

## 7.0 ALTERNATIVES DEFINITION & EVALUATION — STEP-BY-STEP

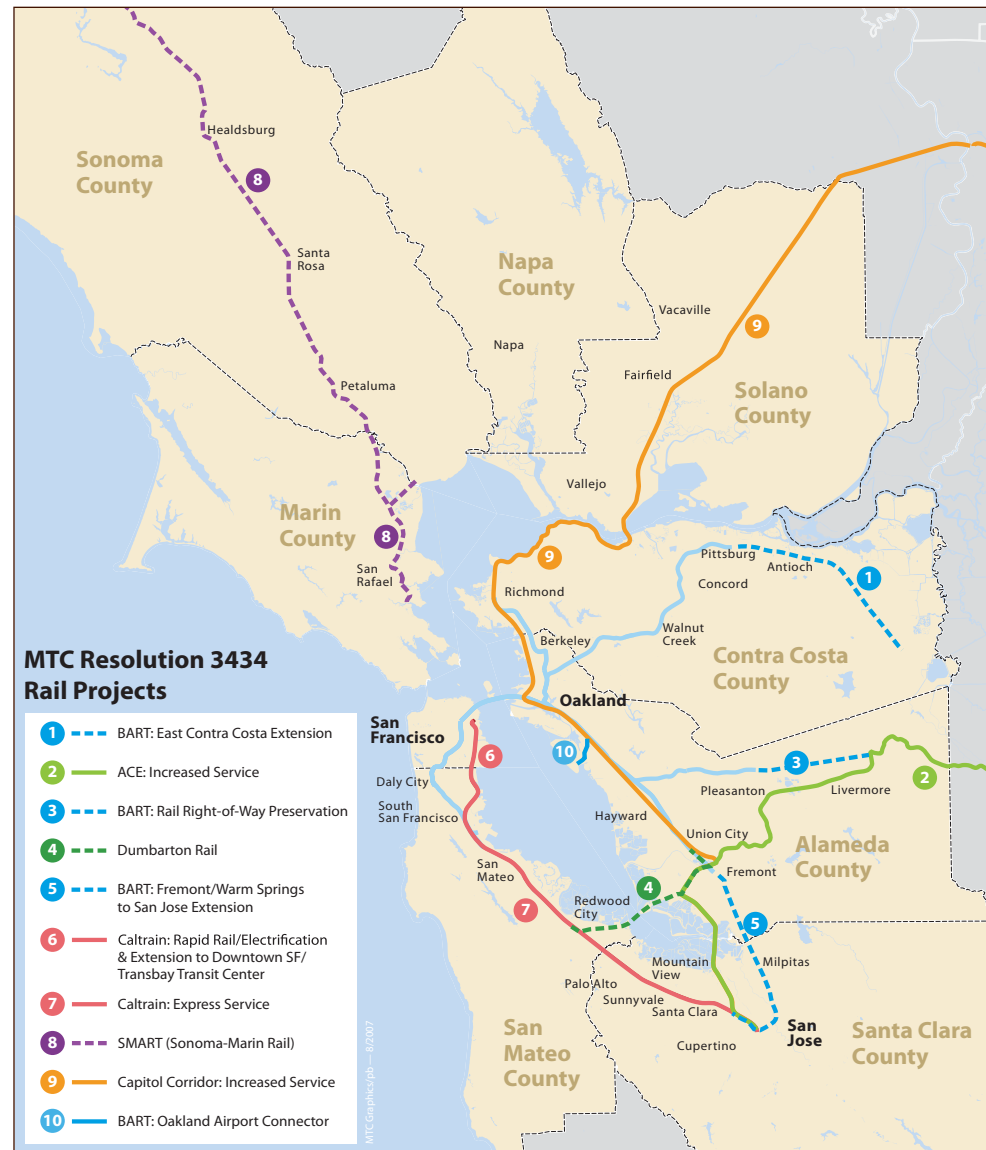
### Step One: Base Network

Recognizing that Resolution 3434 represents MTC’s regional rail investment over the next 25 years as adopted first in the 2001 Regional Transportation Plan and reaffirmed in the subsequent plan update, Resolution 3434 is included as part of the “base case” network. Therefore, the study effort focuses on defining options for rail improvements and expansions beyond Resolution 3434.

Resolution 3434 rail projects include:

1. BART/East Contra Costa Rail (eBART)
2. ACE/Increased Services
3. BART/I-580 Rail Right-of-Way Preservation
4. Dumbarton Bridge Rail Service
5. BART/Fremont-Warm Springs to San Jose Extension
6. Caltrain/Rapid Rail/Electrification & Extension to Downtown San Francisco/Transbay Transit Center
7. Caltrain/Express Service
8. SMART (Sonoma-Marin Rail)
9. Capitol Corridor/Increased Services
10. BART/Oakland Airport Connector

Fig. 7 Resolution 3434





## Step Two: Vision Statements

A set of vision statements was developed for each of the four elements of regional rail - rapid rail, railroad-based, high-speed rail, and freight rail services. In lieu of formally evaluating and screening the wide range of rail service options, these vision statements guided the formulation of various candidate rail service options to be considered in the study alternatives. The vision statements are intended to describe significantly different thematic approaches to the development of each study alternative.

### BART

- **Core Capacity:** BART remains largely as is, with improvements focused on system renovation and core capacity needs.
- **Mass Transit (“Metro System”):** BART is not extended but infill stations are constructed and service is concentrated to provide mass transit service in dense areas with express and/or skip stop service being used to provide adequate travel times for longer length trips. Alternative technologies are used to extend coverage except where short extensions of the BART technology would provide the most beneficial solution.
- **Regional Expansion:** BART is extended and expanded beyond Resolution 3434 to become a system providing regional service throughout the Bay Area counties similar to the original BART plan.

### Railroad-Based Passenger Services

- **Separate Regional Passenger Rail Network** — Rail is upgraded to ultimately provide 115 mph service operating throughout the region on separate electrified grade-separated trackage along principal line segments; passenger service is withdrawn from existing freight tracks along principal lines thereby improving capacity for goods movement.
- **Existing Passenger Services Shared with Freight Rail** — Appropriate capacity and operational improvements including signaling, passing tracks and/or multi-tracking and route alignments are constructed along shared lines to accommodate the projected increases in combined passenger and freight demand in shared freight/passenger corridors using FRA-compliant equipment with higher speeds. High-speed rail, if present, would be on separate trackage using non-FRA compliant equipment.
- **Hybrid System** — A hybrid system is pursued in which the rail solution is selected on a corridor-by-corridor basis to select the most appropriate vehicle technology and running way treatment with consideration for adjacent corridors and other systems (e.g., BART and High-Speed Rail) so that a consistent, workable systemwide plan results.



### High-Speed Rail Visions

- **South Entry:** High-Speed Rail enters the Bay Area from the South through San Jose, and links are added for service to San Francisco and Oakland.
- **East Entry:** High-Speed Rail enters the Bay Area from the East via the Tri-Valley area (Livermore/Pleasanton), and links are added to connect to San Jose, Oakland, and San Francisco.
- **Regional Overlay Services:** High-Speed Rail planning efforts would include the development of regional “overlay” services using the high-speed rail infrastructure with additional investments in facilities and compatible rolling stock necessary to support all of the proposed services.

### Freight

- **Existing Freight Operations Practices** — Future freight movements are dispatched by freight railroads consistent with existing practices and improvements are made to existing freight lines to accommodate traffic growth.
- **Freight Dispatching Optimized** — Future freight movements are dispatched to optimize the utilization of regional rail infrastructure and improvements are made within existing rights of way to accommodate traffic growth needs.
- **Consolidated with Freight By-Pass Lines** — Portions of the regional rail system are consolidated under public ownership and future freight movements are controlled from a consolidated passenger-freight dispatcher center, which hands off freight trains to the private railroads at selected points of connection. Improvements are made both within

existing rights of way as well as along other available rights of way to accommodate traffic growth. Freight traffic is routed away from major urban areas where feasible.

### Step Three: Study Corridors

To facilitate the assembly of the study alternatives, the study area was divided up into corridors. Within each corridor, the intention is to develop alternative packages composed of consistent alignment and station options to support all of the proposed services. Later, the alternative packages could potentially be “mixed and matched” by corridor based upon the evaluation results to develop the recommended hybrid alternative.

The corridors have been defined as areas connecting between major population centers where a substantial portion of the trunk travel within the corridor is longitudinally along the defined route. To the extent possible, corridors are geographically distinct; however, they may overlap at major regional centers, in which case some of the corridor rail infrastructure may be shared between services serving multiple corridors. As shown on Figure 5, twelve corridors used in the study are:

- BART System (all lines)
- US 101 North Corridor (Marin \_ Sonoma)
- North Bay Corridor (Marin \_ Solano)
- I-80 Corridor (Auburn \_ Oakland)
- East Bay Corridor (Oakland \_ San Jose)
- Transbay Corridor (San Francisco \_ Oakland)



- Peninsula Corridor (San Francisco \_ San Jose)
- South Counties Corridor (Santa Cruz, Monterey, San Benito)
- Dumbarton Corridor (Redwood City \_ Union City)
- I-680 & Tri-Valley Corridor (Contra Costa & Southern Alameda)
- Central Valley Corridor (Sacramento \_ Merced)
- Grade Crossings and Grade Separations (all lines)

#### Step Four: Study Alternatives

Twelve study alternatives were identified based on the vision statements. Three study alternatives were developed for Regional Rail without High-Speed Rail Alternative:

- One alternative emphasized regional expansion for BART coupled with shared passenger-freight railroad-based services,
- One emphasized a metro system for BART coupled with separate passenger-freight railroad-based services, and
- One emphasized core capacity for BART with corridor-specific railroad-road based services and freight by-pass lines.

With additional stakeholder and Steering Committee input, the three Regional Rail without High-Speed Rail alternatives were winnowed to two alternatives, which were then subjected to further testing and evaluation.

Nine study alternatives were developed for Regional Rail with High-Speed Rail — three alternatives included different combinations of regional rail and high-speed rail services from the south via San Jose to San Francisco and Oakland; and six alternatives included different combinations of regional rail and high-speed rail services from east via Tri-Valley to Oakland, San Francisco, and San Jose. Refinements to the Regional Rail with High-Speed Rail alternatives were later refined based on the travel analysis prepared for the CHSRA's draft environmental document for the Bay Area to Central Valley High-Speed Train Program.



Fig. 9 Study Alternative 1: 2050 System Map

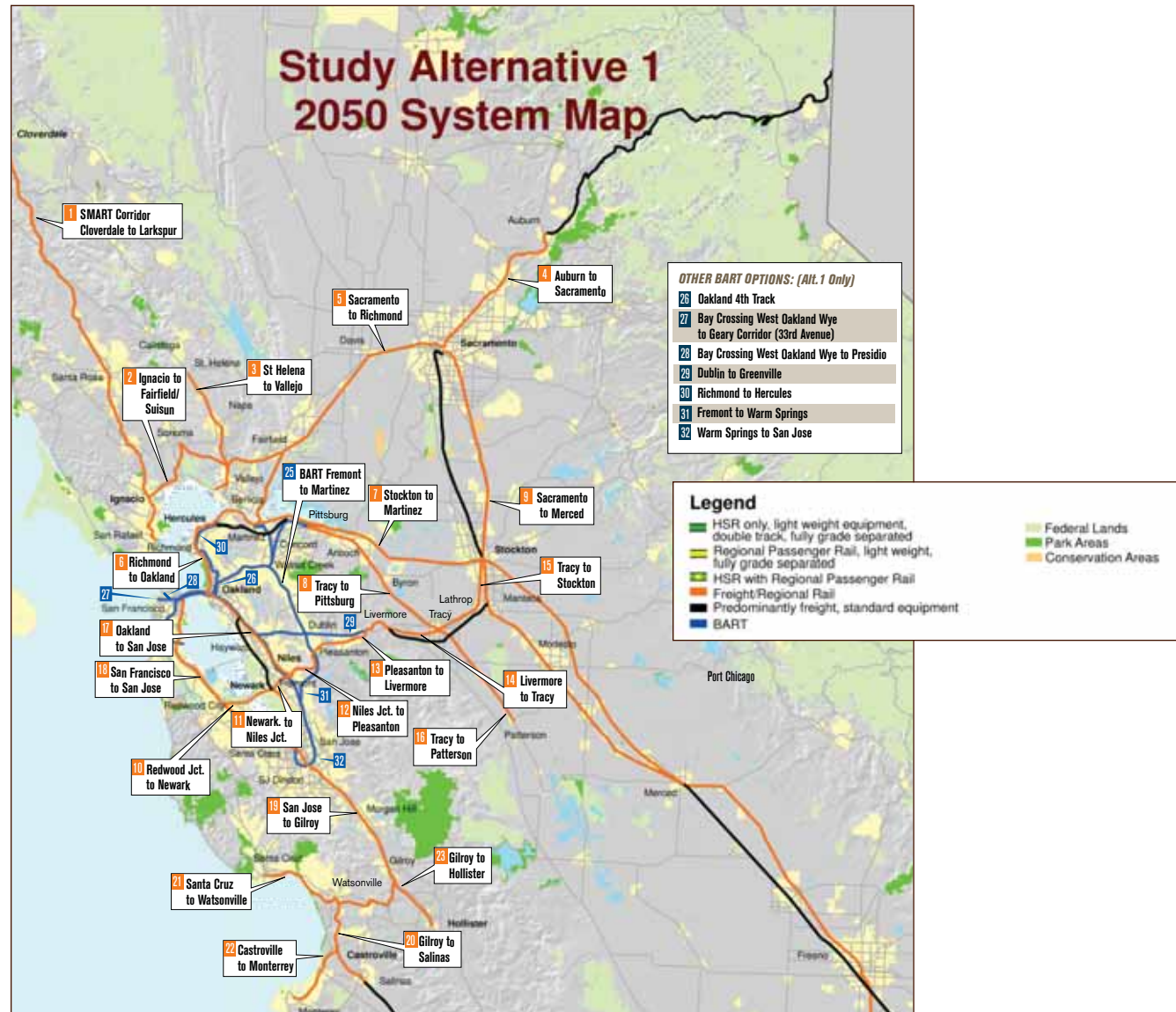
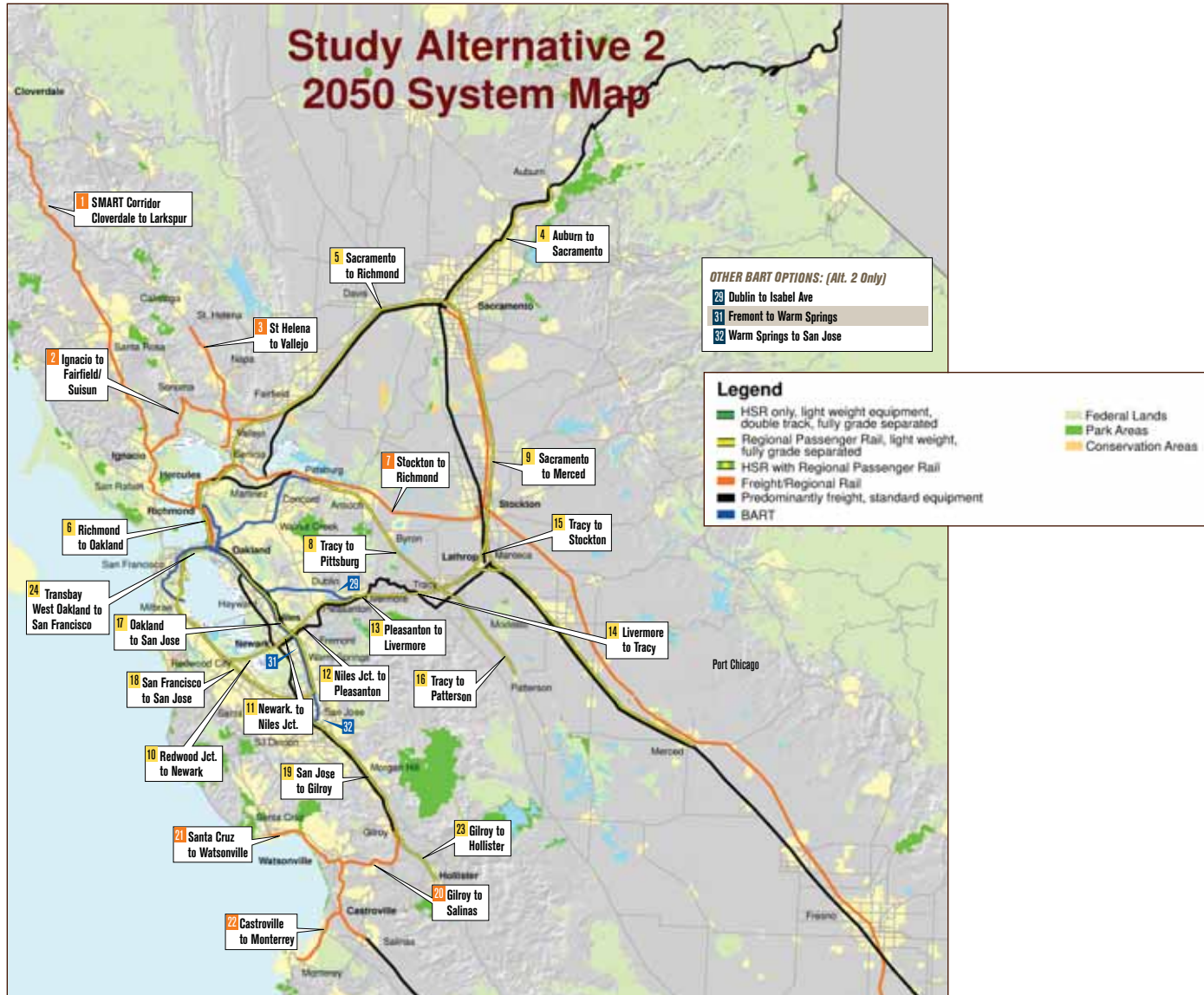


Fig. 10 Study Alternative 2: 2050 System Map





The final study alternatives that were identified with and without high-speed rail are as follows:

- **Existing:** Includes existing Capitol Corridor, Amtrak San Joaquin, Altamont Commuter Express (ACE) and Caltrain standard passenger rail, along with BART services; these systems currently integrate with local rapid transit to provide end-to-end mobility.
- **Baseline — Year 2030:** Encompasses MTC’s Regional Transit Expansion Program (Resolution No. 3434), including nine new rail extensions and significant service expansions to existing rail lines; introduces Sonoma-Marín Rail Transit Project (SMART), Dumbarton, and eBART, as well as enhancements to the Capitol Corridor, Amtrak San Joaquin, ACE and Caltrain. It also includes BART “Core Capacity” improvements.
- **Alternative 1 — Year 2050 — Regional Rail with BART Systemwide Expansion Focus:** No high-speed rail; standard passenger rail shared with freight (capacity improvements as needed); freight dispatching optimized on shared lines; separate freight and passenger tracks on high capacity corridors; short-haul freight between Port of Oakland and Central Valley via Altamont; BART “Regional Expansion;” New BART Transbay Tube; and new San Francisco Subway. Improvements to construct this system are estimated to cost nearly \$40-billion in present day (2006) dollars. Systemwide regional rail ridership on an average weekday would reach 1.35-million riders by Year 2050.
- **Alternative 2 — Year 2050 — Regional Rail with Railroad-Based Services Expansion Focus:** No high-speed rail; lightweight pas-

senger rail system separated from freight on high volume corridors (higher speed, grade separated and electrified system); Transbay rail tunnel to allow extension of Peninsula electrified service to connect with East Bay; freight operating practices independent from passenger operations; and BART “Mass Transit” provider with additional stations and short extensions. Alternative 2 is expected to cost \$37-billion in present day (2006) dollars and would carry nearly 1.20-million rail passengers on an average weekday in Year 2050.

- **High-Speed Rail — Year 2050 — Entry from East via Altamont Pass:** Starting with the recommended Regional Rail network without High-Speed Rail, revisions were made to the regional network to reflect the inclusion of a high-speed alignment entering the Bay Area from the East. These revisions include the additional investment in corridors where high-speed rail would operate as well as consideration for operation of regional services operating on the high-speed lines and opportunities to accelerate improvements to regional corridors affected by the Altamont alignment.
- **High Speed Rail — Year 2050 — Entry from South via Pacheco Pass:** Starting with the recommended Regional Rail network without High-Speed Rail, revisions were made to the regional network to reflect the inclusion of a high-speed alignment entering the Bay Area from the South. These revisions include the additional investment in corridors where high-speed rail would operate as well as consideration for operation of regional services operating on the high-speed lines and opportunities to accelerate improvements to regional corridors affected by the Altamont alignment.





## Step Five: Evaluation Criteria

The evaluation of the study alternatives was conducted on a corridor-by-corridor level using criteria such as engineering feasibility, capital costs, travel demand, operational impacts, connectivity, environmental, and implementation issues.

- **Engineering Feasibility:** The condition, configuration and traffic on the existing passenger and freight rail system in the Bay Area was first inventoried to provide the basis for the engineering analysis. For each study alternative, the study's technical consultants performed conceptual civil engineering of railroad track, grade and sub grade construction, incidental structures, stations and maintenance, servicing and layover facilities. Further, the technical consultants performed conceptual structural engineering with consideration for geotechnical factors for major structures, including conventional railroad and/or high-speed rail crossings of San Francisco Bay and the Carquinez Strait. Lastly, the technical consultants also performed signal and communication systems engineering and cost estimation to an appropriate level of confidence, as well as conducted an evaluation of potential for railroad electrification for each study alternative.
- **Capital Costs:** For each study alternative, the technical consultants performed cost estimation to an appropriate conceptual level of confidence of railroad track, grade and subgrade construction, including major incidental structures. Cost and environmental issues represent prominent concerns in Bay crossings, and therefore, were closely evaluated.
- **Travel Demand:** The travel forecasts used in this study to estimate ridership potential are derived from two modeling

systems: (1) MTC's intraregional travel model which focuses on local highway and transit characteristics and behavior associated with shorter-distance trips (such as commuting and shopping); and (2) the statewide interregional model developed for MTC and California High-Speed Rail Authority to evaluate high-speed rail alternatives in the state. This interregional model captures behavior for longer-distance travel including induced trips, business and commute decisions, recreational travel, attributes of destinations, reliability of travel, party size, and access/egress modal options.

- **Operational Impacts:** The technical consultants developed a "sketch plan" evaluation of capacity based upon readily available information supplemented by planning level analysis. Mainline cross sections for principal line segments were evaluated based upon the general magnitude of intended freight and passenger services to be supported. Major factors that determine capacity of rail lines include, but are not limited to: number of main tracks, location and configuration of crossovers, number of locations where trains can meet and/or pass, ability to get freight trains clear of main line tracks (passing tracks), type of signal and method of traffic control, grades and curvature, passenger train frequencies, traffic mix between freight and passenger, and so forth. Factors that tend to reduce or restrict capacity include, among others: distance between stations, ability to meet or pass trains stopped at stations largely determined by platform configuration, amount of switching activity blocking or fouling the main line tracks, locations where trains tend to queue up, capacity restrictions around yards and terminals, interchange locations, and junction points.



- **Connectivity:** Connectivity points are important to the mobility capability of the passenger and are proven to increase patronage for the overall rail network. In this vein, the technical consultants identified several locations for connectivity among the rail networks and local transportation systems. The connectivity points provide passenger connections between two or more rail services making it easier for the passenger to reach their destination. Major connectivity stations and their potential services were identified for each study corridor. They were organized into three groups, depending on their impact and importance in terms of population served and operators present - statewide, regional, or local relevance. Schedule coordination is key to these connectivity points. In addition, the technical consultants also considered local and regional transit connections, building upon the Regional Measure 2 Transit Connectivity Study and the Transportation 2035 Plan's Regional Express Bus Study being developed for MTC.
- **Environmental Issues:** For the purpose of the Regional Rail Plan, corridor options were screened to identify major environmental concerns. These include impacts to natural resources, section 4(f) impacts, environmental justice, and right-of-way impacts either to existing or adjacent uses. Notable environmental concerns have been identified.
- **Implementation Issues:** Consideration was given to implementation risks including consistency with existing transportation plans, existing corridor ownership and usage (including freight traffic requirements), major environmental issues that may present implementation risk, and other factors.

## Step Six: Regional Rail Alternatives Evaluation

The two systemwide alternatives - Alternative 1 Regional Rail with BART Systemwide Expansion and Alternative 2 Regional Rail with Railroad-Based Services Expansion - were evaluated on a corridor-by-corridor basis taking into account the evaluation criteria described above. See Table 7.0-1 for details.

For each corridor, a recommended corridor treatment has been identified. The recommended alternative was developed based upon the evaluation factors for the services in the corridor with consideration for adjacent corridors and the overall regional rail network. In some cases, the recommended alternative consists of a blend of the two system alternatives or includes refinements suggested by the evaluation process.

### BART System

BART options have been addressed within each of the individual corridors; this section provides a summary of all of the BART considerations.

Alternative 1 included the Resolution 3434 projects (Warm Springs and Santa Clara BART, eBART and Oakland Airport Connector) plus all of the major BART system expansion options including the Transbay, I-80, I-680 and I-580 corridors. In contrast, Alternative 2 was limited to the Resolution 3434 projects plus a one-station extension and connectivity enhancement in the I-580 corridor. Alternative 2 anticipates that BART would develop more like a "Metro" system to provide mass transit in the inner Bay Area. As such, Alternative 2 would include the potential for infill stations and other improvements in system capacity, coverage and operational reliability. The



corridor-by-corridor analysis indicates that the suburban BART system expansion options included in Alternative 1 do not significantly add to corridor ridership levels compared to the railroad-based options provided in Alternative 2.

One segment, which may require system expansion, is in the Oakland - San Francisco Transbay corridor where the highest ridership is present. In the near term, construction of a fourth track through Oakland would improve line connectivity and capacity including providing for cross-platform transfers between all of the various lines. A new Bay Crossing and San Francisco subway would not only relieve the existing transbay tube and Market Street stations, but would provide an opportunity to improve coverage in San Francisco. The Regional Rail plan tested two alignments resulting in similar cost and ridership levels. Further study of alignments in San Francisco would be appropriate at such time as a new tube were to be advanced for project development.

**Plan Recommendation:** Alternative 2 with further development of Metro operating plans and infrastructure; fourth track through Oakland; long-term new Bay Crossing and San Francisco subway line (alignment to be determined)

### **US 101 North Corridor**

The US 101 North corridor has moderate ridership potential, with 9000 to 11,000 daily trips crossing the Marin/Sonoma county line. Alternative 1 includes the SMART service between Larkspur and Cloverdale with capacity and operational improvements to address long-term growth in travel.

Alternative 2 includes a rail connection across the I-580 Bridge to connect the SMART line with the Capitol Corridor in Richmond. The cost of Alternative 2 would be nearly four times the capital cost of Alternative 1. Ridership in the US 101 corridor was found to be similar for both alternatives. Ridership on the East Bay connection was of similar magnitude to that in the US 101 corridor. As a result, Alternative 1 is recommended.

**Plan Recommendation:** Alternative 1

### **North Bay Corridor**

The North Bay corridor between Marin and Solano Counties has low to moderate ridership potential. Only one rail service alternative was tested in the North Bay - an "X" service plan including an east-west line with a timed transfer to a north-south line at Napa Junction.

**Plan Recommendation:** Preserve corridor in near term and develop rail services in phased plan over the longer term



### **Interstate 80 Corridor**

The I-80 corridor has high ridership potential, which is served by BART and Capitol Corridor along the Eastshore area with Capitol Corridor extending beyond to Sacramento. Alternative 1 would develop the UPRR/Capitol Corridor line between Oakland and Sacramento with a range of capacity and operational improvements. Given the high existing level of freight traffic and the expectation that goods movement to and from the Port of Oakland will grow significantly, the line would need to be expanded to three or four main tracks where possible over the long term. The BNSF transcontinental freight line connects to the UPRR line in Richmond. BNSF considers this line to be a vital freight connection to the Port of Oakland and does not want to encumber it with passenger traffic. (In fact, existing passenger trains entering the Bay Area from Stockton on the BNSF are shifted to the UPRR line east of Martinez near Port Chicago.) Passenger improvements would be focused on the UPRR line including a new high level passenger bridge at Benicia, and curve straightening between Pinole and Martinez.

Alternative 2 considered provision of separate passenger-only tracks within the UPRR right-of-way to support the operation of lightweight passenger equipment. This alternative also included a revised alignment north of Hercules to follow I-80 across a new Carquinez bridge at Vallejo and continuing on to reconnect with the UPRR line near Cordelia. Although Alternative 2 resulted in significant travel time savings and higher ridership compared to Alternative 1, the capital cost of Alternative 2 was about twice the cost of Alternative 1. In addition, implementation of separate passenger-only tracks for

lightweight equipment is in conflict with UPRR policies as well as the long-range plan for the Capitol Corridor. Given that significant service improvements can be provided using standard equipment shared with freight, the evaluation indicates that Alternative 1 is the most appropriate solution for the UPRR/Capitol Corridor line.

The BART extension to North Hercules included in Alternative 1 would add \$1.5 to \$1.8 billion to the cost of the network making the total investment in the corridor similar to Alternative 2. However, with shared operation of the freight trackage and expansion to 4 tracks between Oakland and Richmond, there would be adequate track capacity to provide overlay services such as a “wBART” local train operating on conventional rail in lieu of extending the BART system. Given the physical and operational constraints of the single-track BNSF line, the overlay services would likely be confined to the UPRR along San Pablo Bay. If such local service was provided, ridership in the corridor is expected to be about the same as with a BART extension.

**Plan Recommendation:** Alternative 1 with potential for local passenger services on expanded UPRR line



### **East Bay Corridor**

The East Bay corridor between Oakland and San Jose has very high ridership potential and is served by BART and the Capitol Corridor. Alternative 1 would result in expansion of the Niles Subdivision to provide 3 main tracks for operation of passenger services shared with freight.

Alternative 2 considers construction of a new passenger line for lightweight equipment operating between Oakland and San Jose along the UPRR right-of-way north of Fremont and via I-880, Trimble Road and the Caltrain corridor south of Fremont. Provision of a new passenger-only line would require more than twice the investment required to upgrade the existing Capitol Corridor route and would not significantly reduce the travel time or increase ridership. In addition, Alternative 2 would require right-of-way to be obtained from UPRR and is not consistent with the Capitol Corridor long-range plan.

**Plan Recommendation:** Alternative 1

### **Transbay Corridor**

The Transbay market between Oakland and San Francisco has the highest transit and rail ridership demand compared to any corridor or segment in the Regional Rail system - Under Year 2050 Baseline conditions without either Regional Rail Alternative, the Transbay corridor market potential is over 400,000 daily trips. Alternative 1 addresses this demand by providing a new BART Transbay Tube paired with a new San Francisco subway to provide station capacity distribute patrons to stations and connect with regional and local services. Track

connections could be made to the existing BART Market Street line to improve system reliability by providing alternate means of routing trains between Oakland and San Francisco.

In contrast, Alternative 2 would make a standard rail connection via a rail tunnel between tracks in the East Bay and Caltrain, thereby allowing movements such as interlining trains between the Capitol Corridor and Caltrain. However, with Capitol Corridor operating standard equipment and Caltrain tracks devoted to lightweight equipment, a change in regulatory provisions - either a change in Federal Railroad Administration rules or rules waivers in conjunction with improved signaling to allow mixed flow - would be required if trains were to interline between the East Bay and Peninsula.

Analysis of the Transbay peak period ridership indicates BART will be constrained by Year 2030 and over-capacity by Year 2050. Therefore, a new BART Transbay Tube has been indicated in the long-range scenario. Given the significant environmental review process, regulatory approvals, and high cost of such an investment, it is recommended that, should a new Bay Crossing be provided, four standard rail tracks be included to provide a conventional rail connection as well. The cost of this additional provision would be lower as a combined project than if separate BART and rail tunnels were to be built.

**Plan Recommendation:** Alternative 1 with Alternative 2 (both options in long term future)



### **Peninsula Corridor**

The Peninsula corridor between San Francisco and San Jose has high ridership, which is served by Caltrain and, north of Millbrae, by BART. Both Alternatives 1 and 2 would include provision of electrification, additional trackage and grade separations included in the Caltrain long-range development plan to allow the service to operate with approximate 7.5 minute headways during peak periods. However, Alternative 2 includes a rail tunnel connection to the East Bay (cost included as part of “Transbay” corridor) and interlining of the Capitol Corridor trains through the Peninsula to San Jose. (In the East Bay, Oakland - San Jose service on the new passenger alignment would also be provided.) In Alternative 1, Caltrain would operate with standard equipment. In Alternative 2, Caltrain would operate with lightweight equipment - electric multiple unit trains as indicated in the Caltrain Project 2025 plan. The primary factor resulting in higher cost in Alternative 2 is associated with providing a connection to the Transbay rail tunnel. In view the similar costs and ridership, Alternative 2 is recommended for consistency with the Caltrain desire to deploy lightweight equipment.

**Plan Recommendation:** Alternative 2

### **South Counties Corridor**

The South Counties corridor extending south from San Jose to the Monterey Bay cities has moderate ridership potential. Both Alternative 1 and Alternative 2 would develop a network of standard rail services operating both along the UPRR Coast Subdivision as well as along a “wharf-to-wharf” line between Monterey and Santa Cruz with transfer points at Castroville and Pajaro. Alternative 2 would develop a separate higher-speed passenger-only line south from San Jose to Gilroy with an extension to Hollister, which could be served by lightweight Caltrain equipment interlined to Peninsula destinations. The evaluation indicated that either alternative would have similar ridership potential. However, Alternative 2 would require nearly twice the capital investment to provide separate higher speed passenger tracks and would also require riders to transfer at Gilroy for Peninsula services. As a result of the evaluation, Alternative 1 is recommended. It should be noted that when Caltrain converts the Peninsula line between San Francisco and San Jose to operation of lightweight equipment, standard equipment trains operating in the South Counties and into the Bay Area might not be able to operate north of San Jose. Such trains could, however, proceed north along tracks shared with freight in the East Bay. Therefore, interlining South Counties services with East Bay services may be appropriate in the longer term.

**Plan Recommendation:** Alternative 1



### **Dumbarton Corridor**

The Dumbarton corridor between Redwood City and Union City has low to moderate ridership potential. Alternative 1 includes restoration of the a single-track bridge as well as additional improvements necessary to provide a connection to the Union City BART station along the Oakland Subdivision. Passenger and freight traffic would be separated south of Industrial Boulevard in Hayward by routing freight traffic via the Niles Subdivision and passenger traffic via the Oakland Subdivision.

Alternative 2 includes construction of a new 2-track, high-level bridge suitable for interlining lightweight equipment between Union City and points along the Peninsula. Alternative 2 also includes operation of lightweight equipment to Modesto and Tracy. This requires substantial track upgrades in the the Tri Valley area and over Altamont. The evaluation indicated that ridership would be significantly higher if trains from Union City could operate on Peninsula trackage. However, providing a new bridge would nearly double the cost of Alternative 2 compared to Alternative 1. The recommended strategy, therefore, is provision of separate passenger tracks from Union City through Fremont. Between Newark and Redwood City, trains would operate over a rehabilitated bridge as included in Alternative 1. A single-track low-level bridge would provide adequate capacity to meet the Dumbarton operating plan requirements.

**Plan Recommendation:** Blend (Separate passenger tracks with rehabilitated low-level bridge)

### **Interstate 680 and Tri Valley Corridor**

The Interstate 680/Tri Valley corridor has moderate ridership potential with an east-west market paralleling I-580 and a north-south market paralleling I-680. Alternative 1 includes a BART line in the I-680 corridor as well as a BART extension in I-580 to Greenville Road. In contrast, Alternative 2 has a regional bus option in the I-680 corridor, a shorter BART extension to a new ACE intermodal at Isabel/Stanley, and a significant upgrade of the ACE service to Caltrain-like performance by providing separate passenger-only tracks with a new alignment over Altamont Pass and a tunnel under Niles Canyon. Alternative 2 resulted in significantly higher ridership due to the east-west improvements. However, the ridership gain was not high enough to justify the capital cost of the upgraded ACE service, which was four times the capital cost of the rail improvements included in Alternative 1.

Additionally, the freight rail line would need to remain in service to accommodate freight traffic between the Central Valley and East Bay / South Bay, and improvements could be made to the existing line and/or on the parallel abandoned Southern Pacific line to improve the reliability and frequency of ACE services shared with freight.

A one station BART extension to meet ACE would improve connectivity and coverage with less cost than an extension in the median of I-580 all the way to Greenville Road. The cost of extending BART to Greenville was estimated at \$1.0 to \$1.2 billion versus \$500 to \$600 million for an extension to Isabel/Stanley. Due in part to the fact that it would include two stations, the Greenville alternative would attract 25 to 40 per-



cent net new trips (6,200 to 9,200 with Greenville versus 4,400 to 7,400 for Isabel/Stanley). However, at Isabel/Stanley a more convenient transfer (potentially direct vertical or cross-platform at Isabel/Stanley versus a long walk at Greenville) could be provided. Final selection of the preferred Livermore BART station location(s) will be based on further evaluation by BART and others.

Bus in the I-680 corridor would be more cost effective than a new BART line and would leverage several existing and planned express bus/BRT investments. Review of the station boardings indicated that most of the high ridership locations were concentrated in the San Ramon - Pleasanton reach which could be served by buses in the corridor connecting to existing BART lines.

**Plan Recommendation:** Blend (Alternative 1 for railroad-based services plus Alternative 2 for BART)

### **Central Valley Corridor**

The Central Valley corridor has relatively low ridership potential compared to most of the other Regional Rail corridors. Alternative 1 would provide trackage improvements for shared operation of passenger services north-south along the corridor as well as connecting services through the Tri Valley area to the inner Bay Area. Alternative 2 would provide separate passenger-only trackage suitable for operation of lightweight trains provided such trains could operate into this territory from the inner Bay Area, which would require treatment similar to Alternative 2 to be provided through the Tri Valley. Regard-

less of the development of regional corridor trains serving the Central Valley, the Amtrak San Joaquins would continue to provide long-haul services on less frequent schedules. As shown in the evaluation, Alternative 2 would be about twice the cost of Alternative 1 but was not found to carry significantly more riders in the north-south direction (although significantly higher ridership to the East Bay would result as shown in the evaluation of the Tri Valley corridor.)

The overall level of corridor ridership between the Central Valley and the Bay Area was not deemed high enough to justify the very high cost of providing separate trackage for lightweight equipment in the Central Valley, even if it could operate through the Tri Valley area. Therefore Alternative 1 is recommended. However, UPRR has indicated that the north-south lines are approaching capacity and does not want to consider accommodating passenger traffic or selling right-of-way at this point in time. Accordingly, assembly of additional right-of-way paralleling the UPRR north-south alignment would be required to implement corridor passenger service along the UPRR alignment.

**Plan Recommendation:** Develop separate passenger right-of-way paralleling the UPRR right-of-way for operation of standard equipment.





## Summary

Table 7.0-2 compares the projected 2050 ridership of the four existing rail services for each study alternative. Overall, Alternative 1 captures 34 percent more ridership, while Alternative 2 attracts 13 percent compared to the Baseline. BART's ridership potential under both Alternatives 1 and 2 far exceeds the Baseline; and under Alternative 2 where BART functions as a metro system with limited extensions, BART continues to capture significant ridership. ACE's ridership is considerably lower in Alternative 1 compared to both the Baseline and Alternative 2, but as will be shown later in this report, there are opportunities to upgrade ACE in concert with high-speed rail, thereby producing higher ridership levels overall for this rail corridor. The recommended "hybrid" regional rail network achieves ridership levels of 1.3-million, which is comparable to Alternative 1 but at a considerably less capital cost.

The capital cost of Alternative 1 with BART and rail is estimated at \$40 billion, with \$1.6 billion in annual operating costs. The capital cost of Alternative 2 is priced at \$37 billion, with \$1.3 billion in annual operating costs. The recommended "hybrid" network, blending elements of both, has an estimated capital cost of \$35 billion and \$1.4 billion in annual operating costs. An additional \$8 billion would be required for BART Core Capacity improvements, bringing the total to \$43 billion. The Resolution 3434 component of this total is \$10 billion. The costs cited herein are in 2006 dollars.



Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>BART System *1 — Alternative 2 recommended</b>						
<b>Alt 1</b> Existing system with Second Transbay Tube; new SF and I-680 Lines; and North Hercules and Livermore (Greenville Rd.) Extensions	BART \$21,700 – \$26,500 *2	845,000 – 1,030,000	Addresses transbay demand by providing new line to San Francisco  New Transbay connection improves reliability  Peak period headways, 6 mins; off- peak, 12 mins on 7 lines (Oakland Airport Connector: 3.5 / 7 mins peak / off- peak)	New SF subway line adds coverage to Alameda & NW San Francisco  Capitol Corridor / BART at West Oakland (existing lines) & Jack London (new bay crossing)  ACE / BART at Greenville/ I-580 in Livermore	New Bay Crossing  Tunneling & subway construction impacts  Impacts to freeway facilities  Impacts to adjacent properties	Extensive planning process required to finalize extension alignments and stations  Very large funding requirement  Possible service disruption during construction
<b>Alt 2</b> Existing system with Livermore (Isabel Ave. / Stanley Blvd.) Extension	BART \$6,400 – \$7,900 *3	730,000 – 890,000	Addresses Transbay demand by increasing service in core and modifying car configuration  Peak period headways, 6 mins; off- peak, 12 mins on 3 lines; peak / off- peak headways, 12 mins on 3 lines (Oakland Airport Connector: 3.5 / 7 mins peak / off- peak)	Capitol Corridor / BART at West Oakland  ACE / BART at Isabel/ Stanley in Livermore  Infill stations	Overall fewer impacts due to less system expansion	Refine policies to address infill stations

\*1 – Includes Warm Springs & Santa Clara Extensions and eBART (Resolution 3434)

\*2 – BART Cost Breakout: Includes 4<sup>th</sup> Track through Oakland, new Transbay Tube and SF subway line, I-80 extension, I-580 extension to Greenville and new I-680 line

\*3 – BART Cost Breakout: Includes Infill Stations and I-580 extension to Isabel/Stanley; and Preferred Livermore BART station location(s) to be determined by further evaluation by BART and others

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Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	<b>Capital Cost</b> (\$-million 2006)	<b>Daily Systemwide Travel Demand</b> (2050)	<b>Operational Plans &amp; Impacts</b>	<b>Coverage &amp; Connectivity</b>	<b>Environmental Issues</b>	<b>Implementation Issues</b>
<b>U.S. 101 North Corridor — Alternative 1 recommended</b>						
<b>Alt 1</b>  SMART service between Cloverdale and Larkspur	\$430 – \$530	Marin / Sonoma 9,000 – 11,000	Stand-alone service  Peak period / direction headways of 20 mins; off- peak headways, 40 mins	Regional Bus and Ferry  Connection to North Bay corridor at Ignacio	Nominal; mostly within rail right-of way	
<b>Alt 2</b>  SMART service between Cloverdale and Larkspur  Rail connection across reconstructed Richmond- San Rafael Bridge to connect SMART with Capitol Corridor in Richmond	\$1,600 – \$1,950	Marin / Sonoma 12,000 – 15,000  Marin / Contra Costa 11,000 – 13,000	Service interlined with East Bay Services; more complex operating plan  Sonoma – Marin service: peak period, peak direction headways of 30 min.; off- peak headways, 60 min.  Sonoma – Stockton service: peak period / direction headways of 60 mins; off- peak headways, 120 mins	Rail, Regional Bus and  Connection to North Bay corridor at Ignacio  Connection to Capitol Corridor at Richmond	New Bay Crossing	Schedule integration with East Bay services



Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>North Bay Corridor — Alternative 1 recommended</b>						
<b>Alt 1</b>  Rail from St. Helena to Vallejo (feeder bus to Calistoga) and San Rafael to Fairfield/Vacaville	\$670 – \$810	Napa / Solano 3,000 – 4,000	North-south plus east-corridor requires complex operating plan to serve all market patterns  Peak / off-peak headways of 60 mins (Alt. 1); peak / off-peak headways of 30 mins (Alt. 2)	Rail and Ferry  Ties US 101 North rail corridor to I-80 rail corridor; only existing rail connection	Wetlands along east-west alignment	Schedule coordination of N/S with E/W service & E/W service with SMART, ferries and Capitol Corridor
<b>Alt 2</b>  Rail from St. Helena to Vallejo (feeder bus to Calistoga) and San Rafael to Fairfield/Vacaville		Napa / Solano 3,000 – 4,000				

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Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>I-80 Corridor *4 – Alternative 1 recommended for Rail; Alternative 2 recommended for BART (add Hercules – Union City rail overlay)</b>						
<p><b>Alt 1</b></p> <p>Upgrade UP RR line to 3 or 4 tracks with grade separation and operational impvts; add grade separations to 4-track segments</p> <p>Extend BART Richmond line to intercept station on I-80 north of Hercules</p>	<p>Rail &amp; BART \$3,450 – \$4,180</p>	<p>Yolo / Solano 39,000 – 48,000</p> <p>Contra Costa / Solano 43,000 – 53,000</p> <p>Contra Costa / Alameda Rail &amp; BART 84,000 – 103,000</p>	<p>Critical freight corridor most suitable for operation of standard passenger equipment</p> <p>Oakland – Sacramento travel time 92 mins</p> <p>Peak / off-peak headways of 30 mins (Sacramento – San Jose); peak / off-peak headways of 60 mins (Auburn – San Jose)</p>	<p>Bus, Amtrak &amp; BART in East Bay; Bus, Amtrak &amp; Sacramento Regional Transit LRT at Sacramento</p> <p>Maintains connectivity with San Joaquin long haul services at Martinez</p> <p>I-80 BART extension</p>	<p>Bay edge track improvements Pinole – Martinez, new bridge at Benicia, improvements through Suisun marsh and Yolo Causeway may result in impacts to SF Bay, US waters, wetlands and sensitive habitat</p> <p>Grade separation r/w and circulation impacts</p> <p>Environmental justice concerns: improvements to corridor passing through disadvantaged neighborhoods</p>	<p>Environmental clearance</p> <p>UP RR has accepted track improvements to provide passenger slots</p> <p>Grade separations and road closures developed incrementally in conjunction with 4-track sections</p>
<p><b>Alt 2</b></p> <p>New passenger line for lightweight equipment from Oakland to Auburn via UP RR; follows 80 between Hercules and Cordelia, including new bridge across Carquinez Strait at</p>	<p>Rail \$3,730 – \$4,560</p>	<p>Yolo / Solano 34,000 – 42,000</p> <p>Contra Costa / Solano 56,000 – 68,000</p> <p>Contra Costa / Alameda Rail &amp; BART 133,000 – 163,000</p>	<p>Oakland – Sacramento travel time 63 mins</p> <p>Peak headways of 30 mins, off-peak headways of 60 mins (Auburn – San Jose); peak headways of 15 mins, off-peak 30 mins (Sacramento – San Jose express)</p>	<p>Bus, Amtrak &amp; BART in East Bay, Bus, Amtrak &amp; Sacramento Regional Transit LRT at Sacramento</p> <p>Provides direct rail service to Vallejo; does not serve Martinez Amtrak</p> <p>Connects with new Oakland – San Francisco rail tunnel</p>	<p>Slightly less overall impact compared to Alt 1 but new water crossing (Carquinez) and improvements at Yolo Causeway may result in impacts to SF Bay, US waters, wetlands and sensitive habitat</p> <p>Grade separation r/w and circulation impacts</p> <p>Environmental justice concerns: improvements to corridor passing through disadvantaged neighborhoods</p>	<p>Environmental clearance</p> <p>Higher speed passenger tracks and four-track sections will require grade separations and closure of minor roads</p> <p>Construction of high speed passenger tracks in rail r/w conflicts with UPRR</p>

\*4 – Includes Capitol Corridor service improvements (Resolution 3434)



Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>East Bay Corridor *5 – Alternative 1 recommended (with Hercules – Union City rail overlay)</b>						
<b>Alt 1</b>  Expand Niles Subdivision to provide 3 tracks for operation of passenger services with freight	\$1,110 – \$1,350	Alameda / Santa Clara  Rail & BART 91,000 – 111,000	Freight corridor provides connection to Coast Subdivision; used to return empty containers to Port of Oakland  Potential for short haul freight  Oakland – San Jose travel time 53 mins  Peak / off-peak headways of 30 mins (Sacramento – San Jose); peak / off-peak headways of 60 mins (Auburn – San Jose)	Bus, Amtrak & BART in East Bay; Caltrain and Valley Transportation Authority LRT in San Jose; Oakland Airport  BART I-680 line and 2-station extension in I-580 provides significant increase in coverage and connectivity to South Bay	Mostly within rail right-of-way  Trestle along Bay edge Newark – Alviso  Environmental justice concerns: improvements to corridor passing through disadvantaged neighborhoods	UPRR has accepted track improvements to provide slots for passenger service
<b>Alt 2</b>  Separate passenger-only tracks from Oakland to San Jose via UPRR north of Fremont and via I-880, Trimble Road and Caltrain corridor south of Fremont	\$2,540 – \$3,100	Alameda / Santa Clara  Rail & BART 84,000 – 103,000	Freight would remain on existing lines with new passenger alignment  Oakland – San Jose travel time 41 mins  Peak / off-peak headways of 30 mins (Oakland – San Jose express)	Bus, Amtrak & BART in East Bay; Caltrain and Valley Transportation Authority LRT in San Jose; Oakland Airport & San Jose Airport  Great America station not served; replaced with I-880 / Montague	Mostly within rail right-of-way  Development of passenger tracks requires full grade separation using aerial structure or modification of local roadways and circulation  Environmental justice concerns: improvements to corridor passing through disadvantaged neighborhoods	Not consistent with Capitol Corridor long range plan  Construction of high speed passenger tracks in rail r/w conflicts with UPRR

\*5 – Includes Capitol Corridor service improvements (Resolution 3434)

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Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>Transbay Corridor – both Alternative 1 &amp; Alternataive 2 recommended in long-term future</b>						
<b>Alt 1</b>  New BART transbay crossing connecting to new SF subway line	BART *6 \$10,200 – \$12,500	Alameda / San Francisco BART 396,000 – 494,000  New SF Subway *7 BART 35,000 – 43,000	Addresses Transbay demand with BART  Construction of new BART tube and SF subway line improves BART system reliability  Peak headways of 3 mins, off- peak headways of 6 mins through each BART Transbay Tube	Bus, Amtrak & BART in Oakland; Bus, BART, Caltrain & MUNI LRT in San Francisco  Construction of new BART SF subway line improves coverage to San Francisco	New Bay Crossing (BART)	Approvals for new Bay Crossing
<b>Alt 2</b>  New rail tunnel with trackage in East Bay and San Francisco interlining trains between Capitol Corridor and Caltrain	Rail *8 \$1,910 – \$2,330	Alameda / San Francisco  BART 370,000 – 450,000  Rail 63,000 – 79,000  Total 433,000 – 529,000	Provides option to route East Bay & I- 80 Corridor trains to San F rancisco  Peak headways of 2 mins, off- peak headways of 6 mins through each Transbay Tube  Peak headways of 30 mins, off- peak headways of 60 mins (Auburn – San Jose); peak headways of 15 mins, off- peak 30 mins (Sacramento – San Jose express)	Improves connectivity of Peninsula and East Bay rail networks	New Bay Crossing (Rail Tunnel)	Approvals for new Bay Crossing  East Bay equipment not compatible with Peninsula equipment over long term  Trade- offs between sunken tube & bored tunnel

\*6 – BART cost includes new SF subway line; cost of transbay crossing and SF subway to Market Street is \$7,200 – \$8,800

\*7 – Trips within San Francisco (over and above Transbay trips through new tube)

\*8 – Rail cost includes transbay rail tunnel only



Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>Peninsula Corridor *9 – Alternative 2 recommended</b>						
<b>Alt 1</b>  Improve capacity to 2-4 tracks, grade separation to support express and local services with electrified standard equipment	\$4,250 – \$4,950	San Mateo / Santa Clara 41,000 – 51,000	Maintains ability to operate passenger shared with freight  San Jose – San Francisco travel time 57 mins  Peak headways of 15 mins, off- peak headways of 30 mins (Salinas – San Francisco); peak headways of 15 mins, off- peak 30 mins (San Jose – San Francisco express)	Bus, BART & MUNI LRT in San Francisco; Bus, BART, Amtrak, Santa Clara Valley Transit Authority LRT, ACE, Capitol Corridor in San Jose; SFO Airport & San Jose Airport	Mostly within rail right-of-way  Grade separation r/w and circulation impacts	Use of standard equipment not consistent with Caltrain long range plan for corridor  Narrow r/w sections require tunneling or aerial track segments for express track
<b>Alt 2</b>  Same as Alt 1 with rail tunnel connection to the East Bay and interlining of Capitol Corridor through Peninsula to San Jose	\$4,400 – \$5,100	San Mateo / Santa Clara 49,000 – 60,000	Freight accommodated at night (temporal separation)  San Jose – San Francisco travel time 45 mins  Peak headways of 30 mins, off- peak headways of 60 mins (San Francisco - Hollister); peak headways of 30 mins, off- peak 60 mins (San Jose – Auburn); peak headways of 15 mins, off- peak 30 mins (San Jose – San Francisco express)	Bus & MUNI LRT in San Francisco; Bus, BART, Amtrak, Santa Clara Valley Transit Authority LRT, ACE, Capitol Corridor in San Jose; SFO Airport & San Jose Airport  Connects to rail tunnel to East Bay at San Francisco	Mostly within rail right-of-way  Grade separation r/w and circulation impacts	Use of lightweight equipment consistent with Caltrain long range plan for corridor  Narrow r/w sections require tunneling or aerial track segments for express track

\*9 - Includes Caltrain line improvements, downtown SF extension and Transbay Transit Center (Resolution 3434)

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Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	<b>Capital Cost</b> (\$-million 2006)	<b>Daily Systemwide Travel Demand</b> (2050)	<b>Operational Plans &amp; Impacts</b>	<b>Coverage &amp; Connectivity</b>	<b>Environmental Issues</b>	<b>Implementation Issues</b>
<b>South Counties Corridor – Alternative 1 recommended</b>						
<b>Alt 1</b>  Standard rail services operating both along UPRR Coast Subdivision and “wharf- to-wharf” line between Monterey and Santa Cruz with transferpoints at Castroville and Pajaro	\$1,440 – \$1,760	Santa Clara / San Benito 6,000 – 8,000	Standard equipment may not operate north of San Jose on Peninsula in the event Caltrain is converted to lightweight equipment  Peak headways of 60 min., off- peak headways of 120 min. (Santa Cruz – Monterey); peak / off- peak headways of 60 min. (Gilroy - Hollister)	Bus, Amtrak, BART, ACE, Caltrain& Capitol Corridor at San Jose  Monterey Bay cities at Pajaro & Castroville	Mostly within rail right- of-way	Use of standard equipment compatible with existing freight corridor  UP RR has accepted track improvements to provide slots for passenger service (San Jose to Gilroy)
<b>Alt 2</b>  Same as Alt 1 with separate higher-speed passenger-only line south from San Jose to Gilroy with extension toHollister	\$2,280 – \$2,790	Santa Clara / San Benito 10,000 – 12,000	Lightweight equipment can interline on Peninsula  Standard equipment could not operate on trackage with lightweight equipment; would remain on freight track(s)  Peak headways of 30 mins, off- peak headways of 60 mins (Santa Cruz – Monterey); peak / off-peak headways of 60 mins (Gilroy - Salinas)	Bus, Amtrak, BART, ACE, Caltrain& Capitol Corridor at San Jose  Monterey Bay cities at Pajaro & Castroville  Forced transfer at Gilroy to lightweight equipment for trips between Bay Area and South Counties	Mostly within rail right- of-way	Requires high cost re- build of Monterey Highway to fit separate passenger tracks in narrow right- of- way  Construction of high speed passenger tracks in rail r/w conflicts with UPRR



Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>Dumbarton Corridor *10 – Alternative 1 recommended with separate passenger-only track to Union City</b>						
<b>Alt 1</b>  Single-track Dumbarton bridge with connection to Union City BART	\$680 – \$830	Alameda / San Mateo 6,000 – 8,000	Use of standard equipment may require forced transfer at Redwood City due to capacity constraints on Caltrain and use of lightweight equipment on Peninsula  Peak period / direction headways of 30 mins, off- peak headways of 60 mins	Alts 1 & 2 similar – BART, Capitol Corridor & ACE in East Bay and Caltrain on Peninsula	Repair, replace missing bridge sections and return to service with single track bridge resulting in possible impacts to SF Bay waters, wetlands, wildlife preserve, sensitive habitat	
<b>Alt 2</b>  New 2- track high- level bridge for operation of lightweight passenger equipment	\$1,130 – \$1,380	Alameda / San Mateo 19,000 – 23,000	Lightweight equipment can interline on Peninsula  Standard equipment from East Bay could not operate on trackage with lightweight equipment  Peak period / direction headways of 60 mins, off- peak headways of 120 mins (Merced – San Francisco); peak period / direction headways of 60 mins, off- peak headways of 120 mins (Union City – San Jose); peak / off- peak direction headways of 60 mins, off- peak headways of 60 mins (West Oakland – San Jose)		Replacement Bay Crossing with 2-track high level bridge resulting in possible impacts to SF Bay waters, wetlands, wildlife preserve, sensitive habitat  Higher potential for disruption compared to Alt 1	Approvals for new Bay Crossing

\*10 – Resolution 3434

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Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	<b>Capital Cost</b> (\$-million 2006)	<b>Daily Systemwide Travel Demand</b> (2050)	<b>Operational Plans &amp; Impacts</b>	<b>Coverage &amp; Connectivity</b>	<b>Environmental Issues</b>	<b>Implementation Issues</b>
<b>I-680 &amp; Tri Valley Corridor – Alternative 1 recommended for Rail; Alternative 2 recommended for BART *11</b>						
<b>Alt 1</b>  New BART line along I- 680 from Warm Springs BART to intermodal with Capitol Corridor at Martinez, transfer stations at West Dublin and Walnut Creek  New BART line along I- 580 to Greenville	Rail \$820 – \$1,010  BART \$4,640 – \$5,670	Alameda / San Joaquin Rail 8,000 – 9,000  BART 48,000 – 58,000	Standard equipment compatible with Capitol Corridor and existing Coast Subdivision Newark – San Jose  Maintains ability to operate freight trains between East Bay and Central Valley using shared track  Peak period peak direction headways of 30 mins, off-peak headways of 60 mins (Sacramento – San Jose)	Bus, BART & ACE at Greenville/ I-80  New BART line provides coverage to I- 680 corridor and connects Martinez Amtrak, existing BART lines and Silicon Valley BART	Mostly within rail right-of-way	Rail options in Altamont corridor would include expansion of UPRR subdivision and/or returning sections of abandoned SP RR to service  Cost for I-680 BART assumes aerial structure as “minimum” cost to provide line; but cost could be twice as high if subway
<b>Alt 2</b>  Regional express bus along I- 680  New BART line along I- 580 to new ACE intermodal at Isabel / Stanley; significant upgrade of ACE	Rail \$3,510 – \$4,290  BART \$500 – \$650	Alameda / San Joaquin Rail 18,000 – 22,000  BART 24,000 – 29,000	Central Valley lines need to be fully separated from freight  Freight track(s) would need to remain in service to provide connection between East Bay and Central Valley  Potential to interline with Peninsula with Alt 2 network to west  Peak period peak direction headways of 30 mins, off-peak headways of 60 mins (Sacramento – Hollister)	Bus, BART & ACE at Isabel / Stanley  I- 680 Regional Bus line provides coverage to I-680 corridor and connects Fairfield/Suisun Amtrak; Martinez Amtrak; BART, ACE and Santa Clara Valley LRT	Constrained r/w Livermore – Pleasanton makes fitting trackage and grade separations difficult as existing freight track(s) would need to remain in service	Rail options in Altamont corridor include costly new rail tunnel under Niles Canyon and new alignment over Altamont Pass  Bus alternative in I-680 corridor consistent with Contra Costa County long range plans

\*11 – Preferred Livermore BART stations to be determined by further evaluation by BART and others



Table 7.0.1 Alternatives Evaluation Summary Table — Regional Rail Without High-speed Rail (continued)

	Capital Cost (\$-million 2006)	Daily Systemwide Travel Demand (2050)	Operational Plans & Impacts	Coverage & Connectivity	Environmental Issues	Implementation Issues
<b>Central Valley Corridor – Alternative 1 recommended</b>						
<p><b>Alt 1</b></p> <p>Improve BNSF and UP RR lines for shared operations of north-south passenger service</p> <p>Extend eBART to Tracy and Patterson using standard equipment</p>	\$3,320 – \$4,050	<p>Sacramento / San Joaquin 5,000 – 6,000</p> <p>San Joaquin / Stanislaus 6,000 / 8,000</p> <p>Stanislaus / Merced 3,000</p>	<p>UP RR line approaching capacity; would require significant expansion in track capacity to accommodate passenger services</p> <p>Peak / off- peak headways of 90 mins (Oakland – Merced via Stockton); peak / off- peak headways of 60 mins (Oakland – Merced via Union City); peak / off-peak headways of 60 mins (Sacramento – Merced)</p>	<p>eBART extension to Tracy; Tracy to P atterson service</p> <p>ACE expanded to Sacramento – Merced</p> <p>Bus, Amtrak, Capital Corridor, LRT at Sacramento; ACE/eBART at Tracy; Amtrak/ACE at Stockton</p>	New structures at riparian crossings	UP RR wants to preserve existing corridor for freight only
<p><b>Alt 2</b></p> <p>Develop separate trackage for operation of lightweight passenger equipment along UP RR</p> <p>Extend eBART to Tracy and Patterson using lightweight passenger equipment</p>	\$5,490 – \$6,710	<p>Sacramento / San Joaquin 11,000 – 14,000</p> <p>San Joaquin / Stanislaus 10,000 / 12,000</p> <p>Stanislaus / Merced 4,000</p>	<p>Would require development of lightweight line over Altamont and down to San Jose to support existing ACE</p> <p>Lightweight network allows interlining on all branches</p> <p>Peak / off- peak headways of 90 mins (Oakland – Merced via Stockton); peak / off- peak headways of 60 mins (Oakland – Merced via Union City); peak / off-peak headways of 60 mins (Sacramento – Merced)</p>	<p>eBART extension to Tracy; Tracy to P atterson service</p> <p>ACE expanded to Sacramento – Merced</p> <p>Bus, Amtrak, Capital Corridor, LRT at Sacramento; ACE/eBART at Tracy; Amtrak/ACE at Stockton</p>	<p>Grade separation r/w and circulation impacts</p> <p>New structures at riparian crossings</p>	UP RR wants to preserve existing corridor for freight only



Table 7.0.2 2050 Average Weekday Daily Total Boardings

Alternative	Service Provider				
	BART	Caltrain	Capitols	ACE	TOTAL
2050 Baseline	830,000	89,000	23,000	24,000	970,000
2050 Alternative 1	1,100,000	120,000	70,000	14,000	1,300,000
2050 Alternative 2	830,000	120,000		49,000	1,100,000
2050 Hybrid	1,000,000	140,000	93,000	21,000	1,300,000