, additional express routes to Oracle would operate, also at 30-minute frequencies – resulting in a 15-minute peak period service to Redwood Shores. On weekends, hourly service would operate.

At Hillsdale Caltrain, a transit center would be created to allow for transfers to local SamTrans buses, as well as shuttles to various employers off-line.

This service schedule would consume a total of 95 vehicle hours daily requiring four "base-period" buses and four peak period buses (a total of eight vehicles). Including spares and allowances for additional service, the total fleet requirement for Line SM1 would be 11 vehicles.
4.1.3.2 Option 2 – Bay Fair BART to Foster City

Route SM2, which would connect Bay Fair BART to the Foster City area via Hesperian, the San Mateo Bridge, Foster City Boulevard, Chess Drive, Bridgepointe Circle, Bridgepointe Parkway, Island Boulevard, Mariners Island Boulevard, Edgewater Boulevard, Metro Enter Boulevard, Shell Boulevard to East Hillsdale.

Total trip time would be 35 minutes in each direction, assuming free-flow conditions on Caltrans facilities. Service would be provided 18 hours a day, five days per week with 30-minute service from 6am to 11pm. No weekend service would be provided.

This service schedule would consume a total of 55 vehicle hours daily requiring three “base-period” buses. Including spares and allowances for additional service, the total fleet requirement for Line SM2 would be five vehicles.

4.1.3.3 Option 3 – Bay Fair BART to San Francisco International Airport

Route SM3 would operate from the San Mateo Bridge via U.S. 101, then via the Broadway/Burlingame exit to Old Bayshore (hotel area) and into the SFO terminal on the lower level. The route would continue on McDonnell Road, operating near the U.S. Postal Service airmail facility, the rental car facility, United Air Lines Maintenance Operations Center, terminating at the Federal Express cargo center.

Limited stop service would operate on Hesperian Boulevard and local service would operate from the Broadway/Burlingame exit via Old Bayshore into the airport and via the airport roads to FedEx.

Total trip time would be 50 minutes in each direction, assuming free-flow conditions on Caltrans facilities. Service would be provided 24 hours a day, seven days per week with 30-minute service from 4am to 11pm, 15-minute service during peak periods, and hourly service from midnight to 4am.

4.1.4 Bus Service Implications

This service schedule would consume a total of 95 vehicle hours daily requiring four “base period” and four peak period buses (a total of eight vehicles). Including spares and allowances for additional service, the total fleet requirement for Line SM3 would be 11 vehicles.

Total Resources – Assuming additional time for deadheading and service requirements, the totals for all three lines is presented in Table 4.

Table 4: San Mateo Express Bus Alternatives

<table>
<thead>
<tr>
<th>Route</th>
<th>Vehicles</th>
<th>Spares</th>
<th>Weekday Service Hrs</th>
<th>Annualized Service Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM 1</td>
<td>8</td>
<td>3</td>
<td>95</td>
<td>30,000</td>
</tr>
<tr>
<td>SM2</td>
<td>3</td>
<td>2</td>
<td>55</td>
<td>15,000</td>
</tr>
<tr>
<td>SM3</td>
<td>8</td>
<td>3</td>
<td>95</td>
<td>36,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>8</td>
<td>245</td>
<td>81,000</td>
</tr>
</tbody>
</table>

Weekday vehicles hours 245
Estimated hourly cost to operate $75
Total annual vehicle hours 81,000
Total annual operating cost $6.0 million
Fares would mimic existing transbay bus or BART fares – for example, the approximate 25 mile AC Transit transbay fare is $2.75, while the BART fare for a similar distance is $3.25 to $3.50. All bus services would be fully integrated with BART, Caltrain and other connecting bus services.

4.1.5 Preliminary Issues

- Free-flow conditions are absolutely critical in the success of the bus operation. Alternatives include a reversible HOV lane (3 persons minimum) from the I-880/92 junction to the high-rise section of the San Mateo Bridge.
- Operating subsidies for these bus services must be identified.
- Park and ride facilities will require coordination with other agencies.
- AC Transit has requested funding for a first phase of this bus service plan which entails seven base buses operating on Lines SM1 and SM2, with additional peak hour buses, for a total request of 12 “Cruiser” coaches for the MTC regional express bus program. As additional buses are added, service would be extended to SFO and additional peak period service would be added.
- Should AC Transit operate the service, then provision for storing the peak period buses at the SamTrans north base (adjacent to SFO) and the SamTrans south base (adjacent to Redwood Shores) would greatly reduce deadheading requirements and lead to cost savings.

4.1.6 System wide implications

The route description and operation plan assumes max integration and coordination with other transit services.
Figure 28
CONCEPTUAL ALTERNATIVES
San Mateo Express Bus Service
4.2 Expansion of Dumbarton Bridge Express Bus Service

The Dumbarton Bridge connects the East Bay with the Peninsula (Fremont/Newark to Palo Alto). The facility is about six miles long, including approaches to the bridge. On the east end of the bridge, the toll plaza is about three miles west of the junction with Interstate 880.

As with the San Mateo-Hayward Bridge corridor, the current Dumbarton Bridge transit corridor is extremely problematic due to traffic congestion and lack of investment in transit facilities and limited investment in transit operations. A consortium of transit operators (AC Transit, SamTrans, VTA, Union City Transit, and BART) have worked with a First Transit, a contracted private operator to, gradually build and develop a viable transit option in this corridor. The service now features 25 westbound trips and 23 eastbound trips each weekday. There is no weekend service.

While the Dumbarton Express services uses a two-mile bus/carpool lane to bypass traffic at the Dumbarton toll plaza, severely limited park and ride facilities and limited service frequencies have limited patronage to about 950 passengers daily. The bus/carpool lane starts at Ardenwood and is estimated to save up to 15 minutes each weekday morning.

Travel Market – Caltrans traffic counts indicate that about 73,000 vehicles daily use the Dumbarton Bridge in both directions, with about 5,400 of those vehicles in the peak hour. The bridge is a six-lane facility with a capacity of about 6,000 vehicles in each direction.

Major traffic generators include the Palo Alto technology and business centers, including Stanford Industrial Park, Stanford University, and the electronics manufacturing and research and technology job centers along the east side of U.S. 101 in Mountain View and Sunnyvale.

4.2.1 Description of Corridor

Since there is an existing and established express bus service in the Dumbarton Bridge corridor, this corridor plan proposes to increase service on the existing routes and proposes one new route to Mountain View/Sunnyvale. As in current practice, service would begin at the Union City BART station to four locations on the Peninsula/South Bay: Table 5 presents a summary of the Dumbarton Bridge Express Bus Service.

Table 5: Dumbarton Express Bus Service Summary

<table>
<thead>
<tr>
<th>Route</th>
<th>Origins</th>
<th>Destinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB</td>
<td>Union City BART</td>
<td>Palo Alto/ Stanford</td>
</tr>
<tr>
<td>DB1</td>
<td>Union City BART</td>
<td>Palo Alto/Stanford (Oregon Express)</td>
</tr>
<tr>
<td>DB2</td>
<td>Union City BART</td>
<td>Bayfront/Oracle</td>
</tr>
<tr>
<td>237</td>
<td>Warm Spring BART</td>
<td>Great America/NASA</td>
</tr>
</tbody>
</table>

4.2.2 Capital Costs

The capital investment includes vehicles, park and ride facilities and HOV facilities. These items are preliminarily summarized as in Table 6.
Table 6: Dumbarton Express Bus Cost Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Cruiser” buses</td>
<td>21</td>
<td>$11 million</td>
</tr>
<tr>
<td>Park and Ride Spaces</td>
<td>3000</td>
<td>$45 million</td>
</tr>
<tr>
<td>HOV Facilities</td>
<td>See Section 2.3</td>
<td>To Be Determined</td>
</tr>
</tbody>
</table>

The operating plan details the requirements for vehicles. Park and Ride facilities are necessary because the system must group passengers in the East Bay for carriage to several Peninsula and South Bay locations – Redwood Shores (Oracle), Palo Alto/Stanford, and Sunnyvale/Mountain View. Park and Ride facilities are estimated to serve about half of the bus passengers. Finally, HOV facilities are required for congestion by-pass to give the bus system a faster overall travel time.

4.2.3 Operating Plan Options

In the East Bay, buses would operate from the Union City BART station to the Dumbarton Bridge via Decoto Road and Highway 84. Major park and ride facilities would be located at Union City BART, and along Decoto Road and Highway 84. These options are illustrated on Figure 29.

4.2.3.1 Option 1 – Route DB to Palo Alto/Stanford

Route DB would continue to operate as at present, but with improvements in service and equipment. Service would be operated every 30 minutes from 5am to 11pm via the existing route (From Union City BART via Decoto Road, Highway 84, Dumbarton Bridge, Willow, Middlefield, Homer/Channing to Palo Alto Caltrain, El Camino to Page Mill Road, Deer Creek, Hillview, Hanover, Hansen, Page Mill, and then back to El Camino).

Total trip time would be 60 minutes in each direction, assuming free-flow conditions on Caltrans facilities and improvements on the west approach of the Dumbarton Bridge. Service would be provided 18 hours a day, five days per week with 30-minute service from 5am to 11pm. Hourly service would be provided on weekends.

This service schedule would consume a total of 75 vehicle hours daily requiring five buses. Including spares and allowances for additional service, the total fleet requirement for Line DB would be six vehicles.

4.2.3.2 Option 2 – Route DB1 Union City to Palo Alto/Stanford – Express

Route DB1, would continue to operate peak hours only to provide an express connection between Union City and the Stanford Industrial/Page Mill Road area. Service would be provided every 30 minutes during the peak period, bypassing the Palo Alto Caltrain station.

Total trip time would be 45 minutes in each direction, assuming free-flow conditions on Caltrans facilities. Service would be provided every 30 minutes, peak hours only, five days per week. There would be no weekend service.

This service schedule would consume a total of 25 hours weekdays only, requiring four buses. Including spares, the total fleet requirement for Line DB1 would be five vehicles.
This service schedule would consume a total of 25 hours weekdays only, requiring four buses. Including spares, the total fleet requirement for Line DB1 would be five vehicles.

4.2.3.3 Option 3 - Route DB2 Union City BART to Bayfront Expressway & Redwood Shores

Route DB2 currently operates limited peak period service from Union City BART to the Bayfront Expressway electronics industry area in Menlo Park. The service results have been disappointing with fewer than five passengers per trip - as a result, Line DB2 will be discontinued on July 1, 2001. This proposal would reinstate the service and extend the line to Redwood Shores. Service would operate every 30 minutes from 5am to 11pm from Union City BART via Decoto Road, Highway 84, Dumbarton Bridge, Bayfront Expressway, U.S. 101, Marine World Parkway, Twin Dolphins Parkway, Redwood Shores Parkway to Pico Boulevard.

Total trip time would be 55 minutes in each direction, assuming free-flow conditions on Caltrans facilities and improvements on the west approach of the Dumbarton Bridge. Service would be provided 18 hours a day, five days per week with 30-minute service from 5am to 11pm. No weekend service would be provided.

This service schedule would consume a total of 75 vehicle hours daily requiring five buses. Including spares and allowances for additional service, the total fleet requirement for Line DB2 would be six vehicles.

4.2.3.4 Option 4 - Route 237 Warm Springs BART to Great America/Sunnyvale

Route 237 would provide 30-minute service to the industries and hi-tech firms located along Highway 237 (via a stop at Amtrak Great America) then continuing to the Sunnyvale/Lockheed area, terminating at NASA Moffett Research Center.

Service would operate every 30 minutes from peak hours only from Warm Springs BART via Dixon Landing Road, Interstate 880, Highway 237, North First Street, Vista Montana, Tasman Drive (Amtrak Great America), Lawrence Expressway, Caribbean, Mathilda, 5th Street, H Street, Manila Road to NASA/Moffett Research Park.

Total trip time would be 35 minutes in each direction, assuming free-flow conditions on Caltrans facilities. Service would be provided peak hours only, weekdays only.

This service schedule would consume a total of 20 vehicle hours daily requiring three buses.

4.2.4 Bus Service Implications

Total Resources – Assuming additional time for deadheading and service requirements, the totals for all three lines is presented in Table 7.
Table 7: Dumbarton Express Bus Service Summary

<table>
<thead>
<tr>
<th>Route</th>
<th>Vehicles</th>
<th>Spares</th>
<th>Weekday Service Hrs</th>
<th>Annualized Service Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB</td>
<td>5</td>
<td>1</td>
<td>75</td>
<td>23,000</td>
</tr>
<tr>
<td>DB1</td>
<td>4</td>
<td>1</td>
<td>25</td>
<td>6,500</td>
</tr>
<tr>
<td>DB2</td>
<td>5</td>
<td>1</td>
<td>75</td>
<td>20,000</td>
</tr>
<tr>
<td>237</td>
<td>5</td>
<td>1</td>
<td>20</td>
<td>5,500</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19</td>
<td>4</td>
<td>195</td>
<td>55,000</td>
</tr>
</tbody>
</table>

Weekday vehicles hours 265
Estimated hourly cost to operate $75
Total annual vehicle hours 55,000
Total annual operating cost $4.1 million

Fares would mimic existing transbay or BART fares - for example, the approximate 25 mile AC Transit transbay fare is $2.75, while the BART fare for a similar distance is $3.25 to $3.50. All bus services would be fully integrated with BART, Caltrain and other connecting bus services.

4.2.5 Preliminary Issues

- Free-flow conditions are absolutely critical in the success of the bus operation. Alternatives include an expanded HOV lane (3 persons minimum) from a point east of I-880 to the Dumbarton Bridge toll plaza.
- Operating subsidies for these bus services must be identified.
- Park and ride facilities will require coordination with other agencies.

4.2.6 System wide implications

The route description and operation plan assumes max integration and coordination with other transit services.

(Note: South Bay employees numbers source: Sunnyvale and Mountain View city websites. Dumbarton Bridge traffic counts: Caltrans statewide traffic volumes. Bus running times: PTM field surveys.)

4.2.7 Construction of Park and Ride Lot with Median Bus On- & Off-Ramps to Newark Boulevard

In support of the existing and planned express bus service on the Dumbarton Bridge, a park-and-ride lot would be constructed at the Newark Boulevard interchange. This facility would allow center, median exits and entries from SR 84 at the interchange from left-side HOV lanes.
CONSTRUCT PARK 'N RIDE LOT WITH MEDIAN BUS ON & OFF RAMPS TO NEWARK BOULEVARD

Figure 29
CONCEPTUAL ALTERNATIVES
Dumbarton Bridge Express Bus Service Augmentation
4.3 Expansion of Express Bus Service on Bay Bridge

The San Francisco-Oakland Bay Bridge connects the East Bay with downtown San Francisco and the northern Peninsula. The facility is about seven miles long including the ramps into the Transbay Transit Terminal at First and Mission Streets in downtown San Francisco. On the east end of the bridge, the toll plaza is connected to the distribution structure which routes traffic from Interstates 80, 580 and 880 into and around the bridge traffic.

Unlike other bridge corridors, the Bay Bridge corridor is rich in transit and in transit investment. AC Transit operates more than 100 buses in the peak hour to serve the East Bay to San Francisco transit market – with about 4,000 passengers in the peak hour and more than 15,000 on a typical weekday. BART is a major carrier with 22 trains of up to 10 cars each operating in the peak hour. Total BART Transbay demand is estimated at more than 140,000 daily. Ferries carry about 5,000 daily trips in the Bay Bridge corridor.

Travel Market – Caltrans traffic counts indicate that about 270,000 vehicles daily use the Bay Bridge in both directions, with about 10,000 of those vehicles in the peak hour – and the peak hour lasts for several hours.

In the peak hour more than half of Bay Bridge corridor trips are made on transit (21,000 transit trips – 16,000 on BART, 4,000 on AC buses, and 1,000 on ferries) compared to automobiles (10,000 automobiles at 1.5 passengers per vehicle).

Downtown San Francisco accommodates about 350,000 jobs, most within walking distance of the Transbay Terminal. MTC has projected that the Bay Bridge corridor will experience a 31 percent increase in demand, with transit experiencing about a 45 percent patronage increase in the corridor (survey period is 1990 – 2020).

Transit is successful because good service is provided to a very concentrated employment location. This pattern will continue to dominate the Transbay travel market.

4.3.1 Description of Corridor

There are two options for the express bus in the Bay Bridge Corridor – the first involves increasing AC Transit service to San Francisco, and the second would establish new service to central Contra Costa County. Table 8 presents summary of improvement on Bay Bridge Corridor bus service.

Table 8: Bay Bridge Bus Service Summary

<table>
<thead>
<tr>
<th>Service Provider</th>
<th>Destinations</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Transit</td>
<td>Various East Bay locations</td>
<td>10-15 miles</td>
</tr>
<tr>
<td>Central CCC</td>
<td>Diablo Valley, Moraga, etc</td>
<td>15-30 mi</td>
</tr>
<tr>
<td>Central CCC</td>
<td>Diablo Valley, Walnut Creek, etc.</td>
<td>15-30 mi</td>
</tr>
</tbody>
</table>
4.3.2 Operating Plan Options

Option 1

The Transbay Terminal Improvement Plan anticipates that, without significant BART expansion beyond the already approved closer headways plan, AC Transit peak hour demand will increase from the current 4,000 passengers to more than 6,000 peak hour passengers. This increase would create demand for about 150 to 160 peak hour bus movements through and across the Bridge and through the terminal. Service is assumed to be increased on all existing lines; however, few new lines would be established.

Option 2

For Central Contra Costa - Moraga service, an initial fleet of six to 10 “cruiser” type buses would operate from the Moraga area via Highway 24 and then into the Transbay Terminal. Service would be provided every 15 minutes in the peak period, with hourly service in the midday. Total travel time would be about 35 minutes, depending on free-flow conditions on Caltrans facilities.

Option 3

For Central Contra Costa - Walnut Creek service, an initial fleet of eight to 12 “cruiser” type buses would operate from the Walnut Creek area via Highway 24 and then into the Transbay Terminal. Service would be provided every 15 minutes in the peak period, with hourly service in the midday. Total travel time would be about 45 minutes, depending on free-flow conditions on Caltrans facilities.

Total Resources – Assuming additional time for deadheading and service requirements, the totals for all three options are presented in Table 9.

Table 9: Dumbarton Express Bus Service Summary

<table>
<thead>
<tr>
<th>Route</th>
<th>Vehicles</th>
<th>Spares</th>
<th>Weekday Service Hrs</th>
<th>Annualized Service Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Transit</td>
<td>150</td>
<td>30</td>
<td>1,100</td>
<td>300,000</td>
</tr>
<tr>
<td>CCC-Moraga</td>
<td>6</td>
<td>2</td>
<td>80</td>
<td>21,000</td>
</tr>
<tr>
<td>CCC-Walnut Creek</td>
<td>8</td>
<td>2</td>
<td>95</td>
<td>25,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>164</td>
<td>34</td>
<td>1,275</td>
<td>346,000</td>
</tr>
</tbody>
</table>

Weekday vehicles hours 1275
Estimated hourly cost to operate $75
Total annual vehicle hours 346,000
Total annual operating cost $26.0 million

Fares would mimic existing transbay or BART fares – for example, the approximate 25 mile AC Transit transbay fare is $2.75, while the BART fare for a similar distance is $3.25 to $3.50. All bus services would be fully integrated with other connecting bus services.
4.3.3 Preliminary Issues

- Free-flow conditions are absolutely critical in the success of the bus operation. The opening of the I-80 HOV lane greatly increased bus speed and reliability.
- Operating subsidies for these bus services must be identified.
- Park and ride facilities will require coordination with other agencies.
- Requires HOV or bus bypass at Caldecott Tunnel to ensure bus reliability.
- Requires new bus ramps on Grand Avenue into the toll plaza to by-pass automobile queuing.
- Requires bus priority in the MacArthur corridor from I-80 to Highway 13.

4.3.4 System wide implications

Project description and operation plan assumes max integration and coordination with other transit services

(Note: Sources include MTC RTP, Transbay Terminal Improvement Plan and the Caldecott Tunnel Study).
4.4 Expansion of Capitol Corridor Service with LRT Connection to Mt. View/Sunnyvale

The Capitol Corridor extends from Auburn in the north, through Sacramento, then along the East Bay connecting via Martinez, Richmond, Emeryville, Berkeley, Oakland (Jack London Square), Hayward, Fremont/Centerville, Great America/Santa Clara and San Jose (Diridon Station.). The Capitol Corridor service connects with the Gilroy –San Jose–San Francisco Caltrain operation at San Jose, with a second connection proposed to be created at the Santa Clara station in the near future. On April 29, 2001 an expanded schedule with nine round trips between Sacramento and Oakland daily was implemented, with seven of the trips extending to San Jose. In January of 2002, the number of daily round trips is projected to increase to eleven between Sacramento and Oakland, with at least seven of the trips extending to San Jose. In January of 2003, twelve round trips are projected for the Sacramento –Oakland segment daily, with at least eleven of the trips connecting with San Jose.

The Capitol Corridor service connects with the Valley Transportation Authority (VTA) Mountain View/I-880 Milpitas light rail line at the Great America station in Santa Clara. The light rail line operates on 10-15 minute headways during the day, with late evening and early morning headways of 30 minutes. Travel time between Great America and Sunnyvale is approximately twelve minutes, an additional twelve minutes is required to travel to the end of the line at Mountain View. The Mountain View station is also a connection with Caltrain.

The light rail service provides riders with a reliable, convenient connection with all Capitol Corridor trains. As the Capitol Corridor matures, and additional equipment, already programmed comes on-line, additional frequencies should be added, timed to provide connections with Caltrain at Santa Clara and the Altamont Commuter Express (ACE) at Fremont/Centerville.

Under this alternative Capitol Corridor Service would be increased by several trains per day with the necessary expansion of VTA LRT connection services to Mountain View and Sunnyvale.
5.0 BART SERVICES

As previously discussed, the main constraint to transbay BART service are train dwell times at the existing stations on Market Street in downtown San Francisco. Train acceleration and deceleration times, combined with the time it takes for passengers to load and unload at these stations serve as the constraint point to the existing BART transbay operation. Secondary constraint points include the Oakland Wye in the East Bay and the three-track operation through downtown Oakland. A number of capital intensive alternatives to improve transbay BART service were identified and described in section 3.0; however, a number of less capital intensive near-term options have been developed and are described below.

These alternatives can be classified as short-term/low-cost or medium-term / medium cost alternatives in relative terms. Capacity can be increased in two ways. First, BART trains may operate with shorter headways than is currently done. Secondly, BART could operate its cars in a manner that would carry more people.

Short-term/low-cost alternatives include the introduction of three-door cars for Transbay lines, revising the Transbay load factor standard and skip stopping the West Oakland station. By converting the current two-door cars to three-door cars, some seats would be lost. However, this could reduce dwell time by about 25%, other things being equal. BART will have to purchase a number of new cars to serve the upcoming San Jose extension. At the time of the new car purchase, BART could potentially purchase new three-door cars and serve the San Jose extension with existing two-door cars.

Current BART standards call for a load factor of 1.35 or less in the peak period. Load factor is the ratio of passengers to seats. This results in a range of 9.0 to 5.75 square feet per passenger in the peak periods. With a change in this policy, the density of passengers in BART trains could be increased by 20 to 40%, producing a corresponding increase in capacity.

If the West Oakland station was skip-stopped, transbay travel times could be reduced and potentially transbay headways could be reduced. A final short term option would include the re-introduction of peak hour reversible operations through the downtown Oakland Stations.

The identified medium-term/medium cost alternative includes the reconfiguration of MacArthur – 12th Street Oakland segment. In this segment, the Pittsburg/Bay Point – San Francisco (Yellow Line) would be disengaged from the Richmond -Fremont/Dublin Pleasanton Line. In the existing downtown Oakland station, the upper level contains two tracks and lower level has one track. The Yellow Line would use the upper deck and would be the only line to provide direct service to San Francisco. The Richmond line would have service to Fremont only and the Fremont Line would only provide service to Richmond. The Richmond – Fremont Line (Orange Line) would operate in the lower level of the downtown Oakland stations. Transfers between the Pittsburg/Bay Point Line and Richmond Line would occur at Mac Arthur, 19th Street Oakland, and 12th Street Oakland stations. This approach should yield reliable two-minute headways across the Bay, without train delay, and possibly 75-second headways (40 trains/hour) depending on what is done to with the Automated Train Control system, currently under evaluation. Under this configuration, BART train operation would be essentially free of the current Oakland Wye constraints.
6.0 WATER-BASED TRANSPORTATION SERVICES

6.1 WATER TRANSIT AUTHORITY’S PHASE I CRITICAL MASS TRANSIT ROUTES

Total of 14 routes are identified as critical mass transit routes by Water Transit Authority’s Phase I Critical Mass Transit Routes. Figure 30 presents a summary of these routes.

Generally, on the longer routes, larger vessels would operate less often. On the shorter routes, smaller vessels would operate frequently. The basic peak headway would be every 15 minutes, while the midday frequencies would be either 15 or 30 minutes, but in some cases 60 minutes.

6.1.1 Option 1 – Vallejo to San Francisco Ferry

The Option 1 Vallejo to San Francisco Ferry Building route would continue to operate as at present, but with improvements in service and equipment. Service would be operated every 15 minutes in the peak periods (5:30 a.m. to 8am, and 3:30 p.m. to 6:30 pm), and every 30 minutes from 8am to 3:30pm, and after 6:30 p.m. to 12 midnight. Hourly weekend service would be provided from 7am to 12 midnight. Table 10 presents a summary of Ferry Option 1.

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes peak, 30 minutes off-peak, 60 minutes weekends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>5a.m. to 12 a.m. midnight</td>
</tr>
<tr>
<td>One way travel time</td>
<td>50 minutes</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Downtown Vallejo, San Francisco Ferry Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>350+ passenger 35 + knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>7 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 85 vessel hours weekdays requiring seven ferries, and 36 vessel hours on weekends requiring two vessels. Including spares and allowances for additional service, the total fleet requirement for Vallejo-San Francisco ferry service would be eight vessels.

6.1.2 Option 2 – Benicia/Martinez to San Francisco Ferry

The Option 2 Benicia Martinez to San Francisco Ferry Building route would operate as a new route with service every 30 minutes in the peak periods (5:30 a.m. to 8am, and 3:30 p.m. to 6:30 pm), and every 60 minutes from 8am to 3:30pm. No weekend service would be provided. Routing would be as follows: Benicia-Martinez-San Francisco Ferry Building, Benicia. This allows service within a two hour cycle time. Table 11 presents a summary of ferry option 2.
Table 11: Ferry Option 2 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>30 minutes peak, 60 minutes off-peak, no weekend service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>5:30 a.m. to 7 p.m.</td>
</tr>
<tr>
<td>One way travel time</td>
<td>60 minutes Benicia/ 50 minutes Martinez</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Benicia Marina, Martinez Marina, San Francisco Ferry Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>350+ passenger 35+ knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>4 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 34 vessel hours weekdays requiring four vessels. Including spares and allowances for additional service, the total fleet requirement for Benicia/Martinez-San Francisco ferry would be five vessels.

6.1.3 Option 3 – Richmond to San Francisco Ferry Building to South San Francisco

The Option 3 Richmond to San Francisco Ferry Building to South San Francisco route would operate as a new route with service every 15 minutes in the peak periods (6 a.m. to 8am, and 3:30 p.m. to 6:30 pm), and every 30 minutes from 8am to 3:30pm and hourly from 7:00 p.m. to 12 midnight. There would be limited Richmond to San Francisco weekend service, with 60 minute frequencies. Table 12 presents a summary of ferry option 3.

Table 12: Ferry Option 3 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes peak, 30 minutes off-peak, 60 minutes nights and weekends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6:00a.m. to 12 a.m. midnight</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes Richmond to SF; 50 minutes Richmond to So.SF</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Richmond Harbor Channel (Ford Plant), San Francisco Ferry Terminal, South San Francisco – Oyster Point Marina</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 25 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>8 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 84 vessel hours weekdays requiring eight ferries, and 20 vessel hours on weekends requiring one vessel. Including spares and allowances for additional service, the total fleet requirement for Richmond-San Francisco -South San Francisco ferry service would be nine vessels.
6.1.4 Option 4 - Berkeley to San Francisco Ferry Building to Mission Bay to Alameda Point

The Option 4 Berkeley to San Francisco Ferry Building to Mission Bay to Alameda Point would operate as a new route with service every 15 minutes from 6am to 12 midnight weekdays, and from 7am to 12 midnight weekends. Table 13 presents a summary of ferry option 4.

Table 13: Ferry Option 4 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6:00 a.m. to 12 a.m. midnight (7a.m. to 12 a.m. midnight weekends)</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes Berkeley to SAN FRANCISCO; 12 minutes Alameda Pt to Mission Bay; 20 minutes Alameda to San Francisco Ferry Building</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Berkeley (I-80/Gilman Street), San Francisco Ferry Terminal, Mission Bay (16th Street, south of Pier 54), Alameda Point (Pier 1, Seaplane Lagoon)</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 25 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>7 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 125 vessel hours weekdays requiring eight ferries, and 120 vessel hours on weekends. Including spares and allowances for additional service, the total fleet requirement for Berkeley-San Francisco -Mission Bay-Alameda Point ferry service would be eight vessels.

6.1.5 Option 5 – Oakland to San Francisco Ferry

The Option 5 Oakland to San Francisco Ferry Building route would continue to operate as at present, but without the stop in Alameda and with improvements in service and equipment. Service would be operated every 15 minutes weekdays, and 30 minutes on weekends. Table 14 presents a summary of ferry option 5.

Table 14: Ferry Option 5 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes weekdays, 30 minutes weekends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6:00 a.m. to 12 a.m. midnight (7a.m. to 12a.m. midnight weekends)</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes Oakland to San Francisco Ferry Building</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Oakland (Jack London Square), San Francisco Ferry Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 25 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>4 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 70 vessel hours weekdays requiring four ferries, and 34 vessel hours on weekends. Including spares and allowances for additional service, the total fleet requirement for Oakland-San Francisco ferry service would be five vessels.
6.1.6 Option 6 – Harbor Bay to San Francisco Ferry

The Option 6 Harbor Bay to San Francisco Ferry Building route would continue to operate as at present, but with improvements in service and equipment. Service would be operated every 30 minutes weekdays, no weekend service. Table 15 presents a summary of ferry option 6.

Table 15: Ferry Option 6 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6a.m. to 8p.m.; no weekend service</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes Harbor Bay to San Francisco Ferry Building</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Harbor Bay Ferry Terminal, San Francisco Ferry Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 25 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>2 in service, 0 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 30 vessel hours weekdays requiring two ferries.

6.1.7 Option 7 – Oakland Airport to San Francisco Ferry

The Option 7 Oakland Airport to San Francisco Ferry Building route would be a new route connecting Oakland Airport passengers with downtown San Francisco. Service would be operated every 15 minutes daily, seven days per week. Service would operate from a satellite airport terminal on the San Francisco waterfront. Entry into the hovercraft would be secure, with remote check-in available in San Francisco. Hovercraft would operate every 15 minutes and would alight passengers at Gate 26 at Oakland Airport. Service would be operated with amphibious hovercraft, allowing for direct entry into the airport terminal. Table 16 presents a summary of ferry option 7.

Table 16: Ferry Option 7 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6 a.m. to 12 a.m. midnight, daily</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes Oakland Airport to San Francisco Ferry Building</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Oakland Airport, Gate 26, San Francisco Ferry Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>120 passenger 50 knot hovercraft</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>5 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 90 vessel hours daily requiring four hovercraft, plus one spare, for a total of five hovercraft.
6.1.8 Option 8 – San Leandro to San Francisco Ferry

The Option 8 San Leandro to San Francisco Ferry Building route would operate as a new route with weekday only service to and from San Francisco. Service would be operated every 30 minutes weekdays, no weekend service. Table 17 presents a summary of ferry option 8.

Table 17: Ferry Option 8 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6 a.m. to 8p.m.; no weekend service</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes San Leandro to San Francisco Ferry Building</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>San Leandro Marina, San Francisco Ferry Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 35 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>2 in service, 0 spare</td>
</tr>
</tbody>
</table>

6.1.9 Option 9 and 10 – Berkeley to Treasure Island to Oakland (Jack London Square)

The Option 9 Berkeley to Treasure Island ferry service and Option 10 Oakland (Jack London Square) to Treasure Island routes are combined into one service for a more efficient operation. As a lifeline service to Treasure Island, service would be provided every 15 minutes, 6am to midnight. Table 18 presents a summary of ferry options 9 and 10.

Table 18: Ferry Options 9 and 10 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6a.m. to 12 a.m. midnight</td>
</tr>
<tr>
<td>One way travel time</td>
<td>15 minutes Berkeley to Treasure Island, 15 minutes Oakland to Treasure Island</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Treasure Island (Pier 14, East Side), Oakland Ferry Terminal (Jack London Square), Berkeley Ferry Terminal (I-80/Gilman)</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 25 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>5 in service, 1 spare</td>
</tr>
</tbody>
</table>

6.1.10 Option 11 – San Francisco to Treasure Island

The Option 10 San Francisco to Treasure Island ferry service would also operate as a lifeline service with boats operating every 15 minutes, 6am to midnight. Table 21 presents a summary of ferry option 11.
Table 19: Ferry Option 11 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6 a.m. to 12 a.m. midnight</td>
</tr>
<tr>
<td>One way travel time</td>
<td>12 minutes San Francisco to Treasure Island</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>San Francisco Ferry Building, Treasure Island (Pier 14, East Side)</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 25 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>3 in service, 1 spare</td>
</tr>
</tbody>
</table>

6.1.11 Option 12 – San Leandro to South San Francisco

The Option 12 San Leandro to South San Francisco ferry service would be a new service operated every 30 minutes weekdays from 6am to 8pm. Weekend service would not be provided. Table 20 presents a summary of ferry option 12.

Table 20: Ferry Option 12 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6:00a.m. to 8:00p.m.</td>
</tr>
<tr>
<td>One way travel time</td>
<td>30 minutes San Leandro to South San Francisco</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>San Leandro Marina</td>
</tr>
<tr>
<td>Vessel</td>
<td>South San Francisco (Oyster Point)</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>3 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 40 vessel hours weekdays requiring three ferries. Including spares and allowances for additional service, the total fleet requirement for San Leandro – South San Francisco ferry service would be four vessels.

6.1.12 Options 13 and 14 – San Leandro to Redwood City; San Leandro to Moffett Field

As with the East Bay Treasure Island service, combined operation of Options 13 and 14 results in the savings of one vessel. These new services would be operated every 30 minutes weekdays from 6am to 8pm. Weekend service would not be provided. Table 24 presents a summary of ferry options 13 and 14.
Table 21: Ferry Options 13 and 14 Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6:00 a.m. to 8:00 p.m.</td>
</tr>
<tr>
<td>One way travel time</td>
<td>30 minutes San Leandro to Redwood City, 40 minutes San Leandro to Moffett Field</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>San Leandro Marina, Redwood City (Port of Redwood City), Moffett Field</td>
</tr>
<tr>
<td>Vessel</td>
<td>149 passenger 35 knot fast ferry</td>
</tr>
<tr>
<td>Vessels Required</td>
<td>5 in service, 1 spare</td>
</tr>
</tbody>
</table>

This service schedule would consume a total of 70 vessel hours weekdays requiring three ferries. Including spares and allowances for additional service, the total fleet requirement for San Leandro – Redwood City and San Leandro – Moffett Field ferry service would be six vessels.

6.1.13 Order of Magnitude Cost

Table 22 presents a summary of the order of magnitude cost estimate prepared for the ferry conceptual options.

Table 22: Water Transit Critical Mass Phase I - Order of Magnitude Cost

<table>
<thead>
<tr>
<th></th>
<th>350+ Passenger Vessels</th>
<th>149 Passenger Vessels (35 Knot)</th>
<th>149 Passenger Vessels (25 Knot)</th>
<th>Hovercraft Passenger Vessels</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday Vessel Hours</td>
<td>119</td>
<td>100</td>
<td>494</td>
<td>90</td>
<td>803</td>
</tr>
<tr>
<td>Estimated Hr. Operating Cost</td>
<td>$600</td>
<td>$500</td>
<td>$400</td>
<td>$400</td>
<td></td>
</tr>
<tr>
<td>Total Annual Vessel Hr.</td>
<td>38,000</td>
<td>26,000</td>
<td>161,505</td>
<td>32,850</td>
<td>258,355</td>
</tr>
<tr>
<td>Total Annual Operating Cost</td>
<td>$23 million</td>
<td>$13 million</td>
<td>$64.6 million</td>
<td>$13.1 million</td>
<td>$113.7 million</td>
</tr>
</tbody>
</table>
6.2 AIRPORT TO AIRPORT HOVERCRAFT OF FERRY

The Oakland Airport to San Francisco International Airport hovercraft or ferry service would be a new route providing a water based connection between the two airports. As currently envisioned, service would operate every 15 minutes daily, seven days per week. Service would operate from a Gate 26 at OAK to the South Terminal at SFO. Table 23 summarizes the operating characteristics of the new ferry service currently under consideration. Figure 31 illustrates the potential alignment for this improvement.

Table 23: Airport to Airport Hovercraft or Ferry Alternative Summary

<table>
<thead>
<tr>
<th>Service Frequency</th>
<th>15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span of Service</td>
<td>6 a.m. to 12 midnight, daily</td>
</tr>
<tr>
<td>One way travel time</td>
<td>25 minutes Oakland Airport to San Francisco International Airport</td>
</tr>
<tr>
<td>Terminal Locations</td>
<td>Oakland Airport, Gate 26, San Francisco International Airport, South Terminal</td>
</tr>
<tr>
<td>Vessel</td>
<td>125 passenger 50 knot hovercraft</td>
</tr>
</tbody>
</table>
VESSEL TYPE

- 350 PAX 35+ Knot (40 MPH)
- 149 PAX 35+ Knot (40 MPH)
- Airport Hovercraft
- 149 PAX 25+ Knot (30 MPH)

FERRY SERVICE ROUTES

1. Vallejo to San Francisco
2. Benicia/Martinez to San Francisco
3. Richmond to South San Francisco
4. Berkeley to SF Ferry Building; Mission Bay; Alameda Point
5. Oakland to San Francisco
6. Harbor Bay to San Francisco
7. Oakland Airport to San Francisco
8. San Leandro to San Francisco
9. San Francisco to Treasure Island
10. Berkeley to Treasure Island
11. Oakland to Treasure Island
12. San Leandro to South San Francisco
13. San Leandro to Redwood City
14. San Leandro to Moffett Field
Figure 31

CONCEPTUAL ALTERNATIVES

Airport to Airport Hovercraft or Ferry
6.3 **OAKLAND TO SAN FRANCISCO FREIGHT FERRY**

The last comprehensive study of truck movements in the Bay Bridge corridor was conducted in 1986 at the request of the State Legislature. The study found that in 1986 during peak times trucks took about 32 minutes to travel from the junction of I-80 /I-580 to Army Street on US 101.

In addition, truck traffic also impacts the capacity of a highway, especially on a grade. Each truck traveling on the westbound incline of the Bay Bridge (two percent grade) takes up the space of two to three automobiles. In the eastbound direction, where the grade is more severe on the suspension span (3.5 percent), the impact is even greater.

Freight ferry addresses freight and congestion issue in way to increase automobile capacity and decrease truck travel time.

A freight ferry route is an option to improve the reliability of goods movements and create additional capacity on the bridge. A large truck ferry could operate from Oakland to San Francisco allowing trucks to bypass the congested bridge.

The 1986 study also estimated the distribution of truck destinations in the westbound direction:

- 42% South of downtown/Daly City
- 30% Peninsula/South Bay
- 20% Downtown/Northern SF/Marin County; and
- 8% Port of San Francisco

Pier 80 terminal would be convenient for about 80 percent of trucks using the Bay Bridge, assuming that the 1986 data remains valid.

Tolls for the truck ferry would mimic the existing truck tolls for the Bay Bridge, which range from $4 to $12, depending on number of axles.

**6.3.1 Operating Plan**

Ferries may be time competitive with the Bay Bridge. As an example, a ferry from the Oakland Army Base to Pier 80 in San Francisco would cover a distance of about 6.5 miles. A ferry with a speed of 21 knots would take about 25 minutes to travel this distance, including acceleration, deceleration, loading, and unloading time.

The estimated travel time between Pier 80 and US 101 is about five minutes, so the total travel time in the morning peak via ferry would be about the same as Caltrans estimated for trucks in 1986.

Trucks from I-80 and I-580 would use the ramp that leads back to I-880 to exit the freeway system at Maritime. Trucks from I-880 would use Grand Avenue to access the terminal via Maritime. In San Francisco, trucks would access Pier 80 via Cesar Chavez (Army Street), either from San Francisco city streets, or from I-280.

Freight ferries would leave from each terminal every 10 minutes. The ferry route would travel from Oakland in the outer harbor area, and then turn directly to Pier 80. The length of this route is about 6.5 miles.

Total trip time would be about 25 minutes in each direction, so each ferry would make one round trip per hour. To provide a consistent 10 minutes service frequency would require six ferries in service with two spare vessels. The vessels would operate from 5 a.m. to 10 p.m., seven days per week. Each
ferry would accommodate one-sixth of the typical highest hourly truck volume or about 75 trucks of varying weights and lengths.

At the terminal, both queuing and toll payment would be integrated, and the transition between land and vessel would be seamless and fast. While underway, truck engines would be off, and vessels could be powered by engines using natural gas fuels.

Figure 32 presents the conceptual alignment for this alternative.

6.3.2 Order of Magnitude Cost

The capital investment includes vessels, terminals, queuing areas, and access improvements. Terminals are necessary to provide access to and from the vessels. Roadway improvements would make the freight ferry a seamless piece of the Bay Area freeway network. Table 24 presents a summary of the costs anticipated under this alternative.

Table 24: Freight Ferry Cost Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight Ferries</td>
<td>8</td>
<td>$200 million</td>
</tr>
<tr>
<td>Ferry Terminals</td>
<td>2</td>
<td>$50 million</td>
</tr>
<tr>
<td>Road Access</td>
<td></td>
<td>$100 million</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$350 million</td>
</tr>
</tbody>
</table>

The total annual operating cost would vary from $30 million to $40 million.

6.3.3 Preliminary Issues

- Further analysis should be performed to determine how fast the ferries should operate to meet trucking travel time requirement.
- Further analysis should be performed to determine if removing trucks benefit traffic flow for the remaining vehicles.
- Operation cost of the freight ferries is high. Further analysis should identify methods to reduce operational expense.
- Source of operating funds need to be identified.
- Terminal design must provide a seamless connection to ensure fast traveling time.
- Further analysis on the implications of natural gas usage on air quality is necessary.
- Handling of “oversize” loads may be problematic.
Figure 32
CONCEPTUAL ALTERNATIVES
Oakland to San Francisco Freight Ferry
7.0 OTHER OPERATIONAL OPTIONS AND STRATEGIES

7.1 INTELLIGENT TRANSPORTATION SYSTEM (ITS) IMPROVEMENTS

Intelligent Transportation Systems (ITS) is becoming widely recognized as a cost effective solution for improving the performance and efficiency of multi-tiered transportation systems. This section considers likely ITS applications for the east-west San Francisco Bay crossing conceptual alternatives.

The single most effective contribution ITS will make for mobility in San Francisco Bay at the regional level will be for the full deployment of Advanced Traveler Information System (ATIS) services. These services, whether through cell phone, kiosk, web-enabled device, or telematics (in-vehicle guidance and Mayday) provide motorists with decision-guiding information about current transportation system performance. Providing timely traveler information will enable the public to make informed pre-trip and en-route choices regarding mode, route, and time-of-day travel.

ITS, whether for advanced transportation management (ATMS) or for disseminating information to motorists through an ATIS requires a comprehensive data collection infrastructure. The pieces of this infrastructure have historically been installed on a project-by-project basis.

Closed-circuit television and roadway traffic detection are used to monitor real-time roadway conditions such as traffic volume and speed. Other sources of information include communications received from police/CHP and maintenance personnel as well as cellular telephone reports called in from drivers. AVI toll tags are used to deduct toll when a vehicle passes through the plaza. Automated Vehicle Identification (AVI) readers may also be installed along the roadway to acquire probe vehicle data.

Traffic control devices, such as ramp meters, lane use control signs indicating open or closed lanes ahead, and signal coordination may be pro-actively applied to provide a better balance between freeway travel demand and capacity during congested conditions. Information may be provided to travelers through roadside traveler information devices such as Changeable Message Signs (CMS), Highway Advisory Radio (HAR), in-vehicle displays and kiosks. A typical deployment location for a kiosk would be a transit center, such as a BART station. Emergency response and incident management providers may be notified to respond to non-recurring incidents. Signal preemption shortens their response time.

Telematics is the term used to describe data-capable wireless communications in vehicles. This includes auto-related help systems like OnStar to Global Positioning System (GPS) based locators and true cellular services that provide traffic information, email and other data useful to people on the move.

Table 25 and Table 26 show potential ITS application to the Bay Crossing Alternatives that are discussed in the previous chapters. These applications are closed circuit TV, traffic detection, changeable message signs, automated toll collection, highway advisory radio, land use sign control, ramp/mainline metering, global positioning system, automated vehicle location, kiosk, signal priority/pre-emption, and signal coordination technologies are applicable to all modes of transportation.

The potential ITS applications identify the infrastructure implementation opportunities necessary to ensure comprehensive coverage. This mapping is shown in the form of a matrix listing previously generated conceptual alternatives and the appropriate ITS applications.
Additionally, ITS applications that could not be mapped to any previous alternatives have been included as separate alternatives and are shown in the matrix in italics. These applications tend to be developing technologies that are likely to begin broad deployment throughout the Bay Area in the coming decade.
### Table 25: ITS Application: San Mateo Bridge and Dumbarton Bridge

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Closed Circuit TV</th>
<th>Traffic Detection</th>
<th>Changeable Message Sign</th>
<th>Automated Toll Collection</th>
<th>Highway Advisory Radio</th>
<th>Lane Use Sign Control</th>
<th>Ramp/Mainline Metering</th>
<th>Global Positioning</th>
<th>System/Automated Vehicle Location</th>
<th>Kiosk</th>
<th>Signal Priority/Pre-emption</th>
<th>Signal Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highway/Multimodal Operational Enhancements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>San Mateo-Hayward Bridge:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Reversible HOV lane on high-rise portion San Mateo-Hayward Bridge</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Modification of causeway section to allow 6 mixed-flow and 2 HOV lanes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Widen I-880 between SR-238 and SR 92 to 10 mixed-flow and 2 HOV lanes</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Improve SR 92/I-880 Interchange</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Improve SR 238/I-880 Interchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Eastern Approach – 3 mixed flow + 1 HOV lane from I-880</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dumbarton Bridge:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Grade separation of University/SR 84 Interchange</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Toll Plaza Improvement/Expansion</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 I-680/I-880 Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Potential enhancements to University Avenue through East Palo Alto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 AVI-based vehicle probes for travel-time and congestion information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Corve Engineering*
## Table 26: ITS Application – Bay Bridge and Non-Vehicular Mode

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Closed Circuit TV</th>
<th>Traffic Detection</th>
<th>Changeable Message Sign</th>
<th>Automated Toll Collection</th>
<th>Highway Advisory Radio</th>
<th>Lane Use Sign Control</th>
<th>Ramp/MLU Pre-Metering</th>
<th>Global Positioning</th>
<th>System/Automated Vehicle Location</th>
<th>Kiosk</th>
<th>Signal Priority/Pre-emption</th>
<th>Signal Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highway/Multimodal Operational Enhancements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct new WB I-580 HOV approach/structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 from SR 24 to Toll Plaza for SR 24 and MacArthur traffic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 AVI-based vehicle probes for travel-time and congestion information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Tourist attraction advisory system to guide visitors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Parking advisory and transit information system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highway/Multimodal Alternatives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Multimodal Bridge Crossing of Bay – SR 238 to Candlestick Point Area</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Multimodal Bridge/Tunnel Crossing of Bay – SR 238 to I-380</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transit Operational Enhancements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Mateo Bridge expanded bus service with</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 HOV/bus lane installation east of Bridge and park-and-ride construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion of Dumbarton Bridge express bus service with associated HOV/bus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 lane upgrades to approaches, including park-and-ride lot at Newark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Real-time transit service and arrival time information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water-Based Transportation Alternatives</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite schedule and arrival information system via kiosks, Internet and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wireless services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Korve Engineering**

83

9/10/01
7.2 CONGESTION PRICING

Congestion pricing charges a premium to road users who want to drive during peak periods such as rush hour or holiday weekends. The toll varies according to the level of congestion with higher tolls during peak hours or in peak directions.

During peak periods, users – not the entire community – would pay a fee in exchange for greater convenience, fewer delays, and prompt access to a free-flowing highway lane.

Experience in other countries, particularly in France, demonstrates that congestion pricing does significantly reduce gridlock during peak traffic periods.

Under this alternative, a congestion pricing strategy would be developed and evaluated in later stages of the study. This alternative would review increasing bridge tolls in the westbound direction in the morning peak hour of travel. Tolls increases in the $1 to $5 range may be considered in this analysis.

7.3 ELIMINATION OF TOLL COLLECTION CONSTRAINT - FASTRAK

Caltrans’ FasTrak system utilizes a small electronic transponder that is installed on the inside windshield of vehicles. Each time a FasTrak user travels through a bridge’s designated FasTrak lane, the transponder registers their passage and the toll is automatically deducted from their pre-paid account.

Currently, FasTrak vehicles must slow to 25 miles per hour while they pass through the designated lanes. FasTrak users traveling in two-axle automobiles save 15 cents off tolls at all Bay Area toll bridges. Caltrans has installed some FasTrak lanes on the Dumbarton, San Mateo and Bay Bridges and has plans to expand this installation in the near future.

Under this alternative, the effective elimination of the toll crossing constraint through an aggressive implementation of the FasTrak system would be evaluated. The alternative would also include an increased number of FasTrak only dedicated lanes. Most toll plaza lanes would be assumed as FasTrak lanes with a small number of non-FasTrak lanes available for very infrequent visitors. These visitors would pay a substantial time penalty that would provide a strong incentive for all Bay Area residents who use the study bridges to obtain a FasTrak transponder.

7.4 FREE TRANSBAY BUS SERVICE

This alternative would explore the benefits of free transbay bus service. With this measure, all transbay bus service provided by AC Transit would be assumed to be free (Samtrans shuttles are currently free). This measure could potentially enhance the modal split to transit by providing a further incentive for bus use. The question to be answered in the evaluation of this alternative is – what is the extent of the disincentive created by charging for transbay bus service? Is the cost of riding AC Transit resulting in people who would otherwise ride the bus, driving across the Bay.

7.5 EXPAND BAY BRIDGE FREE HOV PERIOD

Currently, the Bay Bridge’s free HOV period extends from 7a.m. to 9a.m. and 3p.m. to 7p.m. on weekdays. This alternative would explore the benefits of extending the free HOV period on the Bay Bridge to 24 hours a day, seven days a week. While this change in policy would result in a decrease in bridge toll revenues, it would extend the HOV incentive to all hours of the day and all days of the week, potentially expanding the formation of carpools outside of peak weekday travel periods.
7.6 Increasing Carpool Requirement from 2+ to 3+

Currently, HOVs in the Dumbarton and San Mateo Bridge corridors are defined as vehicles carrying two or more persons. Under this alternative, that standard would be revised to define a carpool as three or more persons, as is currently the policy on I-80 approaching the Bay Bridge.