WCCTAC
West Contra Costa Transportation Advisory Committee

West Contra Costa High-Capacity Transit Study

TECHNICAL MEMORANDUM #10

Preliminary Evaluation and Screening

May 19, 2016

WSP | PARSONS BRINCKERHOFF

With

Kimley-Horn

MLee Corporation

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Acronyms and Abbreviations

BART	San Francisco Bay Area Rapid Transit District
BNSF	Burlington Northern Santa Fe Railway
BRT	bus rapid transit
DMU	diesel multiple unit
GHG	greenhouse gas emissions
HCT	high-capacity transit
I-80	Interstate 80
I-580	Interstate 580
LRT	light rail transit
MTC	Metropolitan Transportation Commission
O&M	Operations and maintenance
PDA	Priority Development Area
SR-4	State Route 4
UPRR	Union Pacific Railroad
VMT	Vehicle Miles of Travel
WCCTAC	West Contra Costa Transportation Advisory Committee

1 EXECUTIVE SUMMARY

The purpose of the West Contra Costa High-Capacity Transit (HCT) Study is to identify and evaluate the feasibility and effectiveness of HCT options in West Contra Costa County for West Contra Costa Transportation Advisory Committee's (WCCTAC) consideration. Central to the study purpose is providing WCCTAC with the analyses necessary to determine and advance the most promising HCT alternative(s). The study is considering multimodal transit options including freeway-based express bus, bus rapid transit (BRT), extension of BART service, including diesel multiple unit (DMU) options in BART corridors, and commuter rail improvements. Study findings will guide future planning, investment priorities, and funding efforts for WCCTAC.

The purpose of this technical memorandum is to present findings of the Step 1 technical evaluation of alternatives that would provide new transit service to the West Contra Costa County study area. This screening was based on the 19 evaluation criteria developed to assess the alternatives against the adopted goals and objectives for the project and against federal funding eligibility. Technical Memorandum #9 presents the criteria in detail.

Following the initial review of concepts, a set of eight alternatives was identified to be carried forward into the Step 1 evaluation: three bus alternatives, two commuter rail alternatives, and three BART alternatives. These alternatives are summarized in Table 1-1.

In comparing the eight alternatives against the goals and objectives for the project, the bus and BART alternatives had the highest levels of performance, though each alternative performs well in some areas. The bus alternatives are cost competitive and they capture the greatest number of potential passengers within a half mile of the stations or stops, serve the greatest number of low income riders, provide the highest level of service to the West County PDAs, and provide good connections to other transit providers and destinations. Because the San Pablo/ Macdonald Avenue BRT Alternative (Alt. 2) is longer than the 23rd Street BRT Alternative (Alt. 3), it scores better in some circumstances, including regional transit centers served, service to low income areas, and availability and type of developable land. The Express Bus Alternative (Alt. 1) is a better option for providing an alternative to travel in single occupant autos on the freeway and would more quickly deliver patrons to their desired destination. While the BRT alternatives (Alternatives 2 and 3), can be implemented relatively quickly, they do not have as high of potential for capturing riders from the I-80 or I-580 corridors and would likely not realize as great of benefits in terms of reducing VMT as the other alternatives would as trips tend to be shorter for these type of services.

For larger and longer term investment, the BART alternatives (Alternatives 6 and 7) score higher than the commuter rail alternatives (Alternatives 4 and 5), despite their high costs. The BART

Table 1-1. Alternatives for Evaluation

No.	Alternative	Description
1	Express Bus Service	**Express Bus Service** on I-80 from Hercules Transit Center (at Willow Avenue/State Route 4) and on I-580 from Marin County to Alameda County via I-80
2	San Pablo Avenue/ Macdonald Avenue Bus Rapid Transit (BRT)	**San Pablo Avenue/Macdonald Avenue Bus Rapid Transit (BRT)**, from El Cerrito del Norte BART to Richmond Parkway Transit Center and serving Contra Costa College and Hilltop Mall on the San Pablo alignment and to Tweksbury Turnaround and serving the Richmond BART/Capitol Corridor station on Macdonald Avenue. Possible extensions of San Pablo BRT to Hercules Transit Center and to the Hercules Intermodal Transit Center (at Bayfront Boulevard)
3	23rd Street BRT	**23rd Street BRT**, from Richmond Ferry Terminal to Richmond BART/Capitol Corridor station continuing to Contra Costa College, with possible extension along San Pablo Avenue to Hilltop Mall and Hercules.
4	Union Pacific Railroad (UPRR) Corridor Commuter Rail	**Union Pacific Railroad (UPRR) Corridor Commuter Rail**, from Richmond BART to Downtown Martinez with an intermediate station at the Hercules Intermodal Transit Center (at Bayfront Boulevard) and with a potential extension to Oakland
5	UPRR-Burlington Northern Santa Fe (BNSF) Corridor Commuter Rail	**UPRR-Burlington Northern Santa Fe (BNSF) Corridor Commuter Rail**, from Richmond BART to Hercules Transit Center (at Willow Avenue/SR-4) with possible east extension to I-680 in Martinez and South Extension to Oakland.
6	BART Extension from Richmond Station to Hercules	**BART Extension from Richmond Station to Hercules,** from Richmond BART station along the UPRR right-of-way transitioning to 13th Avenue and Rumrill Boulevard before tunneling under Hilltop Mall then following the I-80 right-of-way to the Hercules Transit Center (at Willow Avenue/SR-4)
7A	BART Extension from El Cerrito del Norte Station to Hercules	**BART Extension from El Cerrito del Norte Station to Hercules** from El Cerrito del Norte BART station to Hercules Transit Center (at Willow Avenue/SR-4) along the I-80 right-of-way
7B	DMU Extension from El Cerrito del Norte Station to Hercules	**DMU Extension from El Cerrito del Norte Station to Hercules** from El Cerrito del Norte BART station to Hercules Transit Center (at Willow Avenue/SR-4) along the I-80 right-of-way

alternatives outperform the commuter rail alternatives in almost every category except for environmental impacts and costs. The BART and commuter rail alternatives are fairly comparable with respect to environmental impacts, with the exception of avoidance of low-lying areas, as the commuter rail alternatives follow the shoreline (this is particularly true for Alternative 4). The costs for the BART alternatives would be substantially higher than those for commuter rail. However, there are still considerable unknown costs for the commuter rail alternatives, including the grade-separation and additional right of way costs in Oakland, possible cost or timing of sea level rise mitigations, and costs associated with UPRR and BNSF negotiations for establishing additional services.

Between the BART alternatives 6 and 7, the BART Extension from Richmond Station to Hercules Alternative (Alt. 6) performs either the same or higher than the BART Extension from El Cerrito del Norte Station to Hercules Alternative (Alt. 7) for all evaluation criteria except for the availability and type of developable land served by transit. Alternative 7 performs higher in this category since there are approximately 110 potentially developable parcels within a half mile of the stations in this alternative (as compared to 70 parcels in Alternative 6). The primary difference in performance between Alternatives 7A (conventional BART technology) and 7B (DMU technology) lies in air quality and GHG impacts and transportation energy use. The use of DMUs would somewhat reduce air quality and GHG benefits and increase transportation energy use due to new engine emissions and the use of new diesel engines. The DMU options would also require a transfer for patrons at the El Cerrito del Norte Station. Conventional BART technology is however more expensive; the use of BART technology for Alternative 7A extension is estimated to cost $295.6 million (in 2015 dollars) more than the DMU technology for Alternative 7B.

The initial screening process has focused on how the fully implemented alternatives would perform against the adopted goals and objectives for the study. As part of the analysis, it became clear that alternatives also have potential for achieving positive results with incremental improvements. In particular, the bus and commuter rail options have potential for realizing short and medium-term benefits with incremental improvements. For example the Express Bus Alternative 1 could benefit from the initial introduction of new bus service to Alameda County in the short-term and could be built-up as capital investments are made to support these services over time. The UPRR Commuter Rail Alternative 4 also provides opportunities for short and medium-term improvements. A fare subsidy for West County transit patrons using the Capitol Corridor service could potentially be implemented in the short-term and the completion of the Hercules Intermodal Transit Center, which could provide commuter rail access to the northern part of West Contra Costa County as well as for commuters who may access it from I-80, could provide medium-term benefits.

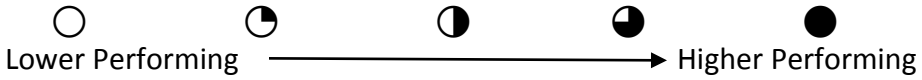
The Step 1 evaluation ratings are summarized in **Table** 4-21**1-2**.

Table 1-2. Summary of Step 1 evaluation results

No.	Evaluation Criteria		Alternative 1 Express Bus Service	Alternative 2 San Pablo Avenue/ Macdonald Avenue BRT	Alternative 3 23rd Street BRT	Alternative 4 UPRR Corridor Commuter Rail	Alternative 5 UPRR-BNSF Corridor Commuter Rail	Alternative 6 BART Extension Richmond Station to Hercules	Alternative 7A BART Extension El Cerrito del Norte Station to Hercules – Conventional BART	Alternative 7B BART Extension El Cerrito del Norte Station to Hercules - DMU
1	Travel time improvement		◔	◔	◔	◑	◑	◕	◕	◕
2	Travel time reliability		◑	◔	○	◕	◕	●	●	●
3	Regional transit centers served		◕	●	◑	◔	◑	◑	◑	◑
4A	Transit market potential	*Existing*	◑	●	●	◑	○	◑	◔	◔
4B		*Future*	◑	●	●	◑	○	◑	◔	◔
5	Quality of connections		◔	◕	●	●	◑	●	●	●
6A	Service to low-income areas	*Existing*	◔	●	◕	◔	◔	◑	◔	◔
6B		*Future*	○	●	◑	◔	◔	◔	○	○
7	Service to underserved transit markets		◕	●	●	◔	◔	◑	◔	◑
8	Potential environmental impacts		●	◕	◕	◕	◕	◕	◕	◑
9	Air quality and GHG impacts		◕	◔	◔	◑	◑	◕	◕	◑
10	Transportation energy use		◕	◔	◔	◑	◑	◕	◕	◑
11	Risk associated with sea level rise		◑	◕	◕	○	◑	●	●	●
12	Compatibility with local plans and policies		●	●	●	◑	◑	◕	◑	◑

No.	Evaluation Criteria	**Alternative 1** Express Bus Service	**Alternative 2** San Pablo Avenue/ Macdonald Avenue BRT	**Alternative 3** 23rd Street BRT	**Alternative 4** UPRR Corridor Commuter Rail	**Alternative 5** UPRR-BNSF Corridor Commuter Rail	**Alternative 6** BART Extension Richmond Station to Hercules	**Alternative 7A** BART Extension El Cerrito del Norte Station to Hercules – Conventional BART	**Alternative 7B** BART Extension El Cerrito del Norte Station to Hercules - DMU
13	West County PDAs served	◑	●	●	◔	◑	◑	◔	◔
14	Availability and type of developable land	◑	●	◕	○	◔	◑	◕	◕
15	Population, employment and households	◑	●	●	◔	◕	◑	◑	◑
16	Congestion relief	●	◔	◔	◑	◑	●	●	●
17	Order of magnitude capital costs	◕	◕	●	◑	◑	○	○	○
18	Order of magnitude O&M costs	◕	○	●	◑	◑	○	○	○
19	Public and stakeholder support	◕	◑	◑	◑	◑	●	◕	◕
	Summary of Performance								
	○	1	1	1	2	2	2	3	3
	◔	3	5	4	6	4	1	5	5
	◑	7	1	3	10	12	8	3	6
	◕	7	4	4	2	3	5	6	5
	●	3	10	9	1	0	5	4	4

Evaluation Scale:



Based on the Step 1 evaluation results, and in order to provide a range of options, five alternatives are recommended for Step 2 refinement and further evaluation.

It is recommended that all of the bus alternatives, Alternatives 1, 2, and 3 be carried forward. The bus alternatives are lower cost and have the potential for implementation in a shorter time frame than any of the rail alternatives. In particular, Alternative 1, the Express Bus Alternative, which is an expansion of already successful express bus programs, has the greatest potential for short-term implementation should funding become available.

We are also recommending that Alternative 6, the BART extension from Richmond Station, also be carried forward. BART, despite its expense, looks like it has the greatest long-term potential for connectivity, serving potential transit markets, and congestion relief than commuter rail. Alternative 6 is also supported by BART staff and City of Richmond Policy and does not conflict with Title VI requirements.

It is also recommended that short to medium term investments to improve access in the UP Corridor (Alternative 4) be further explored. Subsidized fares for West County residents to ease the financial burden of using Capitol Corridor service and additional options for opening up service at the planned Hercules Intermodal Station may offer viable short or medium-term solutions.

2 INTRODUCTION

2.1 West Contra Costa County Transportation Setting

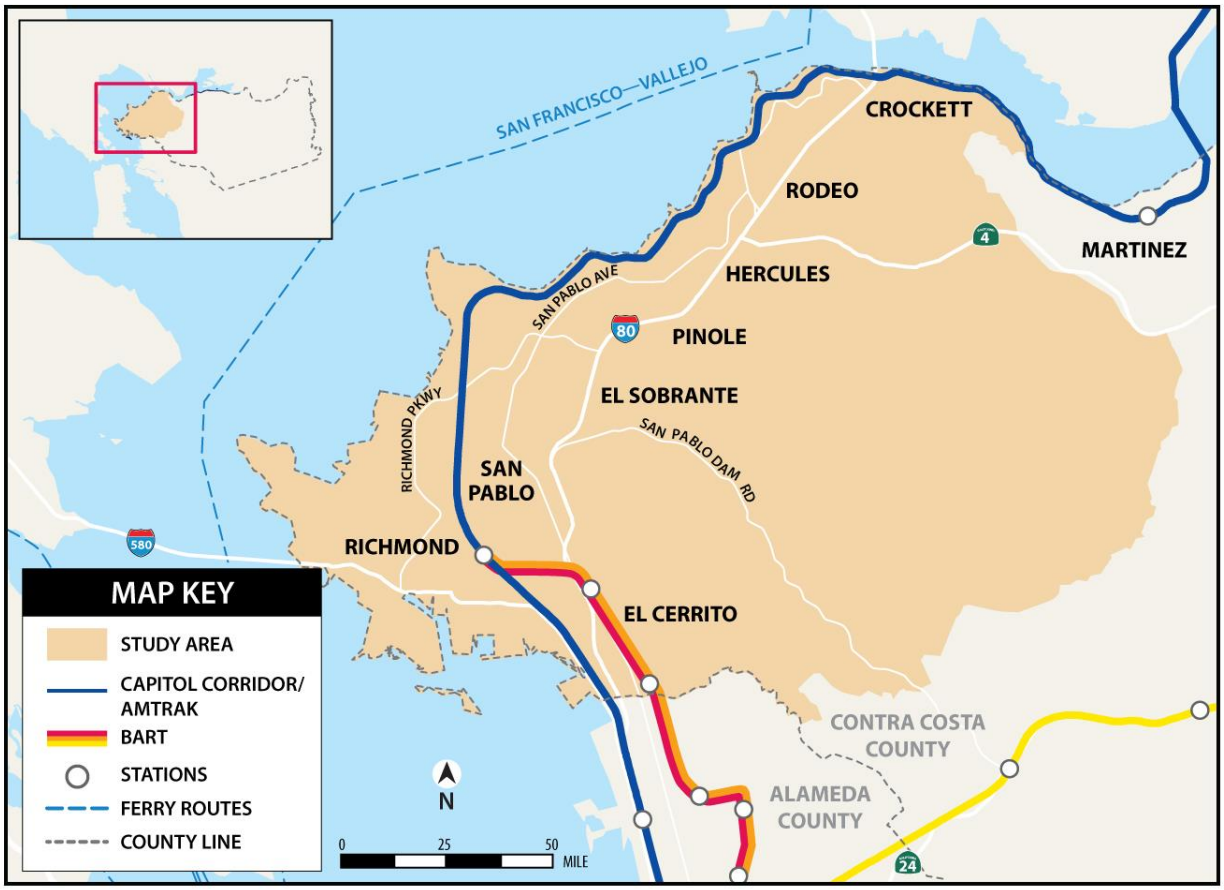
West Contra Costa County is a distinctive sub-region within the Bay Area set between the San Francisco Bay and the East Bay hills. Interstate 80 (I-80), the primary vehicular route running north-south through this sub-region, has major regional significance to Bay Area commuters, and is currently considered the most congested freeway corridor in the region. San Pablo Avenue is a major arterial that runs parallel and functions as a possible alternative to I-80. It links each jurisdiction in West Contra Costa and is a key commercial thoroughfare for the sub-region. Interstate 580 (I-580), running perpendicular to I-80, connects travelers west to and from Marin County across the Richmond-San Rafael Bridge to I-80, and continues east through Alameda County and beyond.

The study area encompasses West Contra Costa County from the southern boundary at the Alameda County line north to the Carquinez Bridge and Solano County line. It essentially encompasses the Metropolitan Transportation Commission's (MTC) Superdistrict 20, which includes the Cities of El Cerrito, Hercules, Pinole, Richmond, and San Pablo and the unincorporated communities of Crockett, El Sobrante, and Rodeo. **Figure 2-1** displays a map of the core study area, which includes I-80 and I-580, State Route 4 (SR-4), as well as major surface streets including San Pablo Avenue and Richmond Parkway. The West County High-Capacity Transit (HCT) Study will also include analysis of travel markets to the west of the I-80 corridor along I-580, south along I-80 to Alameda County and the Bay Bridge, east along SR-4, and north along I-80 across the Carquinez Bridge to Solano County.

2.2 Study Purpose

The purpose of this study is to identify and evaluate the feasibility and effectiveness of HCT options in West Contra Costa County for West Contra Costa Transportation Advisory Committee's (WCCTAC) consideration. Central to the study purpose is providing WCCTAC with the analyses necessary to determine and advance the most promising HCT alternative(s). The study is considering multimodal transit options including freeway-based express bus, bus rapid transit (BRT), extension of BART service, including diesel multiple unit (DMU) options in BART corridors, and commuter rail improvements. Study findings will guide future planning, investment priorities, and funding efforts for WCCTAC.

Figure 2-1: Study Area



Source: WSP|Parsons Brinckerhoff, Kimley-Horn, 2015

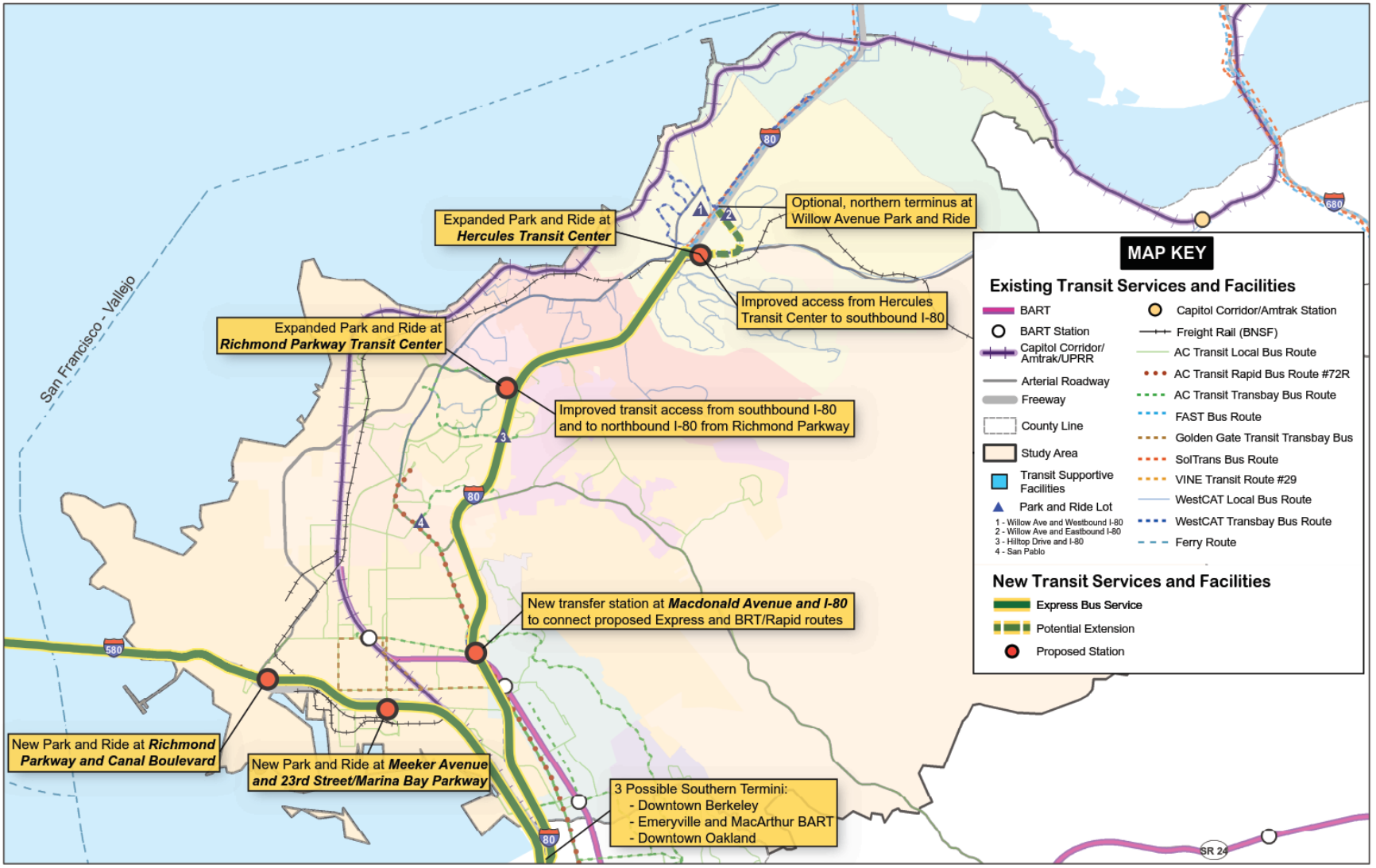
2.3 Purpose of this Technical Memorandum

The purpose of this technical memorandum is to present findings of the Step 1 technical evaluation of alternatives that would provide new transit service to the West Contra Costa County study area. This screening was based on the criteria developed for consistency with federal funding eligibility and presented in Technical Memorandum #9. Recommendations for alternatives to be carried forward for further analysis and development are presented at the end of this technical memorandum.

3 ALTERNATIVES FOR STEP 1 EVALUATION

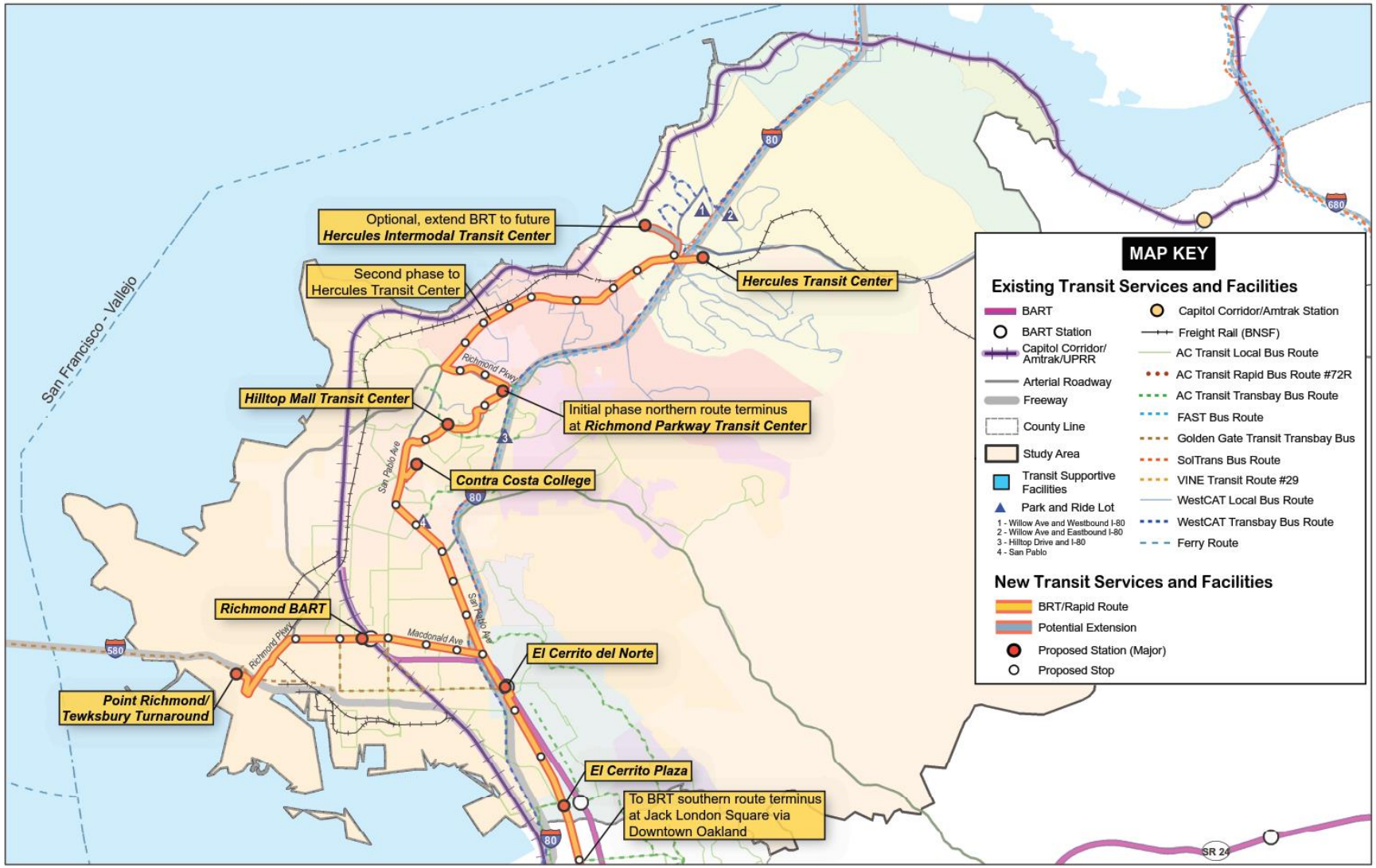
Following the initial review of concepts, a set of eight alternatives was identified to be carried forward into Step 1 evaluation. **Figure 3-1** through **Figure 3-7** portray the general alignment, mode, and station vicinity for each of these eight options. A brief description of each of the alternatives follows the figures.

Figure 3-1: Alternative 1—Express Bus Service



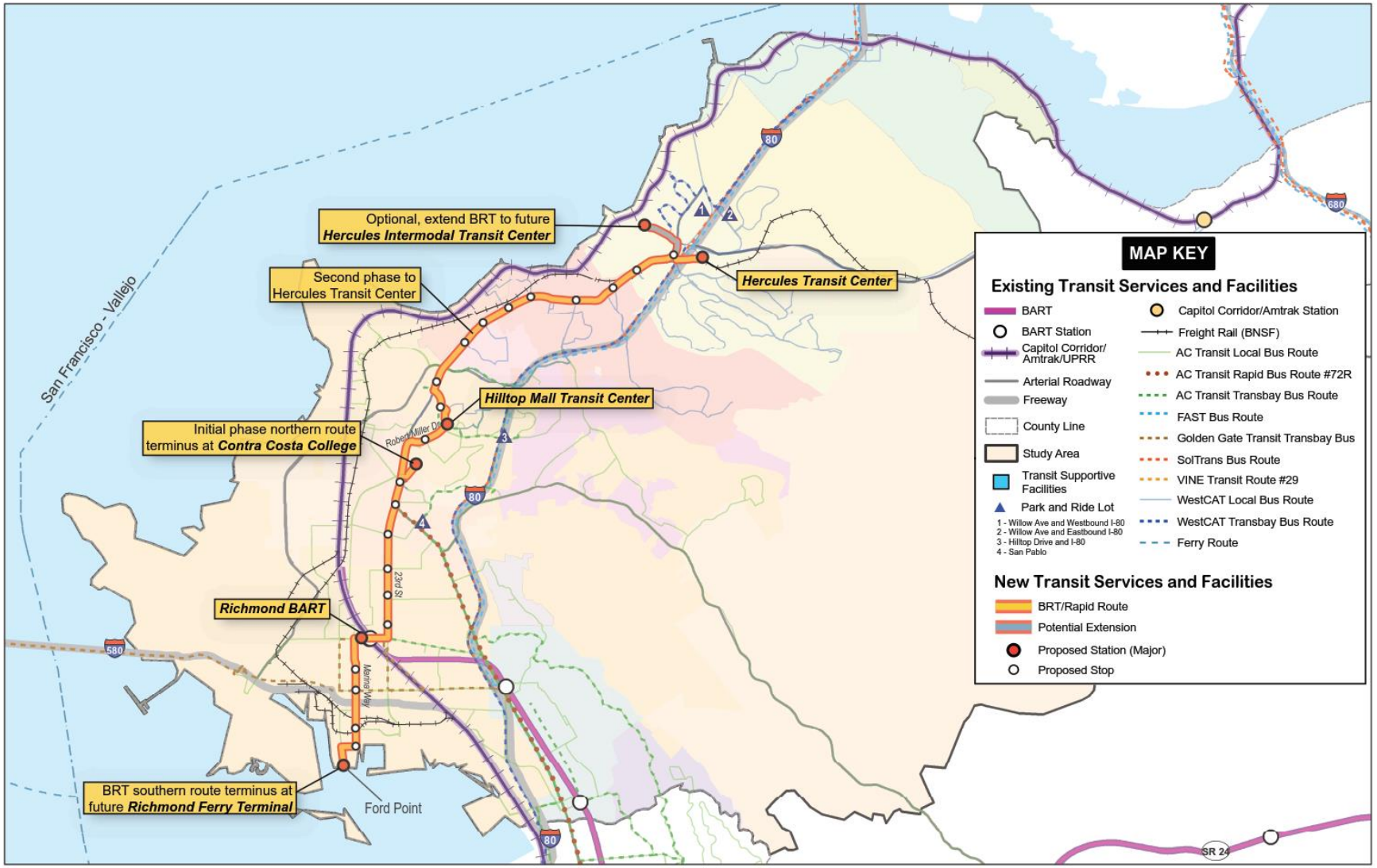
Source: Kimley-Horn, 2015.

Figure 3-2: Alternative 2—San Pablo Avenue/Macdonald Avenue BRT



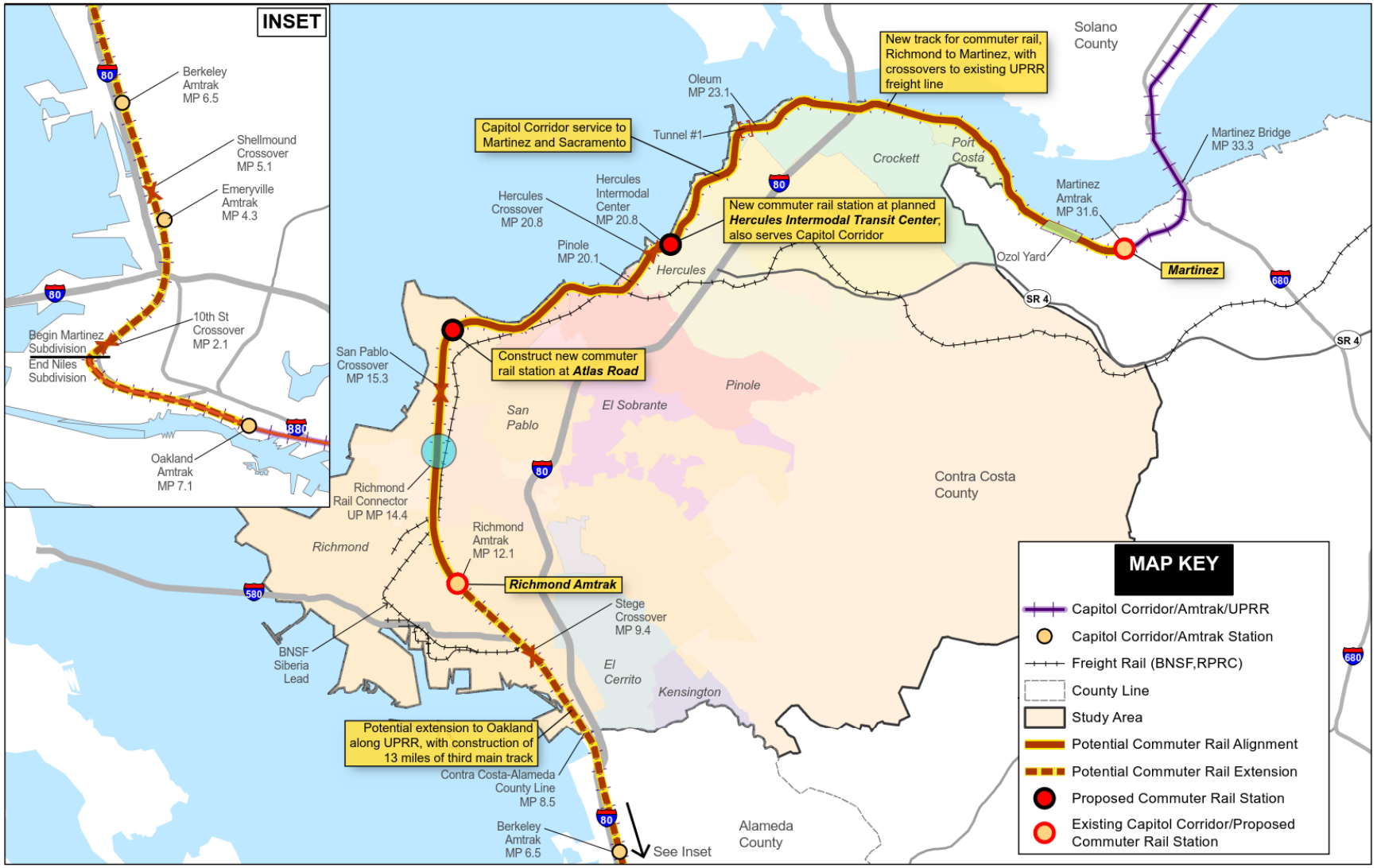
Source: Kimley-Horn, 2015

Figure 3-3: Alternative 3—23rd Street BRT



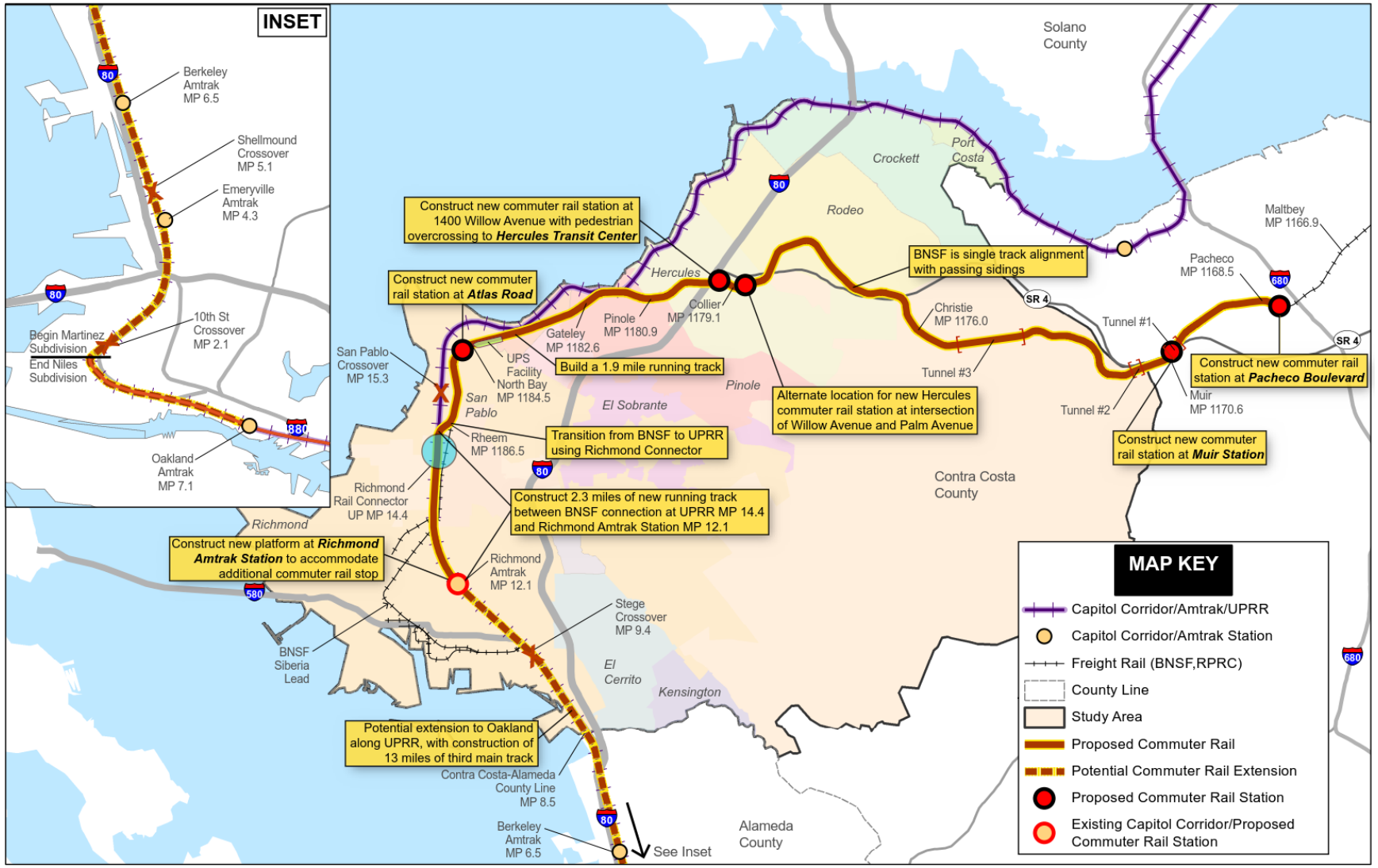
Source: Kimley-Horn, 2015

Figure 3-4: Alternative 4—UPRR Corridor Commuter Rail



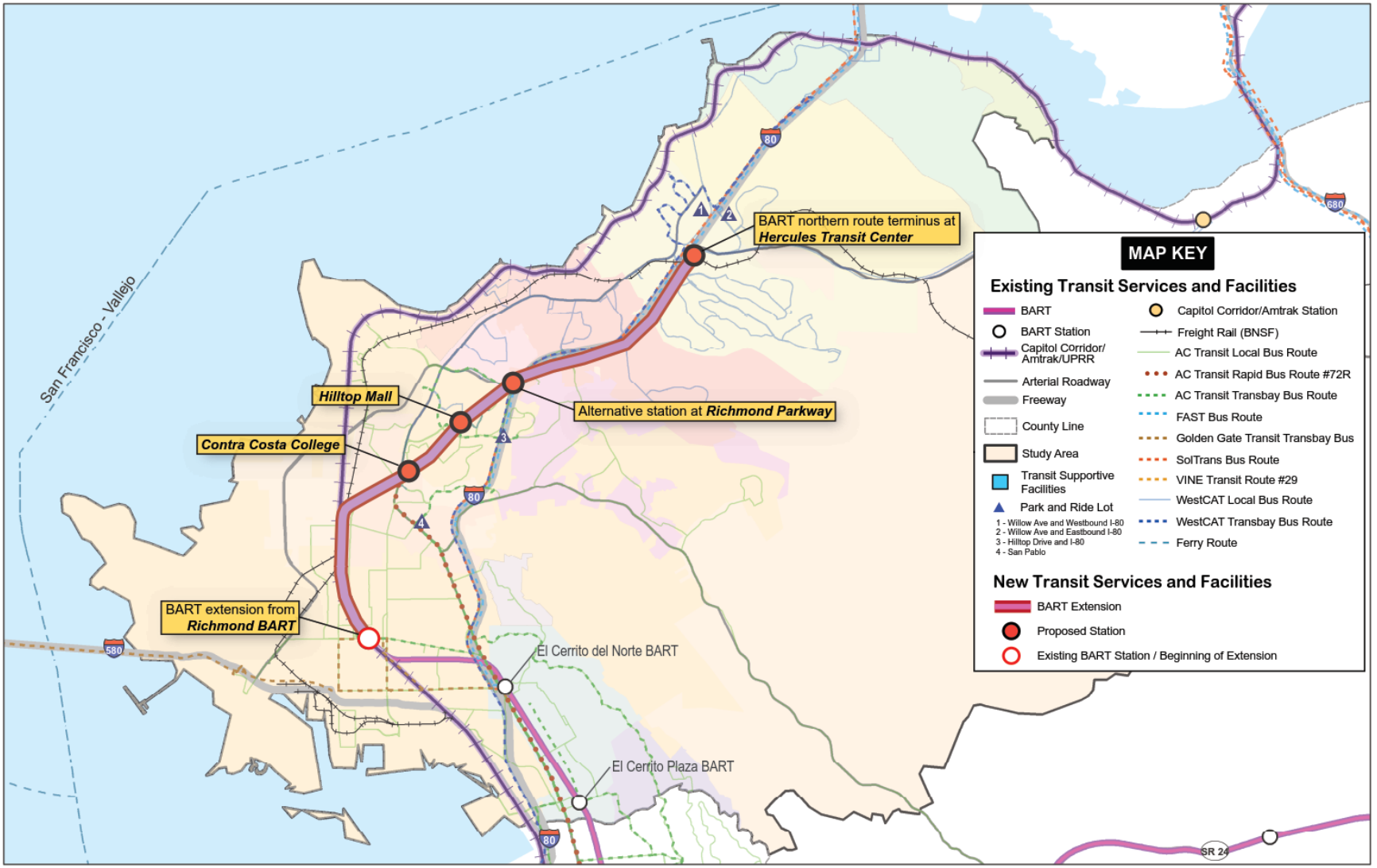
Source: RL Banks and Kimley-Horn, 2015

Figure 3-5: Alternative 5—UPRR-BNSF Corridor Commuter Rail



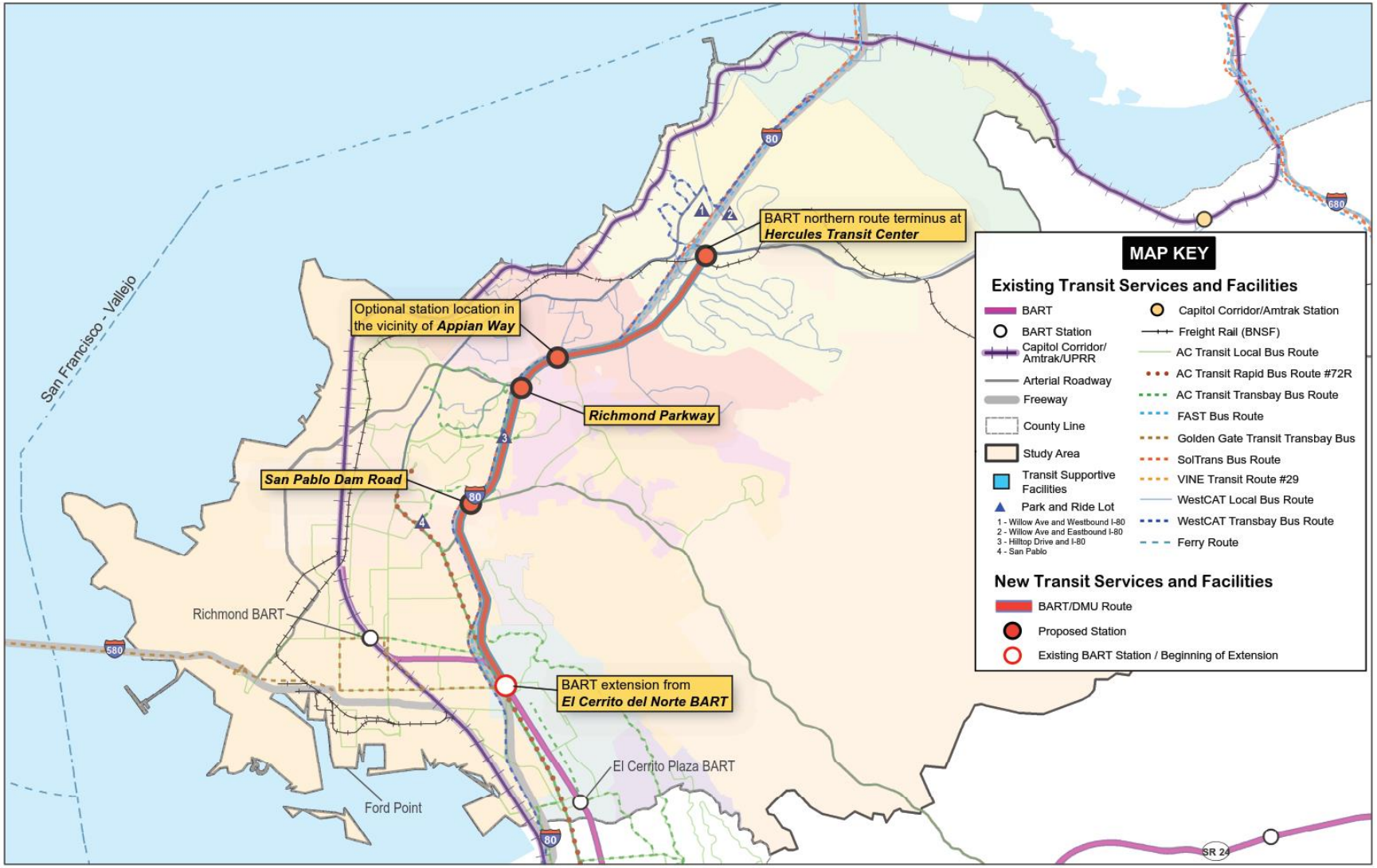
Source: RL Banks and Kimley-Horn, 2015

Figure 3-6: Alternative 6—BART Extension from Richmond Station to Hercules



Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure 3-7: Alternative 7—BART Extension from El Cerrito del Norte Station to Hercules



Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

A full description of the alternatives is provided in Technical Memorandum #8.[1] New potential station locations have been identified in two alternatives, Alternative 4 and Alternative 6, based on feedback received from the High-Capacity Transit Study Management Group and the WCCTAC Technical Advisory Committee (TAC). These new stations are noted below in the descriptions.

3.1 Alternative 1 – Express Bus Service

Alternative 1 proposes Express Bus Service on both the I-80 and the I-580 corridors, taking advantage of existing High Occupancy Vehicle (HOV) lanes and future managed lanes on I-80.

On the I-80 corridor, express bus service would operate from the Hercules Transit Center in the north to Berkeley, Emeryville, and Oakland in Alameda County using HOV lanes. Major stops, with structured park-and-ride facilities, would be provided at the Hercules Transit Center, Richmond Parkway Transit Center near the Hilltop Mall, and at the San Pablo/Barrett Avenue interchange in West County. Service would connect to major transit destinations in Alameda County, including the Berkeley BART station via University and Shattuck Avenues; the Macarthur BART station via Powell, Hollis, and 40th Streets in Emeryville, and 19th Street BART station via 27th Street, Grand Avenue, and Broadway in Oakland. There would be a limited number of stops along these major routes. This alternative would require major ramp construction at the Hercules and Richmond Parkway Transit Centers to access the park-and-ride facilities. Buses would operate at 10 to 12 minute frequencies in the peak period and 30-minute frequencies in the off-peak period.

Proposed new and expanded park and rides lots and other express bus facilities developed by the Express Bus Service Alternative could also be used by existing WestCAT BART feeder (Route J) and transbay (WestCAT Lynx and AC Transit transbay Route L) services. Thus there would be potential for expanded service to the San Francisco Transbay Transit Center (TTC) as well as new express bus service to the East Bay.

The I-580 Express Bus service would travel from the San Rafael Transit Center to the same destinations identified above in mixed flow traffic with two major stops in West County. Major stops, with surface parking, would be provided at the Richmond Parkway/Canal Boulevard interchange and at the 23rd Street/Marina Bay Parkway Interchange. Buses would operate at 15 minute frequencies during the peak period.

Over-the-road coaches, either single or bi-level, would be used for this service.

[1] West Contra Costa County High-Capacity Transit Study, Technical Memorandum #8, WCCTAC, October 2015.

3.2 Alternative 2 – San Pablo Avenue/Macdonald Avenue BRT

The San Pablo Avenue/Macdonald Avenue BRT would connect to and expand on the BRT project proposed as part of the AC Transit Major Corridor Study and the Alameda Countywide Transit Plan, both of which are currently underway. Those alternatives propose service from Jack London Square extending to the Richmond Parkway Transit Center. This alternative would provide service from the Hercules Transit Center in the north connecting to the Richmond Parkway Transit Center (the northern terminus of the AC Transit proposed BRT project) via Willow Avenue, Sycamore Avenue, and San Pablo Avenue. From the Richmond Parkway Transit Center the alignment would follow Blume Drive and Klose Way to Hilltop Mall then to Robert Miller Drive to access San Pablo Avenue, continuing on San Pablo south past Contra Costa College and El Cerrito del Norte and El Cerrito Plaza BART stations. The alignment would continue through Alameda County on San Pablo Avenue to downtown Oakland where it would transition via 20th to Broadway, terminating in Jack London Square. A second branch would start at Tewksbury Turnaround and extend along Macdonald Avenue, joining the San Pablo Corridor where the two intersect. An optional extension would connect the service to the Hercules Intermodal Transit Center via John Muir Parkway. Depending on the roadway segment, this San Pablo Avenue/Macdonald Avenue alternative would include traffic signal modification, roadway reconstruction, station improvements, and parking facilities in Contra Costa County as well as in Alameda County.

The Macdonald Avenue alignment would branch out from San Pablo Avenue, just south of the I-80 overcrossing, continuing on Macdonald Avenue to serve the Richmond BART station and downtown Richmond and branching south at Richmond Parkway. From Richmond Parkway the alternative follows Cutting Boulevard, Garrard Boulevard, West Richmond Avenue, and Railroad Avenue to Tewksbury Turnaround.

This service would use articulated buses, operating at 10 minute frequencies with stops every 1/3 to 1/2 mile.

3.3 Alternative 3 – 23rd Street BRT

This BRT alternative provides service from the proposed ferry terminal at Ford Point in Richmond to connect with the Richmond BART station and downtown Richmond and continuing north to the Hercules Transit Station. From the ferry terminal, the BRT would proceed north along Harbor Way to Halle Avenue, then east along Regatta Boulevard to Marina Bay Parkway. After crossing I-580, the Parkway becomes 23rd Street. The route would follow 23rd Street, diverting via Macdonald Avenue to serve the Richmond BART Station, then returning to 23rd Street until its intersection with San Pablo Avenue. Following San Pablo Avenue, it would divert via El Portal and Campus Drives to serve Contra Costa College, returning to San Pablo Avenue and proceeding north to Robert H. Miller Drive, where it would divert to

reach Hilltop Mall. It would reconnect with San Pablo Avenue via Hilltop Drive. The route would be the same as Alternative 2 from this point north to the Hercules Transit Center. This alternative would also have the potential of extending service west to the Hercules Intermodal Transit Center via John Muir Parkway. Depending on the roadway segment, this alternative would include traffic signal modification, roadway reconstruction, station improvements, and parking facilities.

Like Alternative 2, this service would operate articulated buses at 10-minute frequencies to Contra Costa College and 15-minute frequencies north to Hercules Transit Center, with stops every 1/3 to 1/2 miles.

3.4 Alternative 4 – UPRR Corridor Commuter Rail

This alternative would provide additional commuter rail service on the UPRR right-of-way between Martinez and the Richmond BART/Capitol Corridor/Amtrak Station, in addition to the existing Capital Corridor service. Trains would operate within the gaps of the existing Capitol Corridor service. Because the Capitol Corridor is currently operating at its maximum negotiated capacity, a third track would be required between Martinez and Richmond to facilitate the introduction of this additional service. Four commuter trains would operate in the morning peak period and four trains in the evening peak period at 30-minute frequencies. Tier 4 standard gauge rail equipment is proposed for this service.[2] In addition to a new third track, this service would require 5 new crossover tracks, upgrades of 8 at-grade track crossings, 11 new train signals, 4 bridge widenings, and drainage upgrades.

Potential new station sites were proposed and evaluated at two locations, Atlas Road in Richmond and at the Hercules Intermodal Transit facility. These stations would include parking facilities with opportunities for connections to other modes of transit.

The initial proposed southern terminus of this new service is the Richmond BART/Capitol Corridor/Amtrak Station as it lies solely within the study area. There are also options for extending the new service to Alameda County. The extension could end at the Berkeley or Emeryville Amtrak station or be extended to Jack London Square in Oakland. The extension to Oakland would require an additional 20 to 30 feet of right-of-way between 65th Street and Grand Avenue in Emeryville and Oakland to add a third track and would involve consideration of grade separation of the tracks in the Oakland Jack London Square area.

[2] Tier 4 refers to the federal Environmental Protection Agency (EPA) standards for emissions of nitrogen oxides, particulate matter and carbon monoxide emissions. All vehicles manufactured after 2015 must meet Tier 4 emissions standards.

3.5 Alternative 5 – UPRR – BNSF Corridor Commuter Rail

This alternative would provide commuter rail service on a small segment of UPRR right-of-way just north of the Richmond BART/Capitol Corridor/Amtrak Station and would then transition to the BNSF right-of-way continuing to Martinez. This new commuter service would capture commuters traveling from State Route (SR) 4 onto Interstate 80. The BNSF right-of-way currently has no passenger service operating on this segment and therefore would require new negotiate their jurisdiction.

Trains would operate within the gaps of the current freight service. Although there appears to be additional capacity to introduce passenger service on the BNSF track, 4.2 miles of a third track would be required to the north of the Richmond Amtrak Station on the shared BNSF-UPRR segment. Four commuter trains would operate in the morning peak period and four trains in the evening peak period at 30-minute frequencies. Tier 4 standard gauge rail equipment is proposed for this service. In addition to the new track identified above, this service would require 3 new crossover tracks, upgrades of 7 at-grade track crossings, 15 new train signals, 5 bridge widenings, and drainage upgrades.

Potential station sites were proposed and evaluated at four locations, Atlas Road in Richmond, Hercules Transit Center and Muir and Pacheco stations in Martinez, though there may be additional locations along the corridor with redevelopment opportunities. These stations would include parking facilities with opportunities for connections to other modes of transit.

The initial proposed southern terminus of this new service is the Richmond BART/Capitol Corridor/Amtrak Station as it lies solely within the study area. There are also options for extending the new service to Alameda County. The extension could end at the Berkeley or Emeryville Amtrak station or be extended to Jack London Square in Oakland. The extension to Oakland would require an additional 20 to 30 feet of right-of-way between 65th Street and Grand Avenue in Emeryville and Oakland to add a third track and would involve consideration of grade separation of the tracks in the Oakland Jack London Square area.

3.6 Alternative 6 – BART Extension from Richmond Station to Hercules

This alternative would extend BART service north from the Richmond BART maintenance yard to connect to the I-80 corridor. Initially running parallel to the UPRR on or near 13th Street, it would transition to aerial structure along Rumrill Boulevard in San Pablo. Crossing over San Pablo Avenue, BART would access Hilltop Mall via a deep tunnel. It would cross under I-80 and run parallel to the eastbound lanes of the freeway on elevated structure (a combination of columns and retaining walls) to the Appian Way intersection. It would continue on structure or excavated trench depending on the I-80 grades, to the Hercules Transit Center. Potential new

stations are proposed for consideration at Contra Costa College, Hilltop Mall, and/or Richmond Parkway, subject to station spacing requirements. As the evaluation proceeds, one or two of the station sites would be incorporated into the project rather than multiple stations.

Conventional BART trains would operate on 15-minute headways on weekdays and 20-minute headways on weekends, the same service frequencies and spans as the Richmond service.

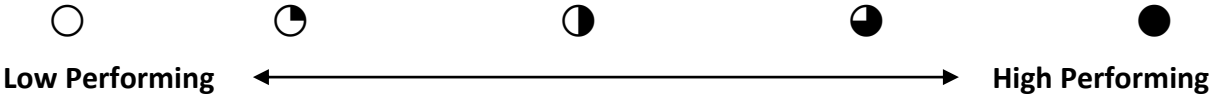
3.7 Alternative 7 – BART or DMU Extension from El Cerrito del Norte Station to Hercules

This alternative would proceed north from the El Cerrito del Norte BART Station following along the I-80 corridor to Hercules Transit Center. It would leave the El Cerrito del Norte BART station on an elevated structure using the San Pablo Avenue (or other local street) right-of-way to connect to the I-80 right-of-way. It would proceed on a combination of elevated structure and excavated trench to the Hercules Transit Center, similar to Alternative 6. This alternative provides an option for two different service scenarios: operation of conventional BART technology (Alternative 7A) or the introduction of diesel multiple unit (DMU) service (Alternative 7B). A DMU is a multiple-unit train that is powered by on-board diesel engines (rather than requiring a separate locomotive) and could be a cost-effective alternative to BART service. The introduction of DMU service would require a cross-platform transfer at El Cerrito del Norte Station for BART passengers to transfer to the new DMU service track. Potential new stations would be located at San Pablo Dam Road, Richmond Parkway, and/or Appian Way.

For Alternative 7A, BART trains would operate on 15-minute headways on weekdays and 20-minute headways on weekends, the same service frequencies and spans as the existing BART service. For Alternative 7B, DMU service could be provided at the same service levels as BART or could be adjusted to reduce frequency, if demand did not warrant the same service levels. Service schedules would be integrated with the BART schedules. In order to maintain the same service frequencies at the Richmond BART station, core service would need to be increased to account for the split of service.

4 EVALUATION RESULTS

This section provides the results of the first step of evaluation using criteria established in Technical Memo #9. The second step of evaluation will occur following the selection of alternatives to advance to the next stage. Each alternative was rated on a five point scale as shown below. No weighting was applied to the evaluation criteria.



4.1 Study Goal: Increase transit ridership

The Step 1 evaluation measures, methodology, and results for this goal are discussed below and include travel time improvement; reliability; regional transit centers served; and transit market potential.

4.1.1 Travel time improvement

Improving transit travel time to make transit a more attractive alternative than auto travel is important to increasing transit use. More new transit trips are expected to be generated if HCT alternatives provide significant decreases in travel times compared to existing transit service.

There are several major travel corridors through and within West County. No HCT alternative serves all corridors well. However, some alternatives would improve travel times (compared to the no build condition) between more major activity centers than other alternatives. Those that serve more activity centers are rated higher than those that serve fewer activity centers under this metric. Simply because an alternative does not generate travel time benefits for multiple origins and destinations—or along multiple travel corridors—does not mean it is a poor alternative overall. It may be the best performing alternative in a particular corridor that is identified as important for HCT investment.

Seven origin-destination (O-D) pairs for travel were identified for evaluation of travel time. Four of these O-D pairs connect major activity centers within West County; three of the pairs connect activity centers in West County to downtown Oakland. The latter are designed to capture representative travel time benefits to major activity centers outside West County. The projected travel times for HCT alternatives that could reasonably serve these O-D pairs were compared to the no-build transit travel times between the O-D pairs.[3] The results are

[3] Reasonable was defined to mean no more than one transfer and no extensive out-of-direction travel.

summarized in **Table 4-1**. A table comparing the travel times between O-D pairs for the seven HCT alternatives is provided as Appendix A to this report.

By these criteria, Alternative 6, BART Extension from Richmond Station to Hercules, was determined to rate best, providing travel time improvements in four of the seven O-D corridors. Alternative 4, UPRR Commuter Rail, and Alternative 5, UPRR-BNSF Commuter Rail, offer travel time improvements in three corridors each. The other alternatives offer improvements in two corridors each.

Table 4-1. Travel time improvement

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◔	I-80 and I-580 express services provide travel time improvement to downtown Oakland along I-80 and I-580, respectively
2. San Pablo Avenue/ Macdonald Avenue BRT	◔	Travel time benefits from Hercules to Richmond BART
3. 23rd Street BRT	◔	Travel time benefits from Hercules to Richmond BART
4. UPRR Corridor Commuter Rail	◑	Travel time improvements from west Hercules and northwest Richmond to Richmond BART and downtown Oakland
5. UPRR-BNSF Corridor Commuter Rail	◑	Travel time improvements from east Hercules and northwest Richmond to Richmond BART and downtown Oakland
6.BART Extension from Richmond Station to Hercules	◕	Travel time improvements from east Hercules to Richmond BART and downtown Oakland; Hilltop Mall to El Cerrito del Norte BART; west Hercules (Intermodal Center) to downtown Oakland
7. BART Extension from El Cerrito del Norte Station to Hercules	◕	Travel time improvements to El Cerrito del Norte BART and downtown Oakland for I-80 corridor trips

The alternatives that perform best, such as Alternative 6, BART Extension from Richmond Station to Hercules; Alternative 4, UPRR Corridor Commuter Rail; and Alternative 5, UPRR-BNSF Corridor Commuter Rail, serve travel markets within West County and travel to points outside of West County, including Oakland and other East Bay employment centers. They are relatively high speed rail modes that serve central and western West County communities more effectively than alternatives such as buses that operate partially in mixed flow conditions.

Among the alternatives with a strong freeway corridor orientation, Alternative 1, Express Bus Service, and Alternative 7, BART Extension from El Cerrito del Norte BART, offer travel time benefits for origins and destinations along I-80, but do not offer as quick of travel times for other trips in West County. For example, the travel time between El Cerrito del Norte BART and Hercules Transit Center is 15 minutes with this alternative (5 minutes faster than Alternative 6). Express bus service would operate primarily in the freeway high occupancy vehicle lanes and avoid the speed-reducing congestion of the mixed-flow lanes. A BART extension from the existing El Cerrito del Norte BART station would operate in exclusive right-of-way and avoid

roadway congestion altogether. To maintain current service levels of 15-minute headways at the Richmond BART station and address Title VI concerns, the core service south of El Cerrito del Norte would need to be increased to 7.5 minutes to accommodate the split service. Alternatively, service to Richmond would need to be reduced in order to serve an extension from El Cerrito del Norte if the core BART service remains at current service levels. Alternative 1 also has the potential in the future to improve travel times between communities in southwest Richmond and the East Bay, assuming implementation of HOV or similar preferential travel lanes along I-580 (these improvements are not yet programmed).

However, Alternative 1 and Alternative 7 would provide more limited travel time benefits elsewhere. They would not offer travel time benefits for trips from communities in the western portion of the study area to other parts of the East Bay or for trips within West County particularly in Central Richmond and in the vicinity of Richmond BART as it would take longer to access the service.

The BRT alternatives rate lower than Alternatives 4 and 5, despite the service improvements provided in the central and western portions of the study area, because the benefits are limited largely to the arterial segments along which they will operate: San Pablo Avenue north of El Cerrito del Norte BART, Macdonald Avenue, and 23rd Street. They do not offer travel time benefits to the major East Bay employment centers in Alameda County. The estimated increase in average vehicle speed that will result from BRT improvements is not nearly as significant as the expected increase on other modes. Thus for longer trips, such as to downtown Oakland, BRT alternatives do not generate significant travel time improvements. If travel time savings is the goal, transit users will do better to transfer from bus to BART when making trips well outside of West County.

4.1.2 Travel time reliability

Travel time reliability is a second major factor that makes transit more attractive and encourages modal shift from auto. Reliability is directly related to travel time: the more dependable the transit alternative, the less time a user must allow in making a trip, including the time waiting for transit at a station or stop and the time spent in the transit vehicle traveling to a destination. Transit modes operating in exclusive guideways (right-of-way) are the most reliable in schedule adherence. Exclusive guideways may be shared with similar modes (e.g., passenger and freight rail) but not mixed traffic. Dedicated guideways, which are defined as lanes that adjoin travel lanes of other modes and whose use may at times be shared by other modes, offers the second most reliable option compared to exclusive guideway.

HCT alternatives are rated according to the extent of alignment offering exclusive or dedicated guideway for transit vehicle operation. The highest rating is for alternatives operating in exclusive guideway and the lowest rating is assigned to alternatives operating in dedicated

guideway to a substantial extent, but with the potential for frequent operational conflicts with other modes. The results are summarized in **Table 4-2**.

Table 4-2. Travel time reliability

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◑	Alignment 88% in dedicated (HOV) lanes; somewhat unreliable travel times due to HOV lane congestion and need for buses to cross mixed-flow lanes
2. San Pablo Avenue/ Macdonald Avenue BRT	◔	Alignment proposed to be 70% dedicated lanes although may not be possible; conflicts with autos likely at intersections; frequent stops although fewer than for local bus service
3. 23rd Street BRT	○	Alignment proposed to be 40% dedicated lanes although may not be possible; conflicts with autos likely at intersections; frequent stops although fewer than for local bus service
4. UPRR Corridor Commuter Rail	◕	Alignment almost entirely within exclusive railroad right-of-way (several at-grade crossings should not degrade normal service but present accident/delay risks). Shared use with other rail operations could reduce reliability.
5. UPRR-BNSF Corridor Commuter Rail	◕	Alignment almost entirely within exclusive railroad right-of-way (several at-grade crossings should not degrade normal service but present accident/delay risks). Shared use with other rail operations could reduce reliability.
6.BART Extension from Richmond Station to Hercules	●	Alignment 100% exclusive guideway with no at grade crossings, no shared use of corridor.
7. BART Extension from El Cerrito del Norte Station to Hercules	●	Alignment 100% exclusive guideway with no at grade crossings, no shared use of corridor.

BART extensions have the highest performance rating and BRT alternatives the lowest although it should be kept in mind that a low rating is still substantially better than the no-build condition. BRT alternatives will experience conflicts with autos in adjacent lane in certain situations, such as at intersections and the transitions between mixed-flow and dedicated lane segments of BRT alignments.

Commuter rail alternatives do not rate as high as BART alternatives because they encounter at-grade crossings and in some segments must operate along with freight or other passenger rail modes. Express bus would rate higher if operation in freeway HOV lanes, such as those on I-80, can be improved. However, HOV lanes at times are congested. Also, express buses must use mixed-flow lanes to enter and exit the HOV lane in most locations.

4.1.3 Regional transit centers served

The performance rating and number of transit centers within West Contra Costa County served by each alternative is shown in **Table 4-3**. Regional transit centers include existing and planned/proposed BART stations, multimodal transit centers, rail stations, and major business districts with high levels of transit.

Table 4-3. Regional transit centers served

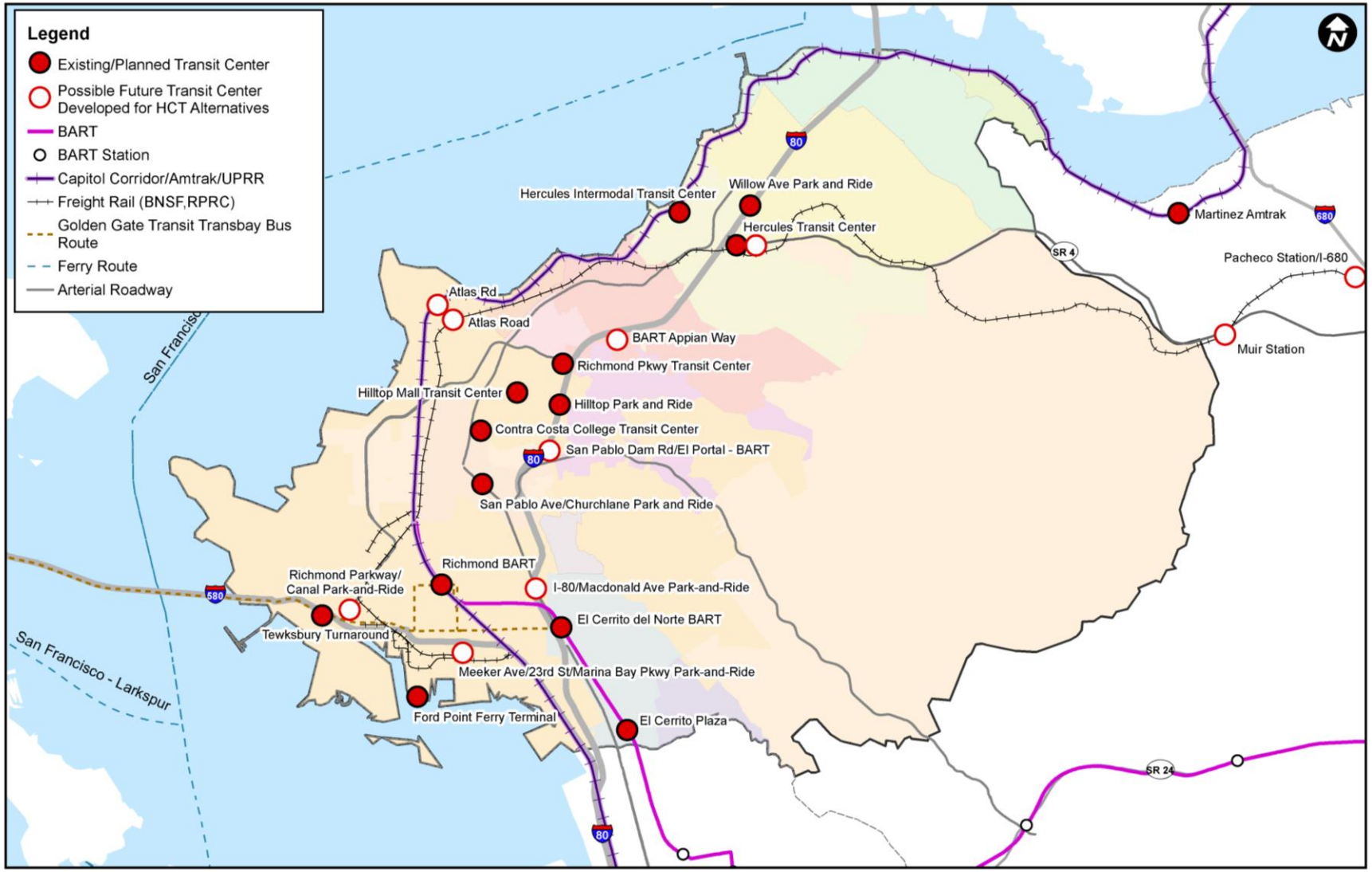
Option	Performance Rating	Summary of Findings
1. Express Bus Service	◕	Connects 6 regional transit centers (Hercules Transit Center, El Cerrito del Norte BART, Meeker Ave/23rd St/Marina Bay Pkwy Park-and-Ride, Richmond Parkway/Canal Park-and-Ride, Richmond Pkwy Transit Center, and Tewksbury Turnaround) if the full service is implemented along both the I-80 and the I-580 corridors (this service level would not be achieved if only express bus improvements—such as adding schedules to existing service were implemented).
2. San Pablo Avenue/ Macdonald Avenue BRT	●	Connects 9 regional transit centers, 7 along San Pablo Avenue and an additional 2 centers for the Macdonald Avenue alignment (Contra Costa College Transit Center, El Cerrito del Norte BART, El Cerrito Plaza, Hercules Transit Center, Hilltop Mall Transit Center, Richmond BART (Macdonald Avenue), Richmond Pkwy Transit Center (Macdonald Avenue), San Pablo Ave Park-and-ride, and Tewksbury Turnaround)
3. 23rd Street BRT	◑	Connects 5 regional transit centers (Contra Costa College Transit Center, Ford Point Ferry Terminal, Hercules Transit Center, Hilltop Mall Transit Center, and Richmond BART)
4. UPRR Corridor Commuter Rail	◔	Connects 4 regional transit centers (Richmond BART, Atlas Rd, Hercules Intermodal Transit Center, and Martinez Amtrak)
5. UPRR-BNSF Corridor Commuter Rail	◑	Connects 5 regional transit centers (Atlas Rd, Hercules Transit Center, and Richmond BART, Muir Station, and Pacheco Station/I-680)
6.BART Extension from Richmond Station to Hercules	◑	Has the potential to connect to 5 regional transit centers (Hercules Transit Center; Contra Costa College Transit Center, Hilltop Mall Transit Center, or Richmond Parkway Transit Center (only one of these options would be selected);Richmond BART, El Cerrito del Norte BART, and El Cerrito Plaza BART)
7. BART Extension from El Cerrito del Norte Station to Hercules	◑	Connects 5 regional transit centers (Hercules Transit Center; San Pablo Dam Rd/El Portal Transit Center, Richmond Pkwy Transit Center, or Appian Way Transit Center (only one of these options would be selected); El Cerrito del Norte BART; El Cerrito Plaza BART; and Richmond BART (with potential transfer

The performance ratings were assigned based on the number of regional transit centers served. The lowest rating was assigned to alternatives serving less than two transit centers, which no alternatives received. The second-lowest rating was assigned to alternatives serving two to four transit centers. A medium-performing rating was assigned to alternatives serving five transit

centers. The medium-high rating was assigned to alternatives serving six to eight transit centers. Alternatives serving more than eight transit centers received the highest rating.

The performance ratings range from the highest rank for Alternative 2 to the lowest for Alternative 4. Alternative 2, which also has the greatest number of stations, would connect 9 regional transit centers. Alternative 1 would serve 6 regional transit centers, resulting in a relatively high performance rating, while Alternatives 3, 6, and 7, have a moderate performance rating.

Figure 4-1: Existing and planned transit centers



Source: Kimley-Horn, 2015

4.1.4 Transit market potential

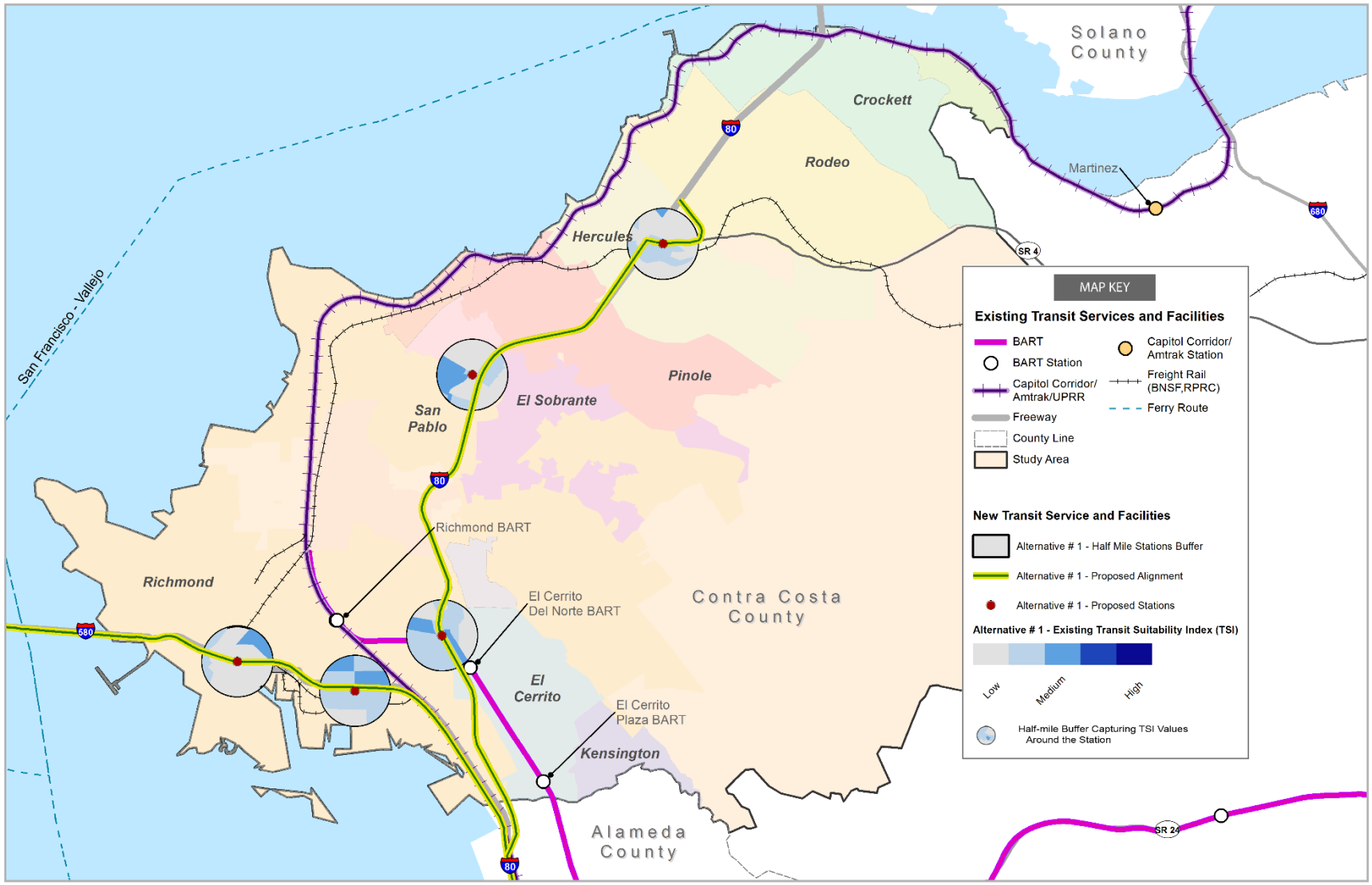
Transit market potential for the seven alternatives was rated with a Transit Suitability Index (TSI). A TSI is a sketch planning tool utilized to identify locations of markets most suitable to serve transit. Spatial analysis tools in a Geographical Information System (GIS) are applied to evaluate the cumulative relationship of variables that are indicative of transit riders. The TSI provides a transit assessment based on population density, employment density, household income and vehicle ownership. Transit market potential was determined by capturing the TSI values within a half mile of the Alternatives' proposed stations and stops for the BRT alternatives. The TSI most effectively identifies walkable markets for transit and therefore the ratings for the BRT alternatives tend to be higher than those for the Express Bus or rail alternatives which pull from a broader market. Those modes that draw from a broader market base, do not fare as well for this rating. **Table 4-4** summarizes the transit market potential ratings. For this evaluation, the TSI was calculated in the absence of travel model forecasts. Step 2 evaluation will involve ridership forecasting to capture the transit market potential of ridership.

Table 4-4: Transit market potential

Option	Existing Conditions Performance Rating	2040 Performance Rating	Summary of Findings
1. Express Bus Service	◑	◑	Alternative 1 captured an average number of TSI values for existing and 2040 conditions
2. San Pablo Avenue/ Macdonald Avenue BRT	●	●	Transit market potential for Alternative 2 is high for both existing conditions and 2040
3. 23rd Street BRT	●	●	Transit market potential for Alternative 3 is high for both existing conditions and 2040
4. UPRR Corridor Commuter Rail	◑	◑	Alternative 4 captured an average number of TSI values indicating a medium transit market potential for both existing and 2040 conditions
5. UPRR-BNSF Corridor Commuter Rail	○	○	Alternative 5 captured a low average TSI value for existing conditions and for 2040
6.BART Extension from Richmond Station to Hercules	◑	◑	Alternative 6 captured an average number of TSI values indicating a medium transit market potential for both existing and 2040 conditions
7. BART Extension from El Cerrito del Norte Station to Hercules	◔	◔	Alternative 7 captured a low average TSI value for existing and 2040 conditions

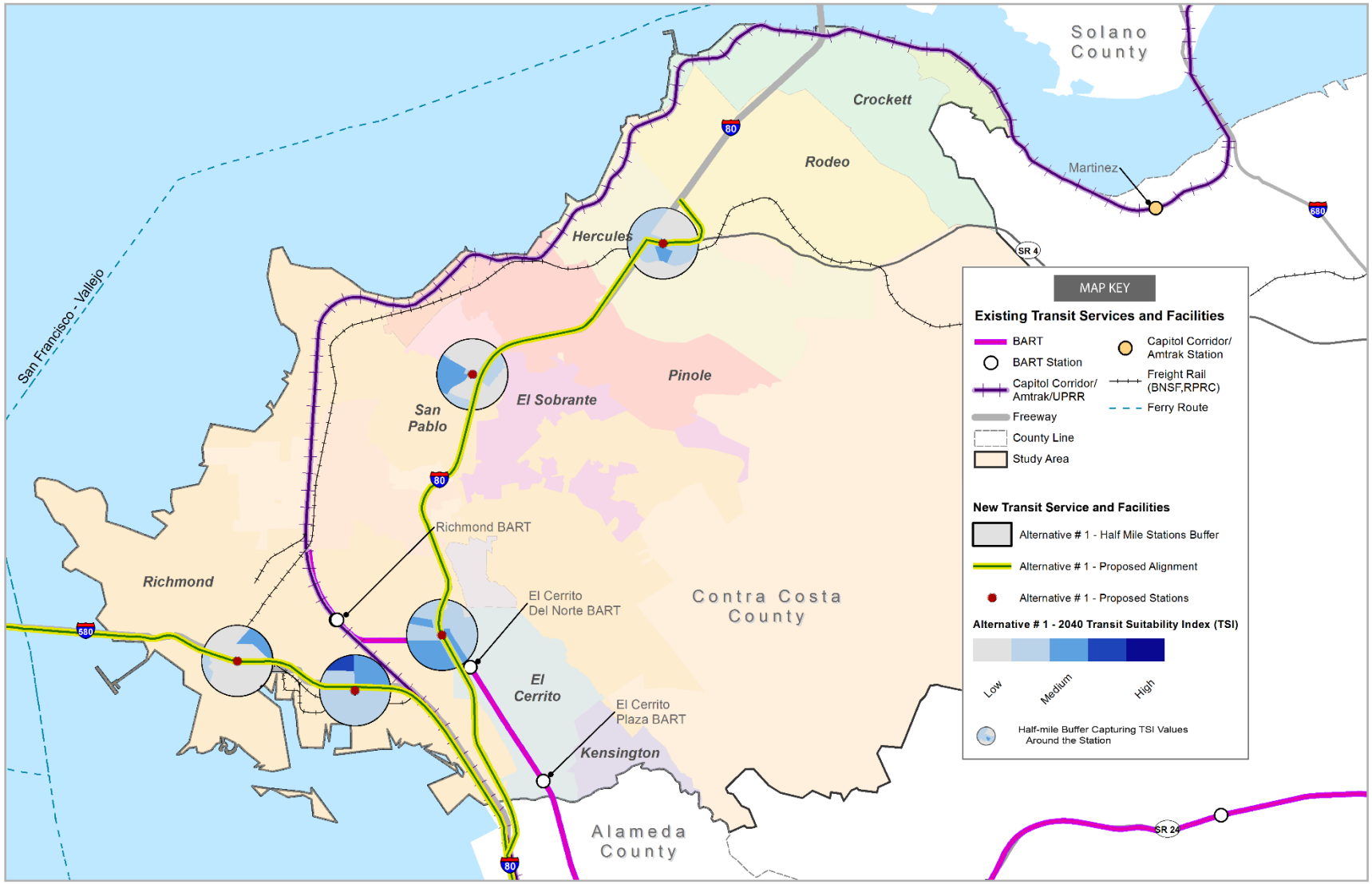
Alternative 2 and Alternative 3 were rated with the highest transit market potential. To illustrate how the transit market potential was determined, **Figure 4-2** and **Figure 4-3** show the

Figure 4-2: Alternative 1. Express Bus Service Existing Transit Suitability (TSI) Half Mile Capture Zone



Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure 4-3: Alternative 1. Express Bus Service 2040 Transit Suitability (TSI) Half Mile Capture Zone



Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

TSI capture within a half mile of Alternative 1 proposed stations. The TSI analysis for all alternatives is presented in Appendix B.

4.2 Study Goal: Improve transit connections

The Step 1 evaluation measures, methodology, and results for this goal are discussed below.

4.2.1 Quality of connections to existing transit systems and facilities

The quality of connections to the existing transit system was assessed relative to existing transit service and facilities. The existing bus and rail facilities and major bus transfer hubs that would connect to the alignment of each option were identified. Each station along an alternative was rated individually, receiving a high rating for convenient connections, such as a platform integrated with a transit center, down to a low rating for challenging connections that may require significant walking, roadway crossings, and other obstacles to make a transfer. The results were summed and averaged for each option. A rating of low to high performance was assigned to alternatives to assess the ease of connections to existing transit. **Table 4-5** summarizes the rating for the quality of transit connections for each alternative.

Alternatives 3, 4, 6, and 7 rank the highest for high-quality intermodal connections at all stops or stations. Alternative 1 is the lowest performing due to its alignment following the freeway corridor, creating barriers at many transfer points for bus and rail connections.

Table 4-5. Quality of connections to existing transit systems and facilities

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◔	Okay connections with walking distance required at most stops along freeway corridors to nearby bus transfers and park-and-rides. Close proximity to freeway ramps creates obstacles.
2. San Pablo Avenue/ Macdonald Avenue BRT	◕	High quality connections except for El Cerrito BART station, where buses will stop on San Pablo Avenue and not enter the station itself, creating significant walking distance to connections.
3. 23rd Street BRT	●	High-quality connections assuming all stops will be well-integrated with limited walking distance to other bus and/or rail connections.
4. UPRR Corridor Commuter Rail	●	High-quality connections with proposed intermodal transit centers.
5. UPRR-BNSF Corridor Commuter Rail	◑	Good connections assumed except for a challenging connection at a proposed station in the proximity of Hercules Transit Center, where the station would be east or west of Willow Avenue producing major obstacles.
6.BART Extension from Richmond Station to Hercules	●	High-quality intermodal connections assumed for all BART stations. Bus-rail connections should be possible right outside BART fare gates.
7. BART Extension from El Cerrito del Norte Station to Hercules	●	High-quality intermodal connections assumed for all BART stations. Bus-rail connections should be possible right outside BART fare gates.

4.3 Study Goal: Expand transit to new and underserved travel markets

The Step 1 evaluation measures, methodology, and results for this goal are discussed below and include service to low-income areas and service to markets currently lacking major transit connections.

4.3.1 Service to low-income areas

Service to low-income areas was rated based on the number of low-income households within a 1/2 mile of the alternatives' proposed stations. Alternative 2, San Pablo Avenue/ Macdonald Avenue BRT, has the highest potential to serve low-income areas with a market capture area of over 24,000 low-income households. Alternative 3, 23rd Street BRT has the next highest market capture area with a total of 15,735 low-income households. These two alternatives reflect the ability of bus service to effectively capture ridership within proximity to a route without the need for transfers. For express bus and rail services, particularly with remote stations e.g. along a freeway corridor, there is usually a need to rely on other modes to access the station.

The percentages of low-income households from the total number of households within a 1/2 mile of the Alternatives' proposed stations, ranged from 49 percent to 25 percent. For the 2040 projections, the percentages ranged from 34 percent to 17 percent. Alternative 4, UPRR Corridor Commuter Rail, had the highest capture rate for the percentage of low-income households within the identified market area. The total number of households within a half mile of the Alternatives' proposed stations increased for the 2040 projections, but the percentages of low-income households within a 1/2 mile of stations, declined for all the Alternatives in 2040 between 8 and 15 percent.[4] This trend is consistent with the overall decline in percentage of low income households in the region.

Alternatives were rated based on the following thresholds: Stations serving less than 5,000 low-income households (○); between 5,000 and 9,999 (◔), between 10,000 and 14,999 (◑), between 15,000 and 19,999 (◕), and over 20,000 (●) and over 15,000. **Table 4-6** summarized the ratings of serving low-income areas for the existing conditions, and **Table 4-7** for the 2040 projections.

[4] The regional projections for 2040 show an overall decline in low income households between now and 2040.

Table 4-6: Existing service to low-income areas

Option	Performance Rating	Number of low income households (HH) within a 1/2 mile of stations.	Total number of HH within a 1/2 mile of stations.	Percentage of low income HHs from the total number of HHs within a 1/2 mile of stations.	Summary of Findings
1. Express Bus Service	◔	5,645	21,500	26%	With five station options, Alternative 1 can potentially serve over 5,600 low-income households with a half mile of its stations.
2. San Pablo Avenue/ Macdonald Avenue BRT	●	24,475	69,890	35%	With 35 station/stop options, Alternative 2 has the highest potential to serve nearly 24,500 low-income households.
3. 23rd Street BRT	◕	15,735	42,650	37%	Alternative 3's 27 station/stop options can potentially serve over 15,700 low-income households with a half mile of its stations.
4. UPRR Corridor Commuter Rail	◔	5,845	11,984	49%	With two new station options and two existing stations, Alternative 4 has the potential to serve over 5,800 low-income households within a half mile of its stations.
5. UPRR-BNSF Corridor Commuter Rail	◔	5,918	22,839	26%	With four new station options and one existing station, Alternative 5 has the potential to serve nearly 6,000 low-income households within a half mile of its stations.
6.BART Extension from Richmond Station to Hercules	◑	7,865	20,250	39%	With four station options, Alternative 6 can potentially serve over 7,800 low-income households with a half mile of its stations.
7. BART Extension from El Cerrito del Norte Station to Hercules	◔	5,360	21,065	25%	With four station options, Alternative 7 can potentially serve over 5,300 low-income households with a half mile of its stations.

Socioeconomic data collected from Plan Bay Area ABAG projections (2013)

Table 4-7: Service to low-income areas in 2040

Option	Performance Rating	Number of low income households (HHs) within a 1/2 mile of stations	Total number of HH within a 1/2 mile of stations	% of low income HHs from the total number of HHs within a 1/2 mile of stations	Summary of Findings
1. Express Bus Service	○	4,725	28,125	17%	With five proposed station options, Alternative 1 is projected to serve over 4,700 low-income households.
2. San Pablo Avenue/ Macdonald Avenue BRT	●	20,390	87,705	23%	With 35 station/stop options, Alternative 2 has the highest potential to serve nearly 20,400 low-income households in 2040.
3. 23rd Street BRT	◑	13,550	55,055	25%	Alternative 3's 27 station/stop options can potentially serve over 13,500 low income households in 2040.
4. UPRR Corridor Commuter Rail	◔	5,538	16,113	34%	With two new station options and two existing stations, Alternative 4 has the potential to serve over 5,500 low-income households with a half mile of its stations in 2040.
5. UPRR-BNSF Corridor Commuter Rail	◔	5,203	28,168	18%	In 2040 with four new station options and one existing station, Alternative 5 has the potential to serve over 5,200 low-income households with a half mile of its stations.
6.BART Extension from Richmond Station to Hercules	◔	6,935	26,840	26%	With four station options, Alternative 6 can potentially serve less than 7,000 low-income households with a half mile of its stations.
7. BART Extension from El Cerrito del Norte Station to Hercules	○	4,450	26,670	17%	With four station options, Alternative 7 can potentially serve over 4,400 low-income households with a half mile of its stations.

Socioeconomic data collected from Plan Bay Area ABAG projections (2040)

4.3.2 Service to markets currently lacking major transit connections

Much of West Contra Costa County has been identified as having a strong transit market, however, not all of the areas with high transit potential currently have good transit connections. Each of the seven alternatives was overlaid with all existing transit systems in the study area. Areas with low transit service were identified and tabulated to determine the

greatest potential for expanding service areas. A scale rating ranging from low to high was applied, with the highest marks assigned to alternatives with the highest potential to connect with currently under-served transit markets.

The results of this evaluation measure are presented in **Table 4-8**. Both BRT alternatives, Alternative 2 and Alternative 3, perform the highest for serving the greatest number of markets lacking major transit connections. Commuter rail alternatives do not rate as high as BART alternatives, largely due to the limited number of stations.

Table 4-8. Service to markets lacking major transit connections

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◕	Expands service to markets in south and west Richmond, El Sobrante, and Hercules
2. San Pablo Avenue/ Macdonald Avenue BRT	●	Expands service to markets in west and central Richmond, Tara Hills, Pinole, and Hercules
3. 23rd Street BRT	●	Expands service to markets in south and central Richmond, Tara Hills, Pinole, and Hercules
4. UPRR Corridor Commuter Rail	◔	Expands service to markets in northern Richmond near Point Pinole Regional Shoreline and Hercules Intermodal Transit facility
5. UPRR-BNSF Corridor Commuter Rail	◔	Expands service to markets in northern Richmond near Point Pinole Regional Shoreline and Hercules
6.BART Extension from Richmond Station to Hercules	◑	Expands service to markets in San Pablo, northern Richmond, and Hercules
7. BART Extension from El Cerrito del Norte Station to Hercules	◑	Expands service to markets in San Pablo, El Sobrante and Hercules

4.4 Goal: Protect and enhance the environment and maintain a high quality of life

The Step 1 evaluation measures, methodology, and results for this goal are discussed below and include potential negative environmental impacts; impact on air quality criteria pollutants and GHG emissions; transportation energy use; risk associated with sea level rise; and compatibility with local plans and policies.

A scan of readily available information such as mapping in regard to the San Francisco Bay Delta watershed, U.S. Environmental Protection Agency cleanup sites, earthquake hazards, and disadvantaged communities as well as land use designations from city and county general plans was conducted. This review was used to determine any potential impacts from the implementation of the alternatives. The environmental evaluation is shown in greater detail in Appendix C.

4.4.1 Potential Negative Environmental Impacts

Alternatives that could adversely affect the natural environment, cultural and historic resources, and communities are rated lower than those with limited or no major impacts. A rating of ● would indicate no impact or a low likelihood of an impact occurring. A rating of ◕ would indicate that there is the potential for an impact and the issue would need to be studied further if the alternative moves forward. A rating of ◔ or ◑ would indicate that some impact would occur with a ◔ rating being a more severe impact than a ◑ rating. The results of this evaluation measure are presented in **Table 4-9**.The more detailed ratings for general environmental impacts are included in Appendix C.

In general, the alternatives are located in developed areas and would be constructed along existing roadways and rail corridors, so the potential overall for an impact are lower.

The bus alternatives (Alternative 1, 2, and 3) have the least potential for disturbance, with the highest overall ratings. The alignments would cross some creeks, but these structures would not be widened. At this time, it is unknown to what extent disadvantaged communities would be affected. During construction, there is always the possibility of hazardous material and water quality impacts, however the impacts can be mitigated with the application of best management practices.

With Alternative 1, individual intersections near proposed park-and-ride lots may experience increases in travel demand. There may be temporary traffic disruptions during construction throughout the alignment. With Alternatives 2 and 3, existing traffic flows along the alignment could be affected as traffic lanes would be taken for exclusive bus use. There would be limited availability of on-street parking at some locations along the alignment and potentially at stations.

The commuter rail alternatives (Alternatives 4 and 5) have a higher likelihood of impact compared to the bus alternatives because construction activities would be more complex. The ratings on these two alternatives range from moderate to high performing. The commuter rail alternatives would require installation of a third rail track between Martinez and Oakland that could affect several environmental factors, such as biological, recreational, cultural, and historic resources; and communities. Because the UPRR rail line is within 100 feet of the bay shoreline in various places, a permit for improvements would be required from the San Francisco Bay Conservation and Development Commission and they would likely require biological mitigation. There are disadvantaged communities along the two railroad corridors, but the alternatives have not yet been defined to a degree that would indicate the extent to which these communities would be impacted by the implementation of new or additional rail services along the corridors. Necessary bridge widenings could alter the visual character of the corridor. The

alternatives would introduce eight new commuter trains per day, which may increase noise levels at nearby residences during construction and operation.

The BART alternatives would have a higher likelihood of impact compared to the bus alternatives as well since aerial structures and tunnels would have to be constructed. The

Table 4-9. Environmental impacts

Option	Performance Rating	Summary of Findings
1. Express Bus Service	●	Lowest potential for impacts as construction is limited Standard construction impacts Potential for disadvantaged community impacts Potential traffic impacts at park-and-ride stations
2. San Pablo Avenue/ Macdonald Avenue BRT	◕	Lowest potential for impacts as construction is limited Standard construction impacts Potential for disadvantaged community impacts Potential for traffic impacts due to the conversion of travel lanes to BRT and the loss of some on-street parking
3. 23rd Street BRT	◕	Lowest potential for impacts as construction is limited Standard construction impacts Potential for disadvantaged community impacts Potential for traffic impacts due to the conversion of travel lanes to BRT and the loss of some on-street parking
4. UPRR Corridor Commuter Rail	◕	Higher potential for impacts Standard construction impacts as well as impacts within the 100-foot bay shoreline band Potential for aesthetics, biological, cultural, historic, and disadvantaged community impacts Traffic impacts at new Richmond and Hercules stations
5. UPRR-BNSF Corridor Commuter Rail	◕	Higher potential for impacts Standard construction impacts as well as limited impacts within the 100-foot shoreline band Potential for aesthetics, biological, cultural, historic, and disadvantaged community impacts Traffic impacts at new stations
6.BART Extension from Richmond Station to Hercules	◕	Higher potential for impacts Standard construction impacts Potential for aesthetics, biological, cultural, historic, and disadvantaged community impacts Tunnels would be required due to vertical grades Traffic impacts at the new stations
7. BART Extension from El Cerrito del Norte Station to Hercules	◑	Higher potential for impacts Standard construction impacts Potential for aesthetics, biological, cultural, historic, and community impacts Tunnels would be required due to vertical grades Traffic impacts at the new stations

ratings for the BART alternatives are from low moderate to high. As a result of the structures and tunnels, these alternatives could affect several environmental factors, such as biological, and cultural resources; and communities. There are disadvantaged communities along the two railroad corridors, but the alternatives have not yet been defined to a degree that would indicate the extent to which these communities would be impacted by the implementation of new or additional rail services along the corridors. Alternative 6, however, could go along 13th Street and Rumrill Boulevard in a lower income area that could be impacted due to the structures that would likely be required.

Aerial structures would be placed along the majority of the alignments and could be visually obtrusive. The alternative could potentially introduce new sources of light and glare along the trackway and at the proposed stations. Tunnel or trenching would be needed in areas with steep vertical grades and soil instability. Construction could result in soil erosion from excavation and grading activities. There is the potential for increased noise levels at nearby residences along the new alignment during construction and operation. Individual intersections near the proposed new stations may experience increased traffic congestion.

4.4.2 Impact on Air Quality Criteria Pollutants and GHG emissions

The alternatives have the potential to reduce vehicle miles of travel (VMT), which in turn would reduce air pollutant and GHG emissions. During this Step 1 screening, VMT estimates were not quantified. A rating was based on information available from other studies in regard to trip length, mode capacity, and ridership. Quantitative estimates of each alternative's effects on regional VMT will be obtained from the Countywide Travel Demand Model for Step 2 screening.

All of the alternatives would have a potentially positive impact on air quality and a reduction in GHG emissions due to modal shifts away from single occupant auto travel to transit. The BRT alternatives (Alternatives 2 and 3) would potentially attract a high number of riders, but the trip distances are expected to be shorter than for other alternatives. The 2013 National Transit Database indicates that the average bus trip on AC Transit is a little less than four miles. This more modest reduction in VMT would result in smaller decreases to regional emissions. The results of this evaluation measure are presented in **Table 4-10**.

Alternative 1 and the BART alternatives (Alternatives 6 and 7) would have greater potential for reducing VMT due to the longer trip length associated with these alternatives than the BRT Alternatives. With Alternative 1, it would have the potential to decrease VMT and thereby improve air quality by a substantial amount. This improvement would be somewhat offset by an expected increase in localized pollutants near the proposed new or expanded park-and-ride lots. Construction emissions would occur, but could be reduced by using best management practices.

The commuter rail alternatives (Alternatives 4 and 5) would potentially decrease regional emissions by a moderate amount as new commuter services from Martinez to Richmond would attract new transit riders. In the long term, a service extending to Oakland would likely generate more riders than a service stopping at Richmond. In either case, the use of commuter trains would be limited to eight trains per day, unless demand warranted off-peak service. The ridership capture would be lower with only peak hour service and with service only between Martinez and Richmond, which would limit the volume of passengers and the amount of any

Table 4-10. Air quality and GHG impacts

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◕	High potential for improving air quality due to the volume of expected VMT reduction
2. San Pablo Avenue/ Macdonald Avenue BRT	◔	Low potential for improving air quality due to an expected lower expected VMT reduction
3. 23rd Street BRT	◔	Low potential for improving air quality due to an expected lower expected VMT reduction
4. UPRR Corridor Commuter Rail	◑	Moderate potential for improving air quality due to limited hours of operation and engine generated emissions
5. UPRR-BNSF Corridor Commuter Rail	◑	Moderate potential for improving air quality due to limited hours of operation and engine generated emissions
6.BART Extension from Richmond Station to Hercules	◕	High potential for improving air quality due to high volume capacity and shortening of trips to existing stations
7. BART Extension from El Cerrito del Norte Station to Hercules	◕	High potential for improving air quality due to high volume capacity and shortening of trips to existing stations Use of DMUs would reduce the benefit somewhat due to new engine emissions and required transfers at El Cerrito del Norte

VMT reduction. If the frequency and reach of service was increased and ridership increased significantly, there would be additional air quality benefits. The use of commuter trains would introduce some new emissions if conventional locomotives were used. Implementation of these alternatives would potentially attract local traffic to the existing and proposed new rail stations, which could increase congestion and traffic delays. This could create an increase in localized pollutants. These alternatives would generate additional air toxics due to train use. Construction emissions would occur, but could be reduced by using best management practices.

The BART alternatives, Alternatives 6 and 7, have the potential to decrease regional emissions by a relatively high amount because these alternatives have the potential to attract a large amount of riders, which would reduce VMT. The alternatives have the capacity to carry a large volume of passengers, including new transit riders. In addition, current BART riders may also be able to reduce their driving distances to the stations as there would be additional stations. Implementation of these alternatives would attract local traffic to the existing and new

stations, which could increase congestion and traffic delays. This could create an increase in localized pollutants. Construction emissions would occur, but could be reduced by using best management practices.

The use of DMUs would potentially reduce the benefits of Alternative 7 because some new regional emissions and air toxics would be introduced with the use of diesel motors. In addition, some riders may be deterred from the DMU option due to the required transfer.

4.4.3 Transportation energy use

The same methodology and assumptions discussed in Section 3.4.2 apply to this objective because energy use is also linked to changes in VMT just like with air quality and GHG emissions. The results of this evaluation measure are presented in **Table 4-11**. The Express Bus and BART alternatives (Alternatives 1, 6, and 7) have the greatest potential for reducing transportation energy use, followed by the commuter rail alternatives (Alternatives 4 and 5), and the BRT alternatives (Alternatives 2 and 3).

Table 4-11. Transportation energy use

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◕	High potential for reducing energy use due to the volume of expected VMT reduction
2. San Pablo Avenue/ Macdonald Avenue BRT	◔	Low potential for reducing energy use due to an expected low amount of VMT reduction
3. 23rd Street BRT	◔	Low potential for reducing energy use due to an expected low amount of VMT reduction
4. UPRR Corridor Commuter Rail	◑	Moderate potential for reducing energy use due to limited volume capacity and engine generated emissions
5. UPRR-BNSF Corridor Commuter Rail	◑	Moderate potential for reducing energy use due to limited volume capacity and engine generated emissions
6.BART Extension from Richmond Station to Hercules	◕	High potential for reducing energy use due to high volume capacity and shortening of trips to existing stations
7. BART Extension from El Cerrito del Norte Station to Hercules	◕	High potential for reducing energy use due to high volume capacity and shortening of trips to existing stations Use of DMUs would reduce the benefit somewhat due to use of new diesel engines and transfer issues at El Cerrito del Norte

4.4.4 Risk Associated with Sea Level Rise

Investment in facilities that could be damaged by flooding or be partially submerged by rising bay tides is a risk, unless mitigations or improvements are made to protect these facilities. A Sea Level Rise Screening Level Tool from the National Oceanic and Atmospheric Administration Office of Coastal Management was used to identify low-lying areas within the corridors of the

alternatives.[5] A sea level rise of 5 feet was assumed in the NOAA analysis.[6] Ratings were based on the amount of low-lying areas and the vulnerability of an alternative being a poor long-term investment.

It should be noted that this is a screening level exercise and it is unknown to what extent the existing roadways or rail tracks will be modified to be more resilient to the projected rise in sea level. It is anticipated that programs will be put in place to address the vulnerability of major transportation facilities, such as the regional highways and the rail networks, to sea level rise. This analysis provides a quick overview of the extent to which retrofitting of facilities may be required to address this issue. The results of this evaluation measure are presented in **Table 4-12**.

Table 4-12. Risk Associated with Sea Level Rise

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◑	44,000 linear feet within low-lying areas Richmond Parkway/Canal Boulevard park-and-ride lot within a low-lying area
2. San Pablo Avenue/ Macdonald Avenue BRT	◕	8,000 linear feet within low-lying areas
3. 23rd Street BRT	◕	3,000 linear feet within low-lying area
4. UPRR Corridor Commuter Rail	○	109,000 linear feet within low-lying area
5. UPRR-BNSF Corridor Commuter Rail	◑	31,000 linear feet within low-lying areas
6.BART Extension from Richmond Station to Hercules	●	No low-lying areas
7. BART Extension from El Cerrito del Norte Station to Hercules	●	No low-lying areas

The BART alternatives (Alternatives 6 and 7) would be the least risky from a flooding standpoint. None of the alignments fall within any low-lying areas.

The BRT alignments for Alternatives 2 and 3 would have several thousand linear feet within low-laying areas in Richmond. Alternative 2 would have approximately 8,000 linear feet in

[5] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impact Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December 2015.

[6] The sea level rise of 5 feet was based on scenarios prepared for the California Energy Commission's Public Interest Energy Research Climate Change Research Program. These scenarios assumed a sea level rise along California's Coast of 1.0 to 1.4 meters by the year 2100. The high range translates to a 5 foot sea level rise.

designated low-laying areas, while Alternative 3 would have 3,000 linear feet. This equates to 6 percent of the Alternative 2 alignment and 4 percent of the Alternative 3 alignment.

Alternative 1 has a much larger amount of low-lying areas because the alignment includes I-580. Approximately 44,000 linear feet of the alignment would occur in a low-lying area (22 percent). The park-and-ride lot at Richmond Parkway and Canal Boulevard would also fall within this area. This would need to be taken into account for improvements along this stretch of freeway.

The commuter rail alternatives (Alternatives 4 and 5) would be affected by sea level rise and flooding. The existing UPRR rail line runs along the shoreline between Point Pinole to Martinez. This area currently floods during winter storm events and flooding would become more frequent with sea level rise (assuming a rise of 5 feet). As a result, Alternative 4 would be exposed to potential flooding in many areas, especially the areas around Pt Pinole Regional Park, San Pablo Bay Regional Park, near Rodeo Creek, the Crockett waterfront, and Martinez. Both alternatives include a potential for extension to Oakland, which would pass through two low-lying areas: at the Contra Costa/Alameda County boundary and in Jack London/West Oakland.

Approximately 109,000 linear feet of the Alternative 4 alignment, including both Contra Costa County and the extension to Oakland in Alameda County is in low-lying areas that would flood with a sea level rise of 5 feet. This amounts to 62 percent of the Alternative 4 alignment. Approximately 31,000 linear feet of the low-lying areas would be attributed to the possible extension to Oakland. It should be noted that investments in this corridor by the Union Pacific and/or public entities could mitigate the risk of sea level rise. In such a scenario, the risk to investments in the corridor would be reduced.

Alternative 5 would have approximately 31,000 linear feet within in low-lying areas, primarily associated with the extension from Richmond to Oakland. The alignment would experience the same issues related to the extension to Oakland as Alternative 4, but would move away from the coastline between Pinole and Hercules and would continue much further inland for the rest of the alignment. This would amount to 17 percent of the alignment.

4.4.5 Compatibility with Local Plans and Policies

Compatibility with local plans and policies was determined by examining an alternative's general consistency with local and regional jurisdictions' blueprints for development and transportation strategies. The results of this evaluation measure are presented in **Table 4-13**.

In general, the alternatives are compatible with local plans and policies with a couple of exceptions. For Alternatives 4 and 5, if service were to extend to Oakland, an additional 20-30 feet of right-of-way between West Grand Ave in Oakland and 65th Street in Emeryville would

be required to accommodate a third track. This may not be consistent with local development plans. These alternatives would also exceed the negotiated capacity allowed by UPRR.

Alternative 6 (BART from Richmond) would support the growth strategies of the corridor cities. The alternative would generally not displace existing housing because the construction would predominately be within the existing right-of-way. However, there is a potential for a limited taking of homes along about a 3/4 mile stretch of Rumrill Boulevard in San Pablo in an area that

Table 4-13. Compatibility with local plans and policies

Option	Performance Rating	Summary of Findings
1. Express Bus Service	●	Does not conflict
2. San Pablo Avenue/ Macdonald Avenue BRT	●	There are some conflicts with complete street plans for implementing bike lanes along portions of these corridors.
3. 23rd Street BRT	●	There are some conflicts with complete street plans for implementing bike lanes along portions of these corridors.
4. UPRR Corridor Commuter Rail	◑	Extension to Oakland would require additional right-of-way Not consistent with capacity agreements with UPRR
5. UPRR-BNSF Corridor Commuter Rail	◑	Extension to Oakland would require additional right-of-way Not consistent with capacity agreements with UPRR
6.BART Extension from Richmond Station to Hercules	◕	Right-of-way requirements are not known for maintenance facilities and turn around tracks
7. BART Extension from El Cerrito del Norte Station to Hercules	◑	Right-of-way requirements are not known for maintenance facilities, turn around tracks, and transfer between BART and DMU for the DMU option Inconsistent with Richmond General Plan 2030 which assumes downtown Richmond service

serves lower income families. The right-of-way requirements have not been determined for a potential new Hercules maintenance facility or expansion of the Richmond maintenance facility and for the required turn back tracks in Hercules.

Alternative 7 (BART/DMU from El Cerrito del Norte) may displace existing housing located between the station and the freeway although construction would predominately be within the existing right-of-way. The full right-of-way requirements have not been determined for the maintenance facilities, turn back tracks, or the transfer between BART and DMU service at El Cerrito del Norte (for the DMU option). Alternative 7 would, however, conflict with Richmond General Plan 2030, which supports a future BART extension from the downtown Richmond Station, so as not to isolate it from the main BART system.

4.5 Goal: Support sustainable urban growth

The Step 1 evaluation measures, methodology, and results for this goal are discussed below and include West County PDAs served and availability and type of developable land served by transit.

4.5.1 West County PDAs served

The rating for serving West County Priority Development Areas (PDA) was determined by the area in square miles of PDAs served within a half mile of the Alternatives' proposed stations. With 35 proposed stations and stops and the longest BRT alternative, Alternative 2, San Pablo Avenue/ Macdonald Avenue BRT, rates the highest serving 3.85 square miles of PDAs, followed by Alternative 3, 23rd Street BRT, serving 3.68 square miles of PDAs. In contrast, Alternative 7, BART Extensions from El Cerrito del Norte Station, serves only 0.51 square miles of PDAs, making it the lowest rated alternative.

Alternatives were rated based on the following thresholds of area in square miles in PDAs within 1/2 mile of stations: serves less than 1/2 square mile of PDAs; between 1/2 and 1 square mile, between 1 and 2 square miles, between 2 and 3 square miles; and serving over 3 square miles of West County PDAs. **Table 4-14** summarizes the ratings of the Alternatives serving West County priority development areas.

Table 4-14: West County PDAs served

Option	Performance Rating	Area in square miles in PDAs within 1/2 mile of stations	Total area in square miles within 1/2 mile from stations	PDAs as a % of total area within 1/2 from stations	Summary of Findings
1. Express Bus Service	◑	1.16	3.91	30%	With five station options, Alternative 1 can potentially serve an area of just over 1 square mile of PDAs.
2. San Pablo Avenue/ Macdonald Avenue BRT	●	3.85	16.12	24%	With 35 station/stop options, Alternative 2 has a high potential to serve PDAs covering 3.85 square miles.
3. 23rd Street BRT	●	3.68	10.66	35%	Alternative 3's 27 station/stop options have a high potential to serve PDAs.
4. UPRR Corridor Commuter Rail	◔	0.90	3.14	22%	With two new station options and two existing stations, Alternative 4 has the second lowest potential to serve PDAs.
5. UPRR-BNSF Corridor Commuter Rail	◑	1.11	4.71	40%	With four new station options and one existing station, Alternative 5 can potentially serve an area of over 1 square mile of PDAs.
6.BART Extension from Richmond Station to Hercules	◑	1.21	3.14	38%	With four station options, Alternative 6 can potentially serve an area of over 1 square mile of PDAs.
7. BART Extension from El Cerrito del Norte Station to Hercules	◔	0.51	3.14	16%	With four station options, Alternative 7 has the lowest potential to serve PDAs.

4.5.2 Availability and type of developable land served by transit

The availability and type of developable land in areas served by transit can help indicate the potential for transit-oriented development opportunities around a transit station. Potential new or infill development sites include unused, vacant, or underutilized sites. All of the alternatives have many properties near their stations that could provide development opportunities. The performance rating for each alternative based on availability of potentially developable land is shown in **Table 4-15**.

Table 4-15. Availability and type of developable land served by transit

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◑	There are approximately 100 potentially developable parcels within a half mile of the stations in this alternative. All of the stations in this alternative are in the vicinity of potentially developable properties, particularly in Hercules and near the Hilltop Mall.
2. San Pablo Avenue/ Macdonald Avenue BRT	●	There are approximately 260 potentially developable parcels within a half mile of the stations in this alternative. This alternative has a relatively large number of stations. Potentially developable properties are generally distributed throughout the alignment, with high concentrations in Hercules, near the Hilltop Mall and Richmond Parkway Transit Center, and in the vicinity of the El Cerrito Plaza BART station.
3. 23rd Street BRT	◕	There are approximately 180 potentially developable parcels within a half mile of the stations in this alternative. This alternative has a relatively large number of stations. Potentially developable properties are distributed throughout the alignment, with high concentrations in Hercules, near the Hilltop Mall, and in the vicinity of the Port of Richmond.
4. UPRR Corridor Commuter Rail	○	There are approximately 30 potentially developable parcels within a half mile of the stations in this alternative. There are only two stations in this alternative, but both have multiple large properties nearby that are potentially developable.
5. UPRR-BNSF Corridor Commuter Rail	◔	There are nearly 50 potentially developable parcels within a half mile of the stations in this alternative. The Hercules and Atlas Road stations have a relatively high number of potentially developable properties, with fewer near the Richmond Amtrak Station. The Willow Ave station would have slightly more developable properties than the alternate station to the east at Palm & Willow.
6. BART Extension from Richmond Station to Hercules	◑	There are approximately 70 potentially developable parcels within a half mile of the stations in this alternative. All of the stations in this alternative are near potentially developable properties, particularly those stations in Hercules and near the Hilltop Mall.
7. BART Extension from El Cerrito del Norte Station to Hercules	◕	There are approximately 110 potentially developable parcels within a half mile of the stations in this alternative. All of the stations, San Pablo Dam Road, Richmond Parkway, and Hercules Transit Center have a relatively large number of potentially developable properties within a half mile.

The ratings are based on a high-level assessment of the parcel size and existing land uses within a half mile of each station for each alternative. Parcel sizes were assessed using Contra Costa and Alameda county GIS data and existing land uses were evaluated based on aerial photography and property data available in Google Earth. The following criteria were used to determine if a parcel was potentially developable:

- Size: Land near a transit station should be large and contiguous to make a substantial development feasible. Properties at least one acre in size are considered to accommodate potential future development levels that smaller parcels could not support. Only those parcels at least one acre in size were considered as potentially developable.

- Vacant or underutilized: Land that is vacant or underutilized would be easier to redevelop than land with substantial improvements. Parcels at least one acre or larger were examined using aerial photos to determine if the parcel appeared to be vacant or if a substantial portion of the parcel did not have structures. For example, a parcel `containing a warehouse-type store surrounded by a very large parking lot would be considered underutilized and therefore included as a potentially developable property. Several types of properties were not considered developable even if they included vacant land. The properties that were considered non-developable included schools, cemeteries, water bodies, active rail lines/yards, parks and recreation facilities, and power stations. Additional non-developable properties included those that had a substantial area identified as wetlands or riparian areas in the National Wetland Inventory, or areas that appeared on the aerial photos to be environmentally sensitive, such as areas with steep slopes.

As noted in the table above, all of the alternatives have potentially developable properties near their stations. The alternatives with the largest number of stations/stops (Alternatives 2 and 3) also have the highest number of potentially developable parcels. The remaining alternatives have fewer stations and range between about 30 and 110 developable parcels.

For all alternatives, the actual number of developable properties is likely lower than the number of parcels reported in the table above as this was a high-level assessment. Future more detailed study could consider multiple other factors, such as shoreline and zoning restrictions, existing property ownership (e.g. government owned properties may not be developable), soil/geologic conditions, market factors, and property size.

4.6 Goal: Provide equitable access for residents and businesses

The Step 1 evaluation measures, methodology, and results for this goal are discussed below and include population, employment, and households with access to (or accessible from) transit stations and congestion relief based on estimated reduction in VMT.

4.6.1 Population, employment, and households with access to (or accessible from) transit stations

Population, employment, and total number of households within a half mile of the Alternative's proposed stations, were calculated from the CCTA Travel Demand model for existing conditions and 2040 projections. The rating was assessed by estimating the total number of population, employment, and households within a half mile of the Alternatives' proposed stations. Alternative 2, San Pablo Avenue/Macdonald Avenue BRT, has the highest rating. In contrast, Alternative 4, UPRR Corridor Commuter Rail, would serve the least amount of population, employment and households within a half mile from its proposed stations.

Alternatives were rated based on the following thresholds. For population and employment combined: 1 - serves less than 30,000; 2 - serves 30,000 to 59,999; 3 – serves 60,000 to 89,999; 4 – serves 90,000 to 119,999; and 5 – serves 120,000 plus total. Households were evaluated based on the following criteria: 1 – serves less than 10,000; 2 – serves 10,000 to 19,999; 3 – serves 20,000 t0 29,999; 4 – serves 30,000 to 39,999, and 5 – serves 40,000 plus households. **Table 4-16** summarizes ratings of the employment, population and households served within a half mile of the Alternatives' stations.

Table 4-16: Existing population, employment, and households with access to stations

Option	Performance Rating	Population within a 1/2 mile of stations	Employment within a 1/2 mile of stations	# of households within a 1/2 mile of stations	Summary of Findings
1. Express Bus Service	◑	57,730	23,970	21,500	Alternative 1 can potentially serve over 100,000 combined population and employment.
2. San Pablo Avenue/ Macdonald Avenue BRT	●	196,165	68,220	69,890	Alternative 2 has the highest potential to serve the largest amount of population, employment and households.
3. 23rd Street BRT	●	131,165	31,485	42,650	Alternative 3's 28 stations have the second highest potential to serve population, employment and households.
4. UPRR Corridor Commuter Rail	◔	39,114	14,297	11,984	Alternative 4 has the lowest potential to serve population, employment and households.
5. UPRR-BNSF Corridor Commuter Rail	◕	67,690	22,807	22,839	Alternative 5 has a high potential to serve population, employment and households.
6.BART Extension from Richmond Station to Hercules	◑	60,960	15,525	20,250	Alternative 6 can potentially serve a combined 76,484 population and employment.
7. BART Extension from El Cerrito del Norte Station to Hercules	◑	59,003	11,073	21,063	Alternative 7 can potentially serve a combined 70,076 population and employment.

4.6.2 Congestion relief based on estimated reduction in VMT

Congestion and vehicle miles of travel (VMT) are closely related. Increases in VMT, in busy corridors will increase congestion. A HCT alternative will offer greater congestion relief on West County roadways the greater the reduction in auto VMT. Auto VMT reduction itself varies with the number of auto drivers shifted to transit (new transit trips) and the length of the new trip

on transit. Mode of access to transit can also affect VMT, for instance, if auto access to transit can be reduced whether or not the transit user is a new or existing transit user. However, this is anticipated to have a marginal effect on VMT compared to the reduction that occurs when long auto trips are diverted to transit. The performance rating for each alternative based on is shown in **Table 4-17**.

Table 4-17. Congestion relief based on estimated reduction in VMT

Option	Performance Rating	Summary of Findings
1. Express Bus Service	●	Substantial share of users expected to be shifted from autos; average trip length likely comparable or longer than BART
2. San Pablo Avenue/ Macdonald Avenue BRT	◔	Short trips lengths on average, thereby limiting estimates of auto VMT reduction of new transit riders
3. 23rd Street BRT	◔	Short trips lengths on average, thereby limiting estimates of auto VMT reduction of new transit riders
4. UPRR Corridor Commuter Rail	◑	Low to moderate ridership although most users expected to be new to transit; long average trip length per rider
5. UPRR-BNSF Corridor Commuter Rail	◑	Low to moderate ridership although most users expected to be new to transit; long average trip length per rider
6.BART Extension from Richmond Station to Hercules	●	Substantial ridership, including large number of new transit users making long transit trips; results in high VMT reduction
7. BART Extension from El Cerrito del Norte Station to Hercules	●	Substantial ridership, including large number of new transit users making long transit trips; results in high VMT reduction

BART alternatives are expected to perform best at reducing VMT along with Express Bus alternatives. They would be followed by Commuter Rail alternatives and then BRT alternatives. Substantial VMT reduction from a BART investment results from the relative long trip length of the typical BART rider (13 miles; National Transit Database, 2013) and the anticipated high number of new transit riders. The Express Bus Alternative would perform similarly because it would divert auto drivers from using I-80 for long distance trips to Berkeley, Emeryville, and/or Oakland.

The low VMT reduction from BRT alternatives is mainly due to the short trip length of bus riders (3.7 miles on AC Transit; National Transit Database, 2013) despite the high ridership these high frequency lines can generate. A substantial portion of BRT riders will likely be new riders but not nearly as many as on BART or other modes serving new transit corridors. For example, the East Bay BRT project, 9.5 miles in length, is forecast to generate approximately 9,000 new trips on transit when implemented. The projected reduction in annual VMT is 12.6 million vehicle miles. The Santa Clara County BART extension to East San Jose, just under 10 miles, in length, is

forecast to generate approximately 27,000 new trips on transit each weekday. The projected annual VMT reduction is 83.2 million vehicle miles.[7]

Commuter rail alternatives are expected to generate VMT reductions and congestion relief at a level, less than the BART alternatives, but greater than the BRT alternatives. With commuter rail alternatives extending from Martinez to the Richmond Amtrak/BART station—approximately 20 miles in length—or continuing to Oakland Jack London Square—approximately 33 miles, the average trip length is expected to be relatively high to serve workers travelling to and from the major employment centers in the East Bay.

Average trip length on commuter rail would likely be the highest of any of the HCT modes under consideration, generating significant VMT reduction for each auto trip diverted to the new transit service. Total VMT reduction will be limited by the fact that commuter rail ridership is anticipated to be low to moderate. The low to moderate ridership is due to the more limited service offered by commuter rail alternatives 4 and 5, which is proposed as peak periods, weekdays only, and the less direct access to employment centers that the alignments offer.

Convenient access to dense employment center is key to generating ridership. BART and express bus ridership, including the number of new transit trips, is expected to be several times greater than commuter rail ridership because of the higher service levels each offers and the more direct access to employment centers in the East Bay.

4.7 Goal: Make efficient use of public funds

The Step 1 evaluation measures, methodology, and results for this goal are discussed below and include order of magnitude capital costs; order of magnitude operating and maintenance (O&M); and public and stakeholder support for proposed alternatives.

4.7.1 Order of magnitude capital costs

A capital cost estimate was prepared for each alternative. The estimates are based on very preliminary and limited information and therefore serve as a general guideline of relative costs for preliminary screening of alternatives. The alternatives that are selected for further evaluation will have more refined, yet still preliminary cost estimates. More specific and detailed studies in the future would need to be conducted as the design and planning progress.

All costs are provided in 2015 dollars. No cost escalation to Year of Expenditure (YOE) is included as there is no project schedule available for the escalation/projection calculation. In addition to escalation, items specifically excluded from the estimate include finance charges, mitigation cost for sea level rise, maintenance facilities, abatement of contaminated soils or

[7] This information is presented in the respective environmental impact statements for each project.)

hazardous materials, if any, and furniture, fittings and equipment (FFE) unless it is an integrated part of the buildings.

Capital cost estimates are considered as Class 4 Estimates by the Association for the Advancement of Cost Engineering (AACE) Estimate Classification system. The cost estimate is based on limited project information with project definition from 1 to 15% complete. Expected accuracy ranges for this class of estimate are -15% to -30% on the lower end and +20 to +50% on the higher end.

Table 4-18 presents the estimated capital costs for the range of Step 1 alternatives. The analysis is based on the cost of full implementation of the projects, with the exception of the commuter rail alternatives which have unaccounted costs as noted below. Alternative 3 is the highest performing for this criterion because this corridor is the shortest in length and therefore would not incur the same level of capital investment, with the other BRT and bus options, Alternative 1 and Alternative 2, following closely behind.

Table 4-18. Estimated project capital cost (2015$)

Option	Performance Rating	Capital Cost (in millions)
1. Express Bus Service	◕	$247.9
2. San Pablo Avenue/ Macdonald Avenue BRT	◕	$247.6
3. 23rd Street BRT	●	$120.8
4. UPRR Corridor Commuter Rail	◑	$338.0*
5. UPRR-BNSF Corridor Commuter Rail	◑	$346.5**
6.BART Extension from Richmond Station to Hercules	○	$2,452.8
7A BART Extension from El Cerrito del Norte Station to Hercules	○	$2,465.2
7B BART DMU Extension from El Cerrito del Norte Station to Hercules	○	$2,169.6

*Capital cost for Alternative 4 does not include the costs associated with UPRR negotiations and the costs for major capital investments such as grade separating tracks at Jack London Square or acquiring right-of-way in Alameda County.

**Capital cost for Alterative 5 does not include the costs associated with UPRR and BNSF negotiations and the costs for major capital investments such as grade separating tracks at Jack London Square or acquiring right-of-way in Alameda County.

The two commuter rail alternatives, Alternatives 4 and 5, show as modestly more expensive than the bus alternatives, but there are several potentially large items that are not accounted for in this cost estimate: the costs of addressing sea level rise issues on the Capitol Corridor alignments; the cost of grade separations in the Jack London Square area and additional right of

way and third track that are needed in Alameda County; and the premium associated with negotiations with the UPRR and BNSF to change or establish operating agreements.

Alternatives 6 and 7 are the lowest performing due to the high capital costs associated with significant infrastructure investment for a BART extension. Two separate cost estimates were prepared for Alternative 7, shown as Alternatives 7A and 7B, in order to reflect a DMU option. Step 2 evaluation will calculate the capital cost per project rider using estimates and ridership forecasts in order to more fairly compare the range of alternatives.

There are benefits associated with incremental implementation of transit improvements, which were not fully explored in this first step of the evaluation process. As the study advances to the next step of refinement and evaluation, phased implementation strategies will be explored.

4.7.2 Order of magnitude operating and maintenance (O&M)

Operations and maintenances costs were estimated for the Step 1 options. Cost elements include weekday revenue vehicle miles and hours, stations, operating characteristics such as service frequency and number of trips, and passenger vehicles or trains and spares. An annualization factor was applied depending on the type of service. All costs are base year costs in 2015 dollars. No cost escalation to YOE is included as there is no project schedule available for the escalation/projection calculation.

Table 4-19 presents estimated annual operating and maintenance costs for each alternative. The O&M costs are presented as both the total of the project alternative as well as estimated costs for West County service only. The ratings are applied to each alternative based on the total annual O&M costs. Alternative 3 received the highest performance rating for having the lowest O&M cost. As shown in the table, Alternative 2, 6, and 7 have significantly higher operating costs than the other alternatives, thus performing the lowest. Alternative 2 has higher operating costs than the other two alternatives because it includes the portion of the route in Alameda County and therefore provides a broader level of service coverage than Alternative 3, while the costs for operating BART are also higher than costs for operating buses. Alternatives 4 and 5 have moderate operating costs as they benefit from higher capacity trains and shared maintenance responsibilities.

Step 2 evaluation will calculate the annual operating cost per project rider using estimates and ridership forecasts in order to more fairly compare the range of alternatives.

Table 4-19. Annual O&M costs (2015 dollars)

Option	Performance Rating	Total Annual O&M Cost (in millions)	Estimated Costs for West County Service ONLY (in millions)
1. Express Bus Service	◕	$12.0	$12.0
2. San Pablo Avenue/ Macdonald Avenue BRT	○	$29.4	$20.2
3. 23rd Street BRT	●	$8.2	$8.2
4. UPRR Corridor Commuter Rail	◑	$15.6	$10.0
5. UPRR-BNSF Corridor Commuter Rail	◑	$15.7	$10.1
6.BART Extension from Richmond Station to Hercules	○	$27.9	$27.9
7. BART Extension from El Cerrito del Norte Station to Hercules	○	$28.7	$28.7

4.7.3 Public and stakeholder support for proposed alternatives

The outreach to date has been focused on a round of stakeholder meetings with the cities and the county over the summer of 2015 and a telephone town hall conducted in cooperation with Contra Costa Transportation Authority (CCTA) in November 2015. The results of the public and stakeholder engagement are summarized in **Table 4-20.**

The telephone town hall provided an opportunity for soliciting feedback from a broad base of the West County community to determine their preference for transit improvements. Of the 150 respondents to a question about "What additional transit service would you like to see in West County?" approximately 57% indicated preference for a BART extension, 25% for an expansion of express bus, and 18% for expansion of Capitol Corridor service.

Table 4-20. Public and stakeholder support

Option	Performance Rating	Summary of Findings
1. Express Bus Service	◕	Provides relatively quick capacity enhancements for commute trips, though less popular than BART
2. San Pablo Avenue/ Macdonald Avenue BRT	◑	Provides ability to serve a broad number of people, but may have traffic and parking impacts on corridors where implemented
3. 23rd Street BRT	◑	Provides ability to serve a broad number of people, but may have traffic and parking impacts on corridors where implemented
4. UPRR Corridor Commuter Rail	◑	Would meet the objectives for expanding transit service in Hercules and is strongly supported by Hercules, but lower rating in terms of overall public support and higher risks associated with sea level rise

Option	Performance Rating	Summary of Findings
5. UPRR-BNSF Corridor Commuter Rail	◑	More viable alternative for commuter rail, but Hercules has expressed concern about potential noise impact on residents
6.BART Extension from Richmond Station to Hercules	●	BART extension enjoys strong public support and this option is favored by Richmond, as compared to Alternative #7
7. BART Extension from El Cerrito del Norte Station to Hercules	◕	BART extension enjoys strong public support, but this alternative is not supported by Richmond

Each city has its own perspective on what would best serve their respective jurisdictions. Most cities would like to see improved transit accessibility and bus service improvements as a strategy that can introduce expanded capacity in the short-term. Some city staff have expressed concerns about the potential loss of a travel lane and on-street parking for the BRT alternatives. Because BRT is a new concept for West Contra Costa County, the apprehension over the potential parking and traffic impacts of a potential BRT or BRT hybrid would need to be overcome and a better understanding of the benefits would need to be provided. In addition to the general parking concerns outlined above, cities such as Pinole have expressed concern about the availability and use of existing parking by bus patrons within their jurisdiction. A strategically placed park-and-ride facility or transit station would address these concerns.

4.8 Summary of ratings

The Step 1 evaluation ratings are summarized in **Table 4-21** and discussed below.

In comparing the eight alternatives against the goals and objectives for the project, the bus and BART alternatives had the highest levels of performance, though each alternative performs well in some areas. The bus alternatives are cost competitive and they capture the greatest number of potential passengers within a half mile of the stations or stops, serve the greatest number of low income riders, provide the highest level of service to the West County PDAs, and provide good connections to other transit providers and destinations. Because the San Pablo/ Macdonald Avenue BRT Alternative (Alt. 2) is longer than the 23rd Street BRT Alternative (Alt. 3), it scores better in some circumstances, including regional transit centers served, service to low income areas, and availability and type of developable land. The Express Bus Alternative (Alt. 1) is a better option for providing an alternative to travel in single occupant autos on the freeway and would more quickly deliver patrons to their desired destination. While the BRT alternatives (Alternatives 2 and 3), can be implemented relatively quickly, they do not have as high of potential for capturing riders from the I-80 or I-580 corridors and would likely not realize as great of benefits in terms of reducing VMT as the other alternatives would as trips tend to be shorter for these type of services.

For larger and longer term investment, the BART alternatives (Alternatives 6 and 7) score higher than the commuter rail alternatives (Alternatives 4 and 5), despite their high costs. The BART

alternatives outperform the commuter rail alternatives in almost every category except for environmental impacts and costs. The BART and commuter rail alternatives are fairly comparable with respect to environmental impacts, with the exception of avoidance of low-lying areas, as the commuter rail alternatives follow the shoreline (this is particularly true for Alternative 4). The costs for the BART alternatives would be substantially higher than those for commuter rail. However, there are still considerable unknown costs for the commuter rail alternatives, including the grade-separation and additional right of way costs in Oakland, possible cost or timing of sea level rise mitigations, and costs associated with UPRR and BNSF negotiations for establishing additional services.

Between the BART alternatives 6 and 7, the BART Extension from Richmond Station to Hercules Alternative (Alt. 6) performs either the same or higher than the BART Extension from El Cerrito del Norte Station to Hercules Alternative (Alt. 7) for all evaluation criteria except for the availability and type of developable land served by transit. Alternative 7 performs higher in this category since there are approximately 110 potentially developable parcels within a half mile of the stations in this alternative (as compared to 70 parcels in Alternative 6). The primary difference in performance between Alternatives 7A (conventional BART technology) and 7B (DMU technology) lies in air quality and GHG impacts and transportation energy use. The use of DMUs would somewhat reduce air quality and GHG benefits and increase transportation energy use due to new engine emissions and the use of new diesel engines. The DMU options would also require a transfer for patrons at the El Cerrito del Norte Station. Conventional BART technology is however more expensive; the use of BART technology for Alternative 7A extension is estimated to cost $295.6 million (in 2015 dollars) more than the DMU technology for Alternative 7B.

The initial screening process has focused on how the fully implemented alternatives would perform against the adopted goals and objectives for the study. As part of the analysis, it became clear that alternatives also have potential for achieving positive results with incremental improvements. In particular, the bus and commuter rail options have potential for realizing short and medium-term benefits with incremental improvements. For example the Express Bus Alternative 1 could benefit from the initial introduction of new bus service to Alameda County in the short-term and could be built-up as capital investments are made to support these services over time. The UPRR Commuter Rail Alternative 4 also provides opportunities for short and medium-term improvements. A fare subsidy for West County transit patrons using the Capitol Corridor service could potentially be implemented in the short-term and the completion of the Hercules Intermodal Transit Center, which could provide commuter rail access to the northern part of West Contra Costa County as well as for commuters who may access it from I-80, could provide medium-term benefits.

Table 4-21. Summary of Step 1 evaluation results

No.	Evaluation Criteria		**Alternative 1** Express Bus Service	**Alternative 2** San Pablo Avenue/ Macdonald Avenue BRT	**Alternative 3** 23rd Street BRT	**Alternative 4** UPRR Corridor Commuter Rail	**Alternative 5** UPRR-BNSF Corridor Commuter Rail	**Alternative 6** BART Extension Richmond Station to Hercules	**Alternative 7A** BART Extension El Cerrito del Norte Station to Hercules – Conventional BART	**Alternative 7B** BART Extension El Cerrito del Norte Station to Hercules - DMU
1	Travel time improvement		◔	◔	◔	◑	◑	◕	◕	◕
2	Travel time reliability		◑	◔	○	◕	◕	●	●	●
3	Regional transit centers served		◕	●	◑	◔	◑	◑	◑	◑
4A	Transit market potential	*Existing*	◑	●	●	◑	○	◑	◔	◔
4B		*Future*	◑	●	●	◑	○	◑	◔	◔
5	Quality of connections		◔	◕	●	●	◑	●	●	●
6A	Service to low-income areas	*Existing*	◔	●	◕	◔	◔	◑	◔	◔
6B		*Future*	○	●	◑	◔	◔	◔	○	○
7	Service to underserved transit markets		◕	●	●	◔	◔	◑	◔	◑
8	Potential environmental impacts		●	◕	◕	◕	◕	◕	◕	◑
9	Air quality and GHG impacts		◕	◔	◔	◑	◑	◕	◕	◑
10	Transportation energy use		◕	◔	◔	◑	◑	◕	◕	◑
11	Risk associated with sea level rise		◑	◕	◕	○	◑	●	●	●
12	Compatibility with local plans and policies		●	●	●	◑	◑	◕	◑	◑

No.	Evaluation Criteria	**Alternative 1** Express Bus Service	**Alternative 2** San Pablo Avenue/ Macdonald Avenue BRT	**Alternative 3** 23rd Street BRT	**Alternative 4** UPRR Corridor Commuter Rail	**Alternative 5** UPRR-BNSF Corridor Commuter Rail	**Alternative 6** BART Extension Richmond Station to Hercules	**Alternative 7A** BART Extension El Cerrito del Norte Station to Hercules – Conventional BART	**Alternative 7B** BART Extension El Cerrito del Norte Station to Hercules - DMU
13	West County PDAs served	◑	●	●	◔	◑	◑	◔	◔
14	Availability and type of developable land	◑	●	◕	○	◔	◑	◕	◕
15	Population, employment and households	◑	●	●	◔	◕	◑	◑	◑
16	Congestion relief	●	◔	◔	◑	◑	●	●	●
17	Order of magnitude capital costs	◕	◕	●	◑	◑	○	○	○
18	Order of magnitude O&M costs	◕	○	●	◑	◑	○	○	○
19	Public and stakeholder support	◕	◑	◑	◑	◑	●	◕	◕
	Summary of Performance								
	○	1	1	1	2	2	2	3	3
	◔	3	5	4	6	4	1	5	5
	◑	7	1	3	10	12	8	3	6
	◕	7	4	4	2	3	5	6	5
	●	3	10	9	1	0	5	4	4

Evaluation Scale:

○ ◔ ◑ ◕ ●

Lower Performing → Higher Performing

5 RECOMMENDATIONS FOR STEP 2 EVALUATION

Based on the Step 1 evaluation results, and in order to provide a range of options, five alternatives are recommended for Step 2 refinement and further evaluation.

It is recommended that all of the bus alternatives, Alternatives 1, 2, and 3 be carried forward. The bus alternatives are lower cost and have the potential for implementation in a shorter time frame than any of the rail alternatives. In particular, Alternative 1, the Express Bus Alternative, which is an expansion of already successful express bus programs, has the greatest potential for short-term implementation should funding become available.

We are also recommending that Alternative 6, the BART extension from Richmond Station, also be carried forward. BART, despite its expense, looks like it has the greatest long-term potential for connectivity, serving potential transit markets, and congestion relief than commuter rail. Alternative 6 is also supported by BART staff and City of Richmond Policy and does not conflict with Title VI requirements.

It is also recommended that short to medium term investments to improve access in the UP Corridor be further explored. Subsidized fares for West County residents to ease the financial burden of using Capitol Corridor service and additional options for opening up service at the planned Hercules Intermodal Station may offer viable short or medium-term solutions.

APPENDIX A

Origin-Destination Pairs for Travel Time

APPENDIX A

Origin-Destination Pairs for Travel Time

			Alternatives to Be Compared for the Indicated O-D Pair						
	Origin-Destination for Comparing Travel Time	**No/Build Existing**	I-80 / I 580 Express Bus	San Pablo/ Macdonald BRT	23rd St BRT	UPRR Commuter Rail	BNSF Commuter Rail	Richmond to I-80 BART Ext	El Cerrito to I-80 BART Ext
1	Hercules TC to El Cerrito del Norte BART	WestCAT J to El Cerrito del Norte	√	√	√			√	√
2	Hercules TC to downtown Oakland	WestCAT J to El Cerrito del Norte, BART to 12th Street	√	√	√	√*	√	√	√
3	Hercules TC to Richmond BART	WestCAT Route C3 & AC Route 74		√	√	√*	√	√	
4	Hilltop Mall TC to El Cerrito del Norte BART	WestCAT J	√**	√	√			√	√**
5	Hercules Intermodal TC to downtown Oakland	WestCAT shuttle & Route C3 to AC Route 74; BART to 12th Street		√	√	√	√*	√*	
6	Marina Bay (Richmond) to El Cerrito del Norte	AC Route 74 to 72M to El Cerrito BART	√						
7	Marina Bay (Richmond) to downtown Oakland	AC 74 to Richmond BART, BART to 12th Street	√						
8	Tewksbury Turnaround to Downtown Oakland	AC Route 72M & Richmond BART or GG Route 40 to El Cerrito del Norte BART	√	√					

** Shuttle assumed between Hercules TC and Hercules Intermodal Center*

*** Route J to BART or Express Bus Richmond Parkway station*

O-D Pairs for Travel Time (Improvement) Evaluation

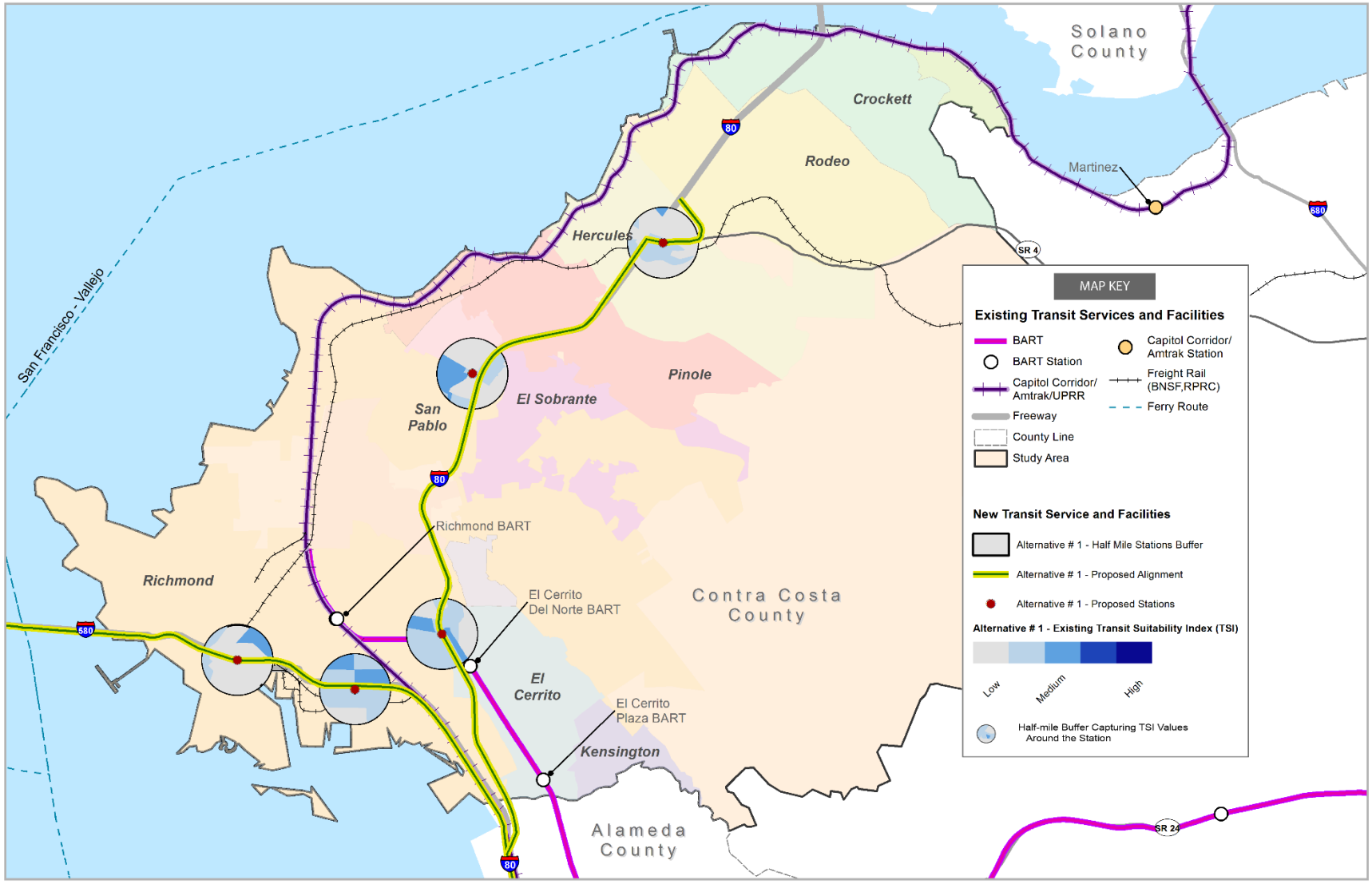
			HCT Alternative														Baseline	
			I-80 / I 580 Express Bus		San Pablo/Macdonald BRT		23rd St BRT		UPRR Commuter Rail		BNSF Commuter Rail		Richmond to I-80 BART Ext		El Cerrito to I-80 BART Ext		Existing Transit Services as Noted	
	Origin-Destination for Comparing Travel Time	No-Build (Existing) Travel Path	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route*	*Travel Time (min)*	*Route(s)*
1	Hercules TC to El Cerrito del Norte BART	WestCAT J to El Cerrito del Norte	25	Express to Macdonald transfer. SPA BRT to BART + transfer penalty .5*7.5	53	SPA BRT 12.2 miles	53	23rd ST BRT 10 miles + BART + .5*7 minute transfer penalty					20	Extension to Richmond plus BART between Richmond and El Cerrito del Norte	15	All on BART	15	West cat JX
2	Hercules TC to downtown Oakland	WestCAT J to El Cerrito del Norte, BART to 12th Street	42	19 miles Express Bus	92	21.1 miles	71	BRT to Richmond BART. Transfer to BART to 12th St plus .5*7 transfer penalty	58	Hercules TC Shuttle to ITC. Train to JLS 21.5 miles. .5*30 transfer penalty	40	Hercules TC to JLS 22.2 miles	45	Extension to Richmond plus BART between Richmond and 12th St	36	Extension plus 21 minute BART between El Cerrito del Norte and 12th St	48.5	West cat JX + BART El Cerrito to 12th
3	Hercules TC to Richmond BART	WestCAT Route C3 & AC Route 74			57	13 miles	43	10 miles	35	Hercules TC Shuttle to ITC. Train to Richmond 9 miles. .5*30 transfer penalty	18	Hercules TC to Richmond 9.7 miles	14	7.6 miles			67	West cat C3 + AC 74
4	Hilltop Mall TC to El Cerrito del Norte BART	WestCAT J	25	4 minute West cat J + 4.1 miles express bus with .5*10 transfer penalty + .6 mile SPA BRT + .5*7.5 transfer penalty	23	5.2 miles	27	4.1 miles to Richmond BART. BART to El Cerrito del Norte with .5*7 transfer penalty					13	4 miles to Richmond, plus BART to el Cerrito del Norte	21	4 minute West cat J + 5 miles BART + .5*15 transfer penalty	14	West cat J
5	Hercules Intermodal TC to downtown Oakland	WestCAT shuttle & Route C3 to AC Route 74; BART to 12th Street			97	22.4 miles	71	9.9 miles to Richmond BART, 24 minute BART to 12th, .5*7 transfer penalty	39	21.5 miles Hercules ITC to JLS	59	Hercules TC to JLS 22.2 miles + 4 minute shuttle + .5*30 transfer penalty	49	4 minute shuttle plus .5*15 transfer penalty plus Hercules TC to Richmond plus 24 minutes to 12th St			60	Shuttle + West cat JX + BART
6	Hercules ITC to Richmond BART				53	12.1 miles	43	9.9 miles	16	9 miles							101	Shuttle +West cat C3 + AC 74
7	Marina Bay (Richmond) to downtown Oakland	AC 74 to Richmond BART, BART to 12th Street	24	11 miles													41.5	9 minute walk to AC 40 on Cutting. Plus BART 20 minutes

* Shuttle assumed between Hercules TC and Hercules Intermodal Center
** Route J to BART or Express Bus Richmond Parkway station
Indicates that the O-D pair is not served by the alternative or would require two or more transfers to complete the trip

APPENDIX B

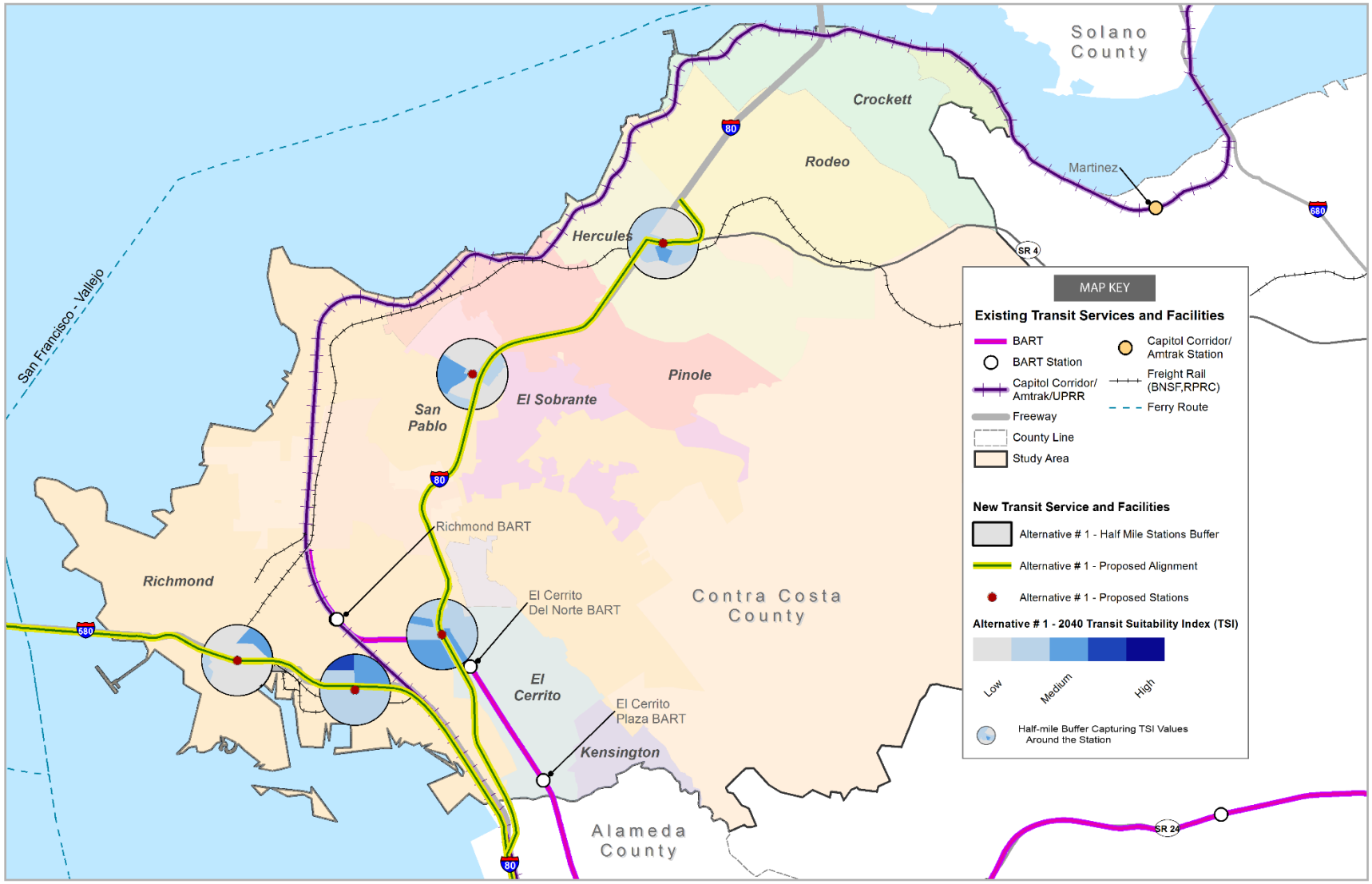
Transit Market Potential Analysis

Figure B-1: Alternative 1. Express Bus Service Existing Transit Suitability (TSI) Half Mile Capture Zone



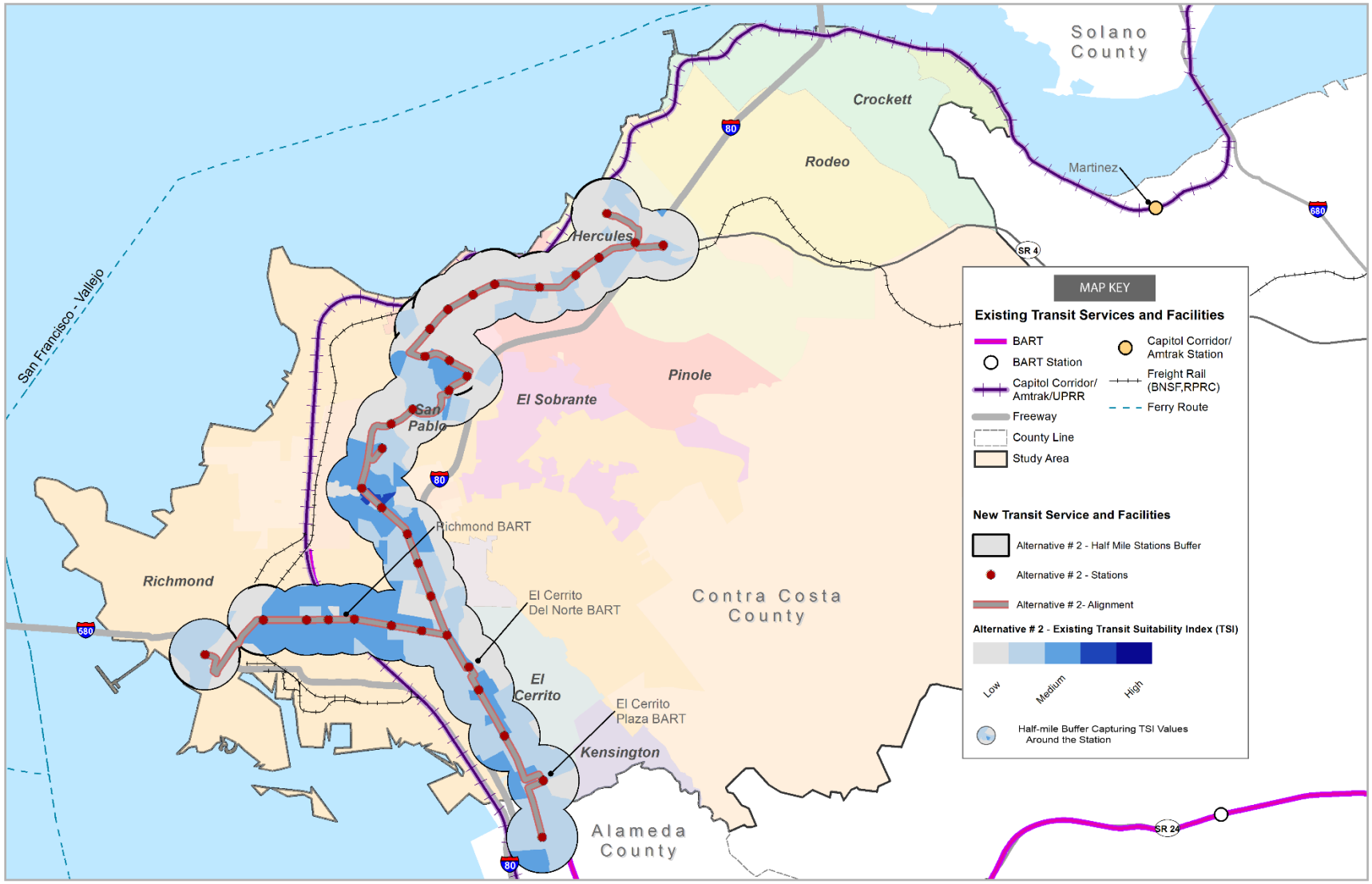
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-2: Alternative 1. Express Bus Service 2040 Transit Suitability (TSI) Half Mile Capture Zone



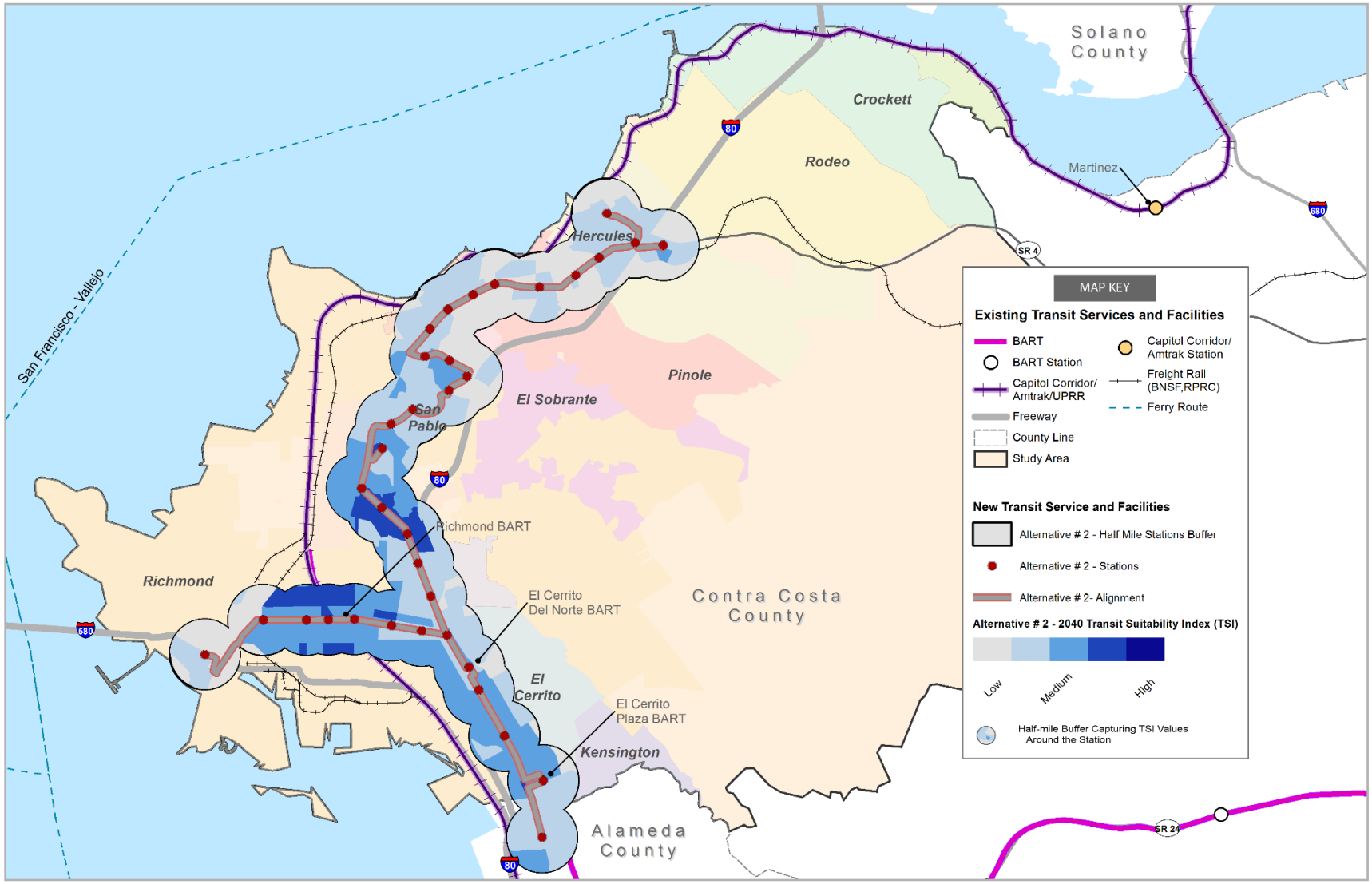
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-3: Alternative 2. San Pablo Avenue/ Macdonald Avenue BRT Existing Transit Suitability (TSI) Half Mile Capture Zone



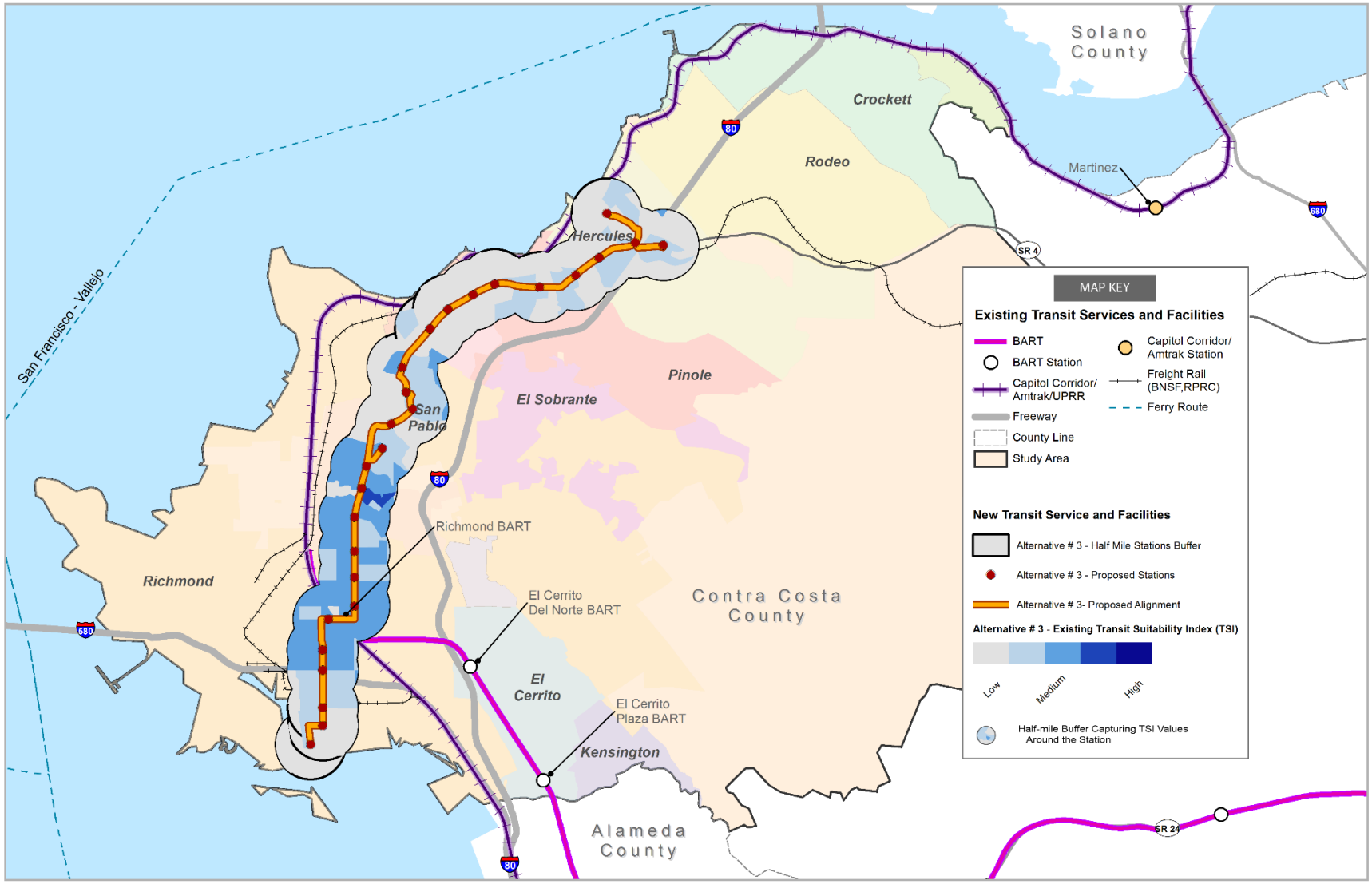
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-4: Alternative 2. San Pablo Avenue/ Macdonald Avenue BRT 2040 Transit Suitability (TSI) Half Mile Capture Zone



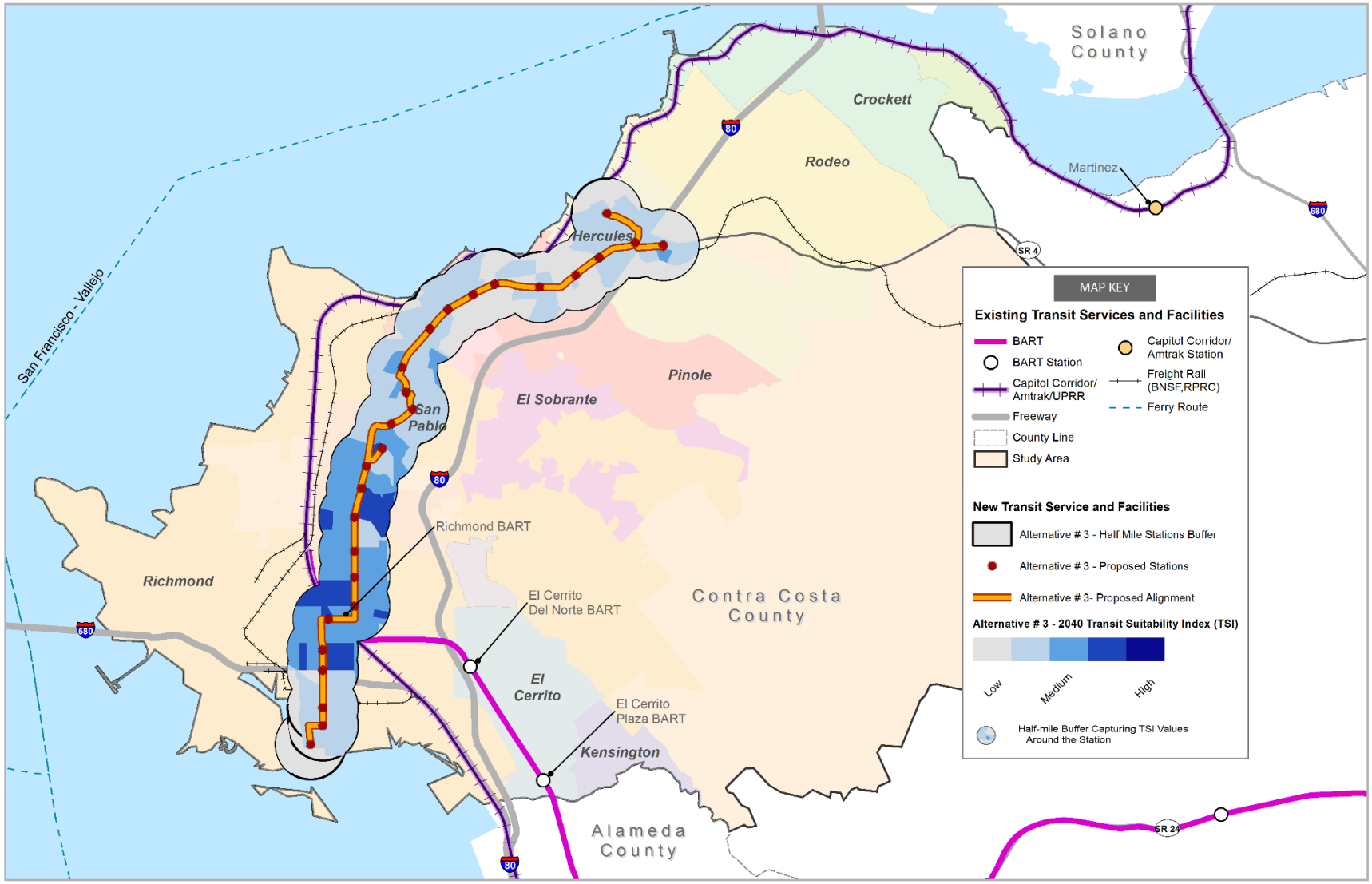
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-5: Alternative 3. 23rd Street BRT Existing Transit Suitability (TSI) Half Mile Capture Zone



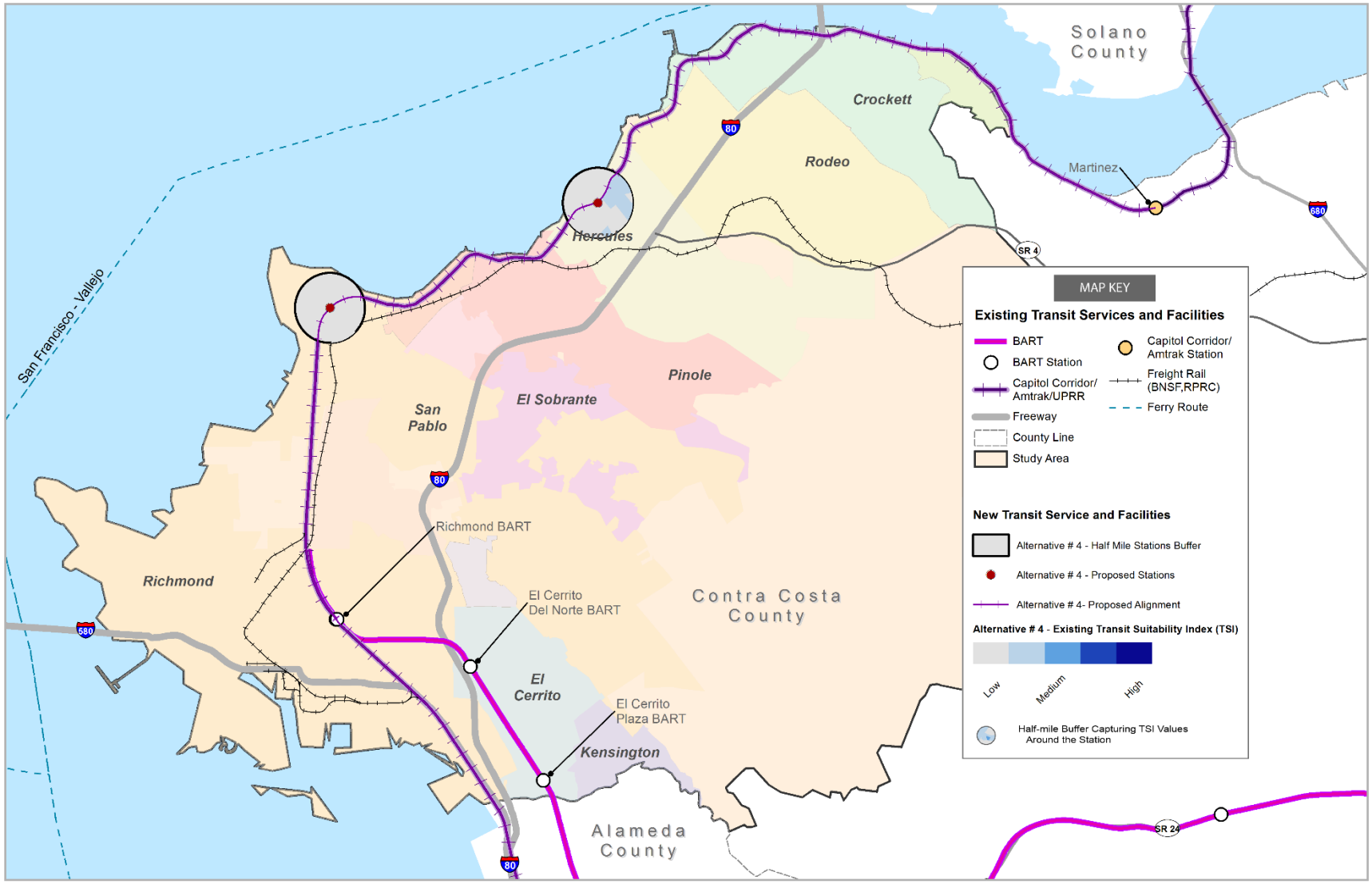
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-6: Alternative 3. 23rd Street BRT 2040 Transit Suitability (TSI) Half Mile Capture Zone



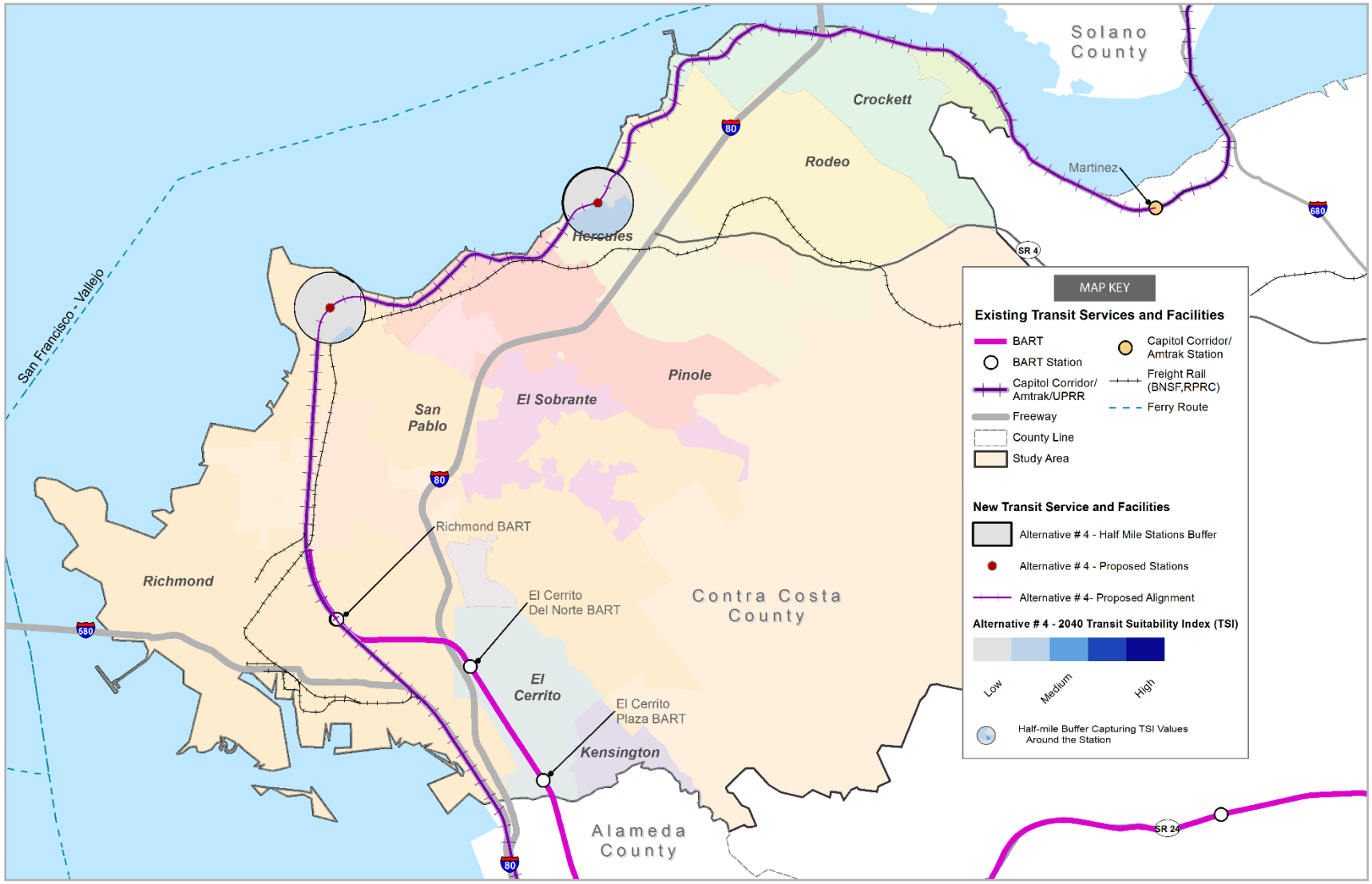
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-7: Alternative 4. UPRR Corridor Commuter Rail Existing Transit Suitability (TSI) Half Mile Capture Zone



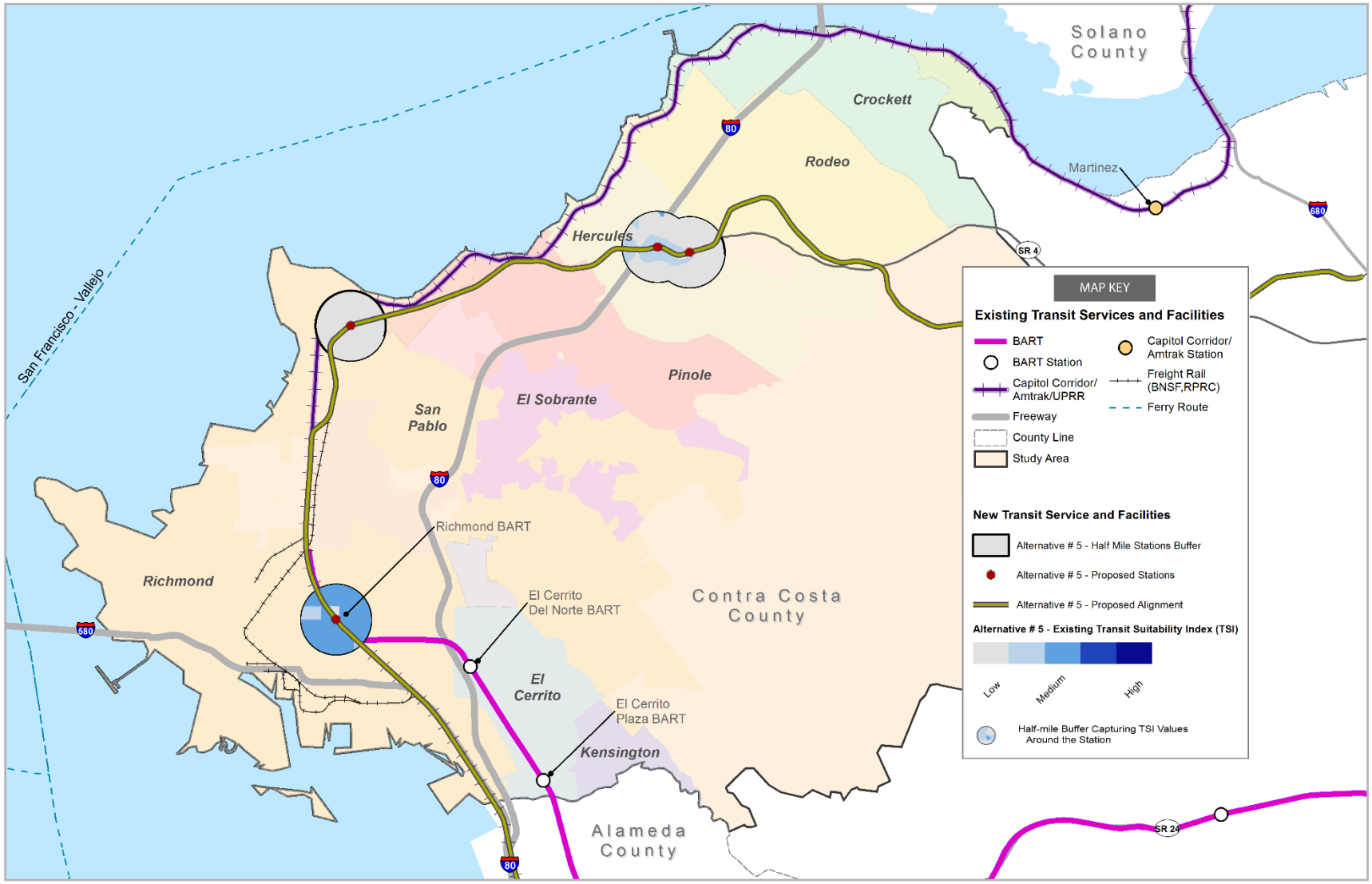
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-8: Alternative 4. UPRR Corridor Commuter Rail 2040 Transit Suitability (TSI) Half Mile Capture Zone



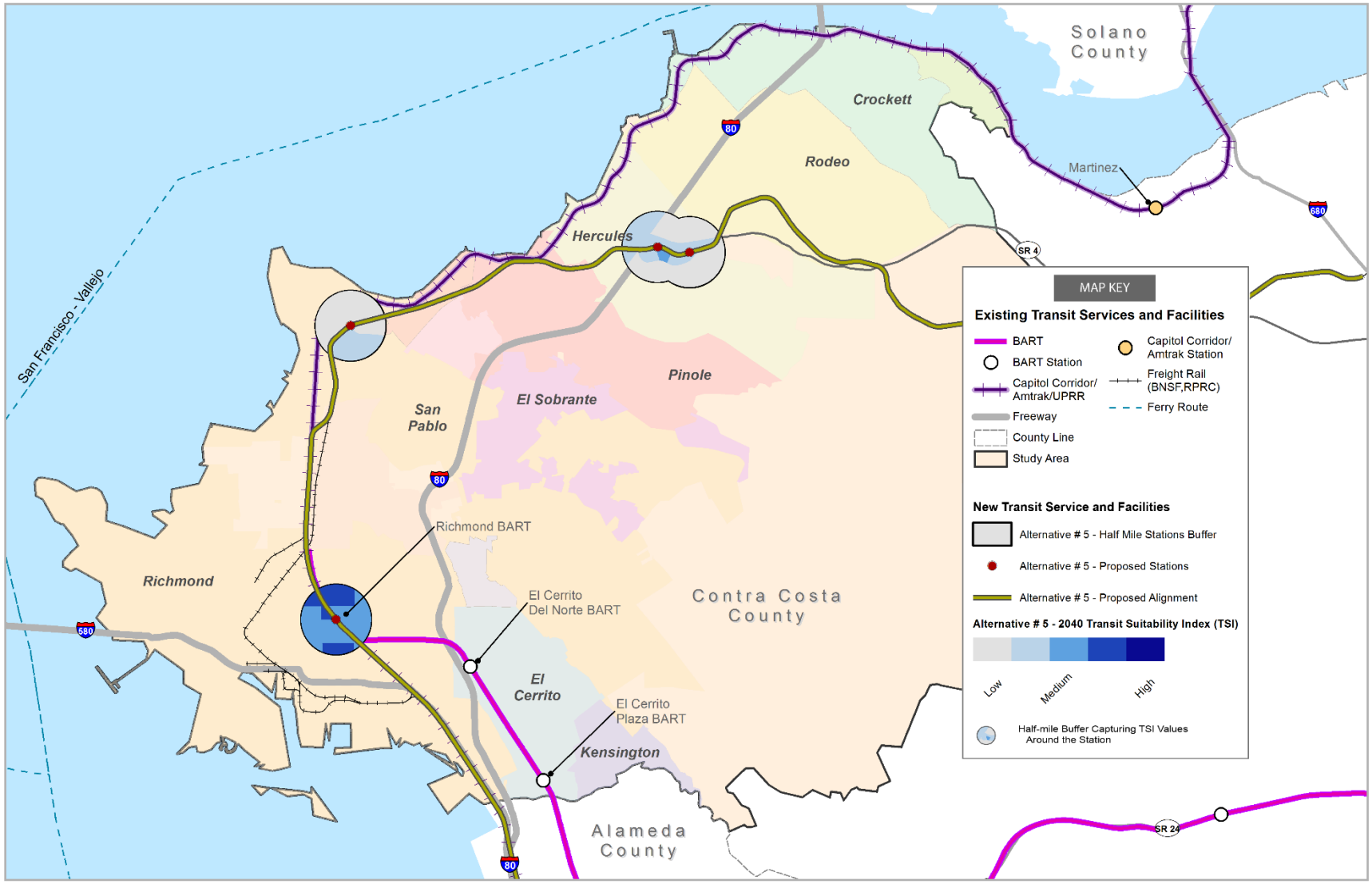
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-9: Alternative 5. UPRR-BNSF Corridor Commuter Rail Existing Transit Suitability (TSI) Half Mile Capture Zone



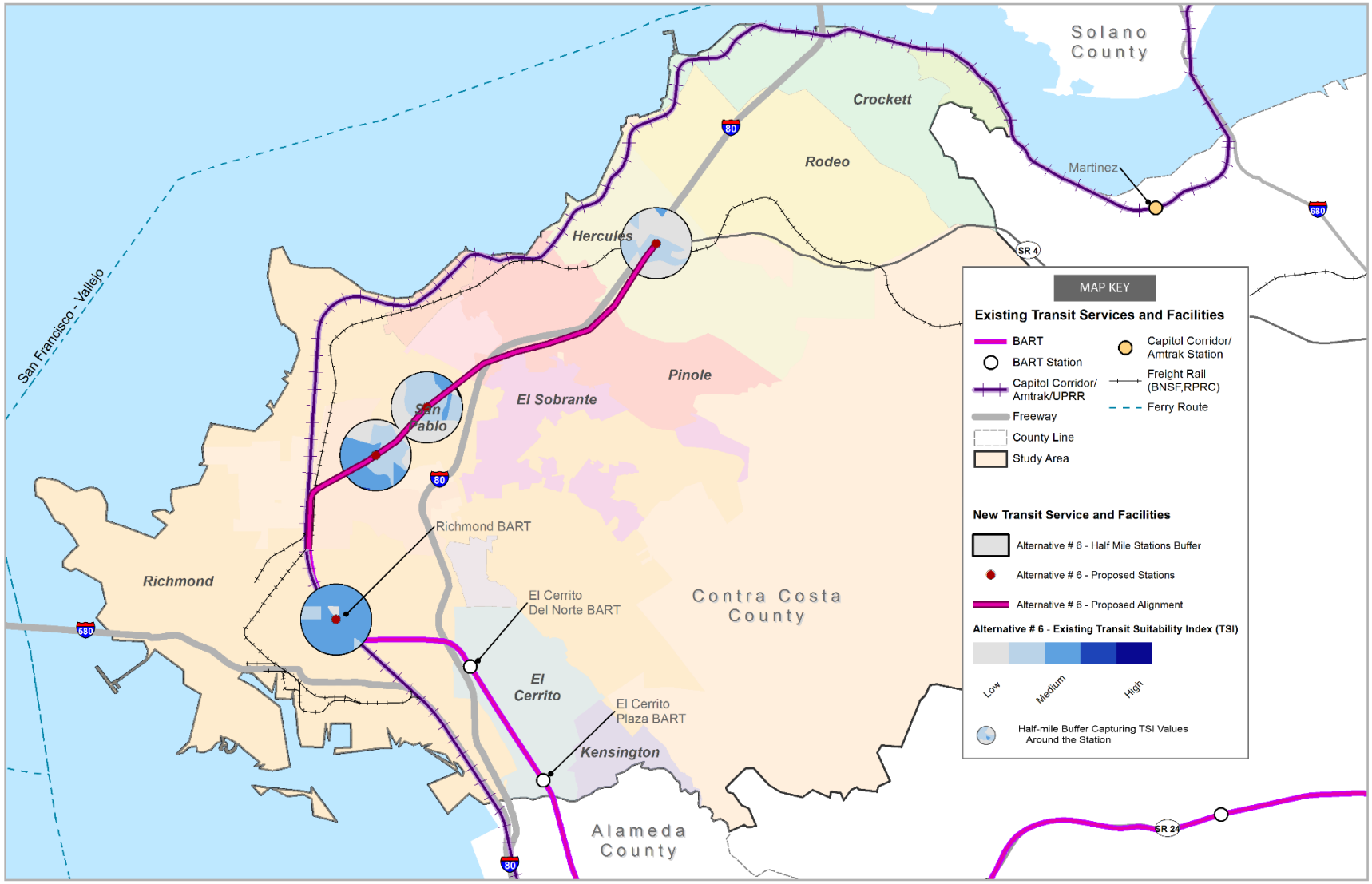
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-10: Alternative 5. UPRR-BNSF Corridor Commuter Rail 2040 Transit Suitability (TSI) Half Mile Capture Zone



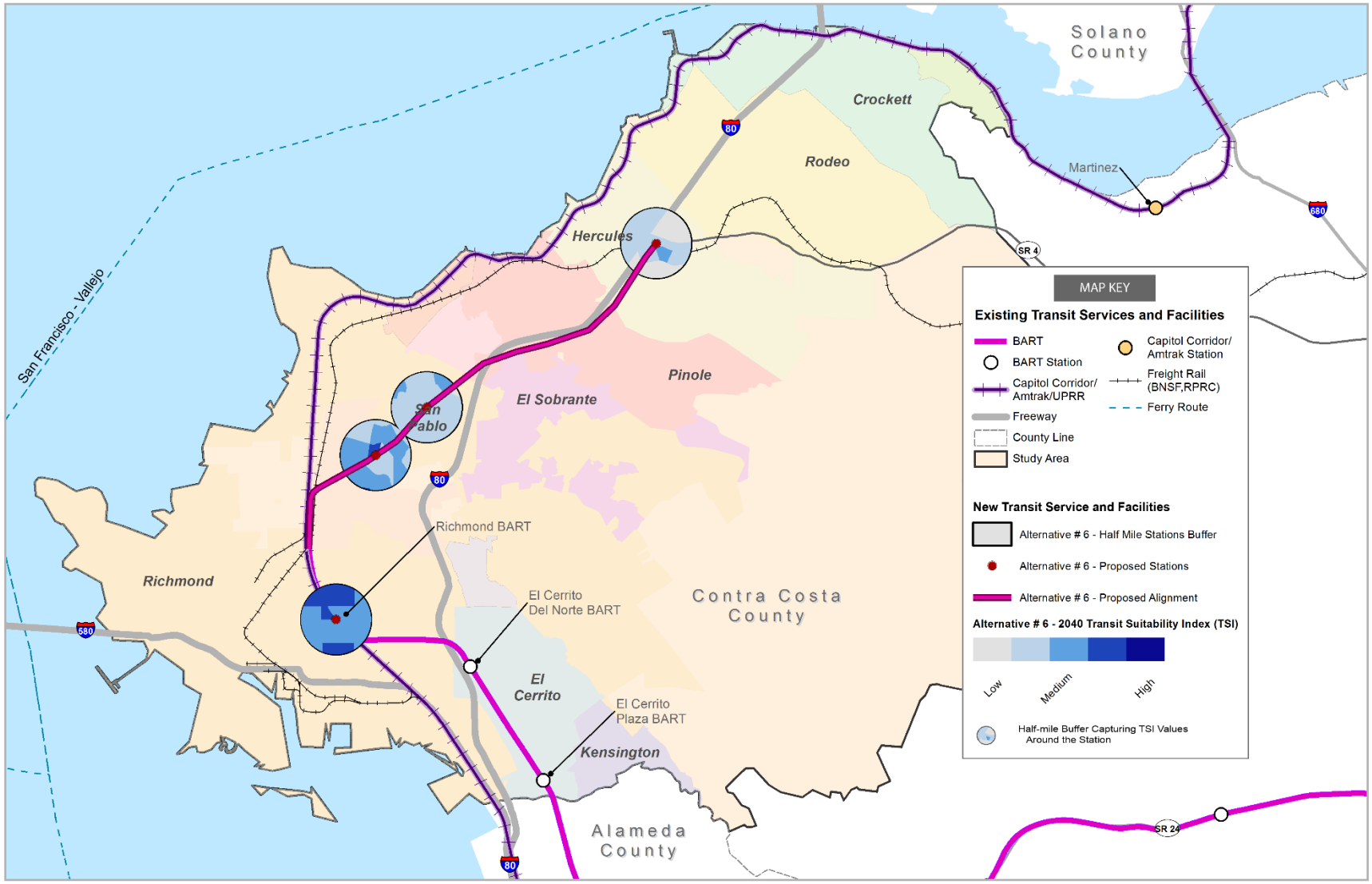
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-11: Alternative 6. BART Extension from Richmond Station to Hercules Existing Transit Suitability (TSI) Half Mile Capture Zone



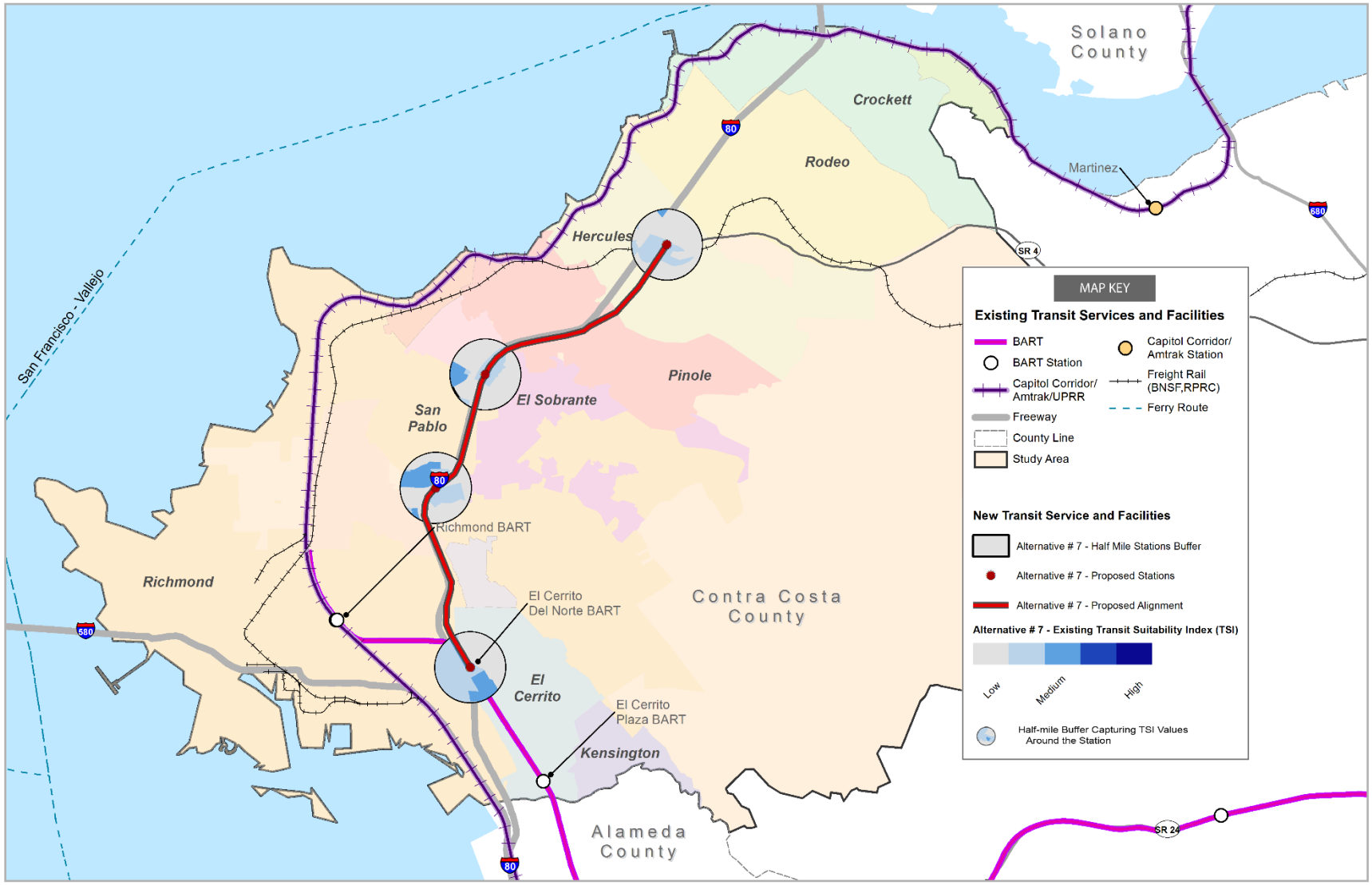
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-12: Alternative 6. BART Extension from Richmond Station to Hercules 2040 Transit Suitability (TSI) Half Mile Capture Zone



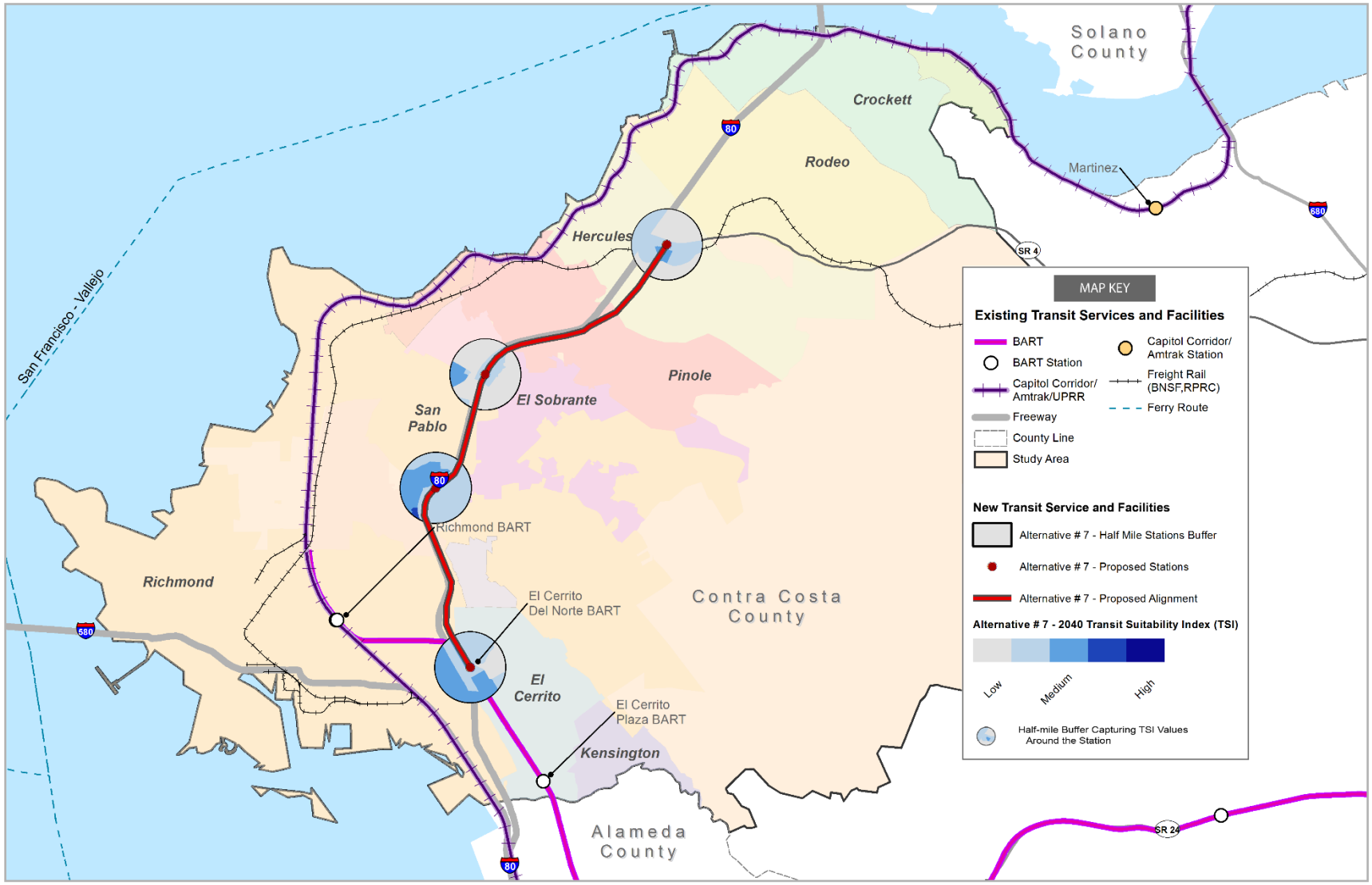
Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-13: Alternative 7. BART Extension from El Cerrito del Norte Station to Hercules Existing Transit Suitability (TSI) Half Mile Capture Zone



Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

Figure B-14 Alternative 7. BART Extension from El Cerrito del Norte Station to Hercules 2040 Transit Suitability (TSI) Half Mile Capture Zone



Source: WSP|Parsons Brinckerhoff and Kimley-Horn, 2015

APPENDIX C

Environmental Reconnaissance

APPENDIX C

Environmental Reconnaissance

PURPOSE OF THIS TECHNICAL MEMORANDUM

The purpose of this technical memorandum is to present findings of the Step 1 evaluation of the alternatives from an environmental perspective. This screening was based on a high level environmental reconnaissance of the alternatives and the application of the criteria developed for consistency with federal funding eligibility. This appendix documents in greater detail the environmental factors that were considered under each of the five environmental objectives identified and presented in Technical Memorandum #9.

GOAL #4 – PROTECT AND ENHANCE THE ENVIRONMENT AND MAINTAIN A HIGH QUALITY OF LIFE

There are five objectives under Goal #4, each with a corresponding evaluation criterion. A high-level environmental scan was conducted to identify potential impacts on neighborhoods and the natural environment to assess how well investment alternatives achieve the following objectives:

Objective 4a: Avoid Impacts to Natural and Cultural Resources;

Objective 4b: Improve Air Quality and Reduce Greenhouse Gas (GHG) Emissions;

Objective 4c: Reduce Energy Demand;

Objective 4d: Consider Risks of Sea Level Rise and Climate Change; and

Objective *4e: Compatibility with Local Plans and Policies.*

METHODOLOGY

Objective 4a: Avoid Impacts to Natural and Cultural Resources

A scan of readily available information such as mapping in regard to the San Francisco Bay Delta watershed, U.S. Environmental Protection Agency cleanup sites, earthquake hazards, and disadvantaged communities as well as land use designations from city and county general plans was conducted. This review was used to determine any potential impacts from the implementation of the alternatives.

Alternatives that could adversely affect the natural environment, cultural and historic resources, and communities are rated lower than those with limited or no major impacts.

Objective 4b: Improve Air Quality and Reduce GHG Emissions and Objective 4c: Reduce Energy Demand

The alternatives have the potential to reduce vehicle miles of travel (VMT), which in turn would reduce air pollutant and GHG emissions as well as reduce energy use. During this Step 1 screening, VMT estimates were not quantified. A rating was based on information available from other studies in regard to trip length, mode capacity, and ridership. Quantitative estimates of each alternative's effects on regional VMT will be obtained from the Countywide Travel Demand Model for Step 2 screening.

Objective 4d: Consider Risks of Sea Level Rise and Climate Change

Investment in facilities that could be damaged by flooding or be partially submerged by rising bay tides is a risk. A Sea Level Rise Screening Level Tool from the National Oceanic and Atmospheric Administration Office of Coastal Management was used to identify low-lying areas within the corridors of the alternatives.[8] A sea level rise of 5 feet was assumed in the analysis. This was based on a set of scenarios prepared for the California Energy Commission's Public Interest Energy Research Climate Change Research Program that projected mean sea level along the California coast would rise from 1.0 to 1.4 meters by the year 2100.[9] The higher value of 1.4 meters was used, which translates to 4.6 feet and was rounded up for this analysis Ratings were based on the amount of low-lying areas and the vulnerability of an alternative being a poor long-term investment.

It should be noted that this is a screening level exercise and it is unknown at this time if any of the existing roadways or rail tracks have been modified or are planned to be modified to protect against inundation with the projected rise in sea level.

Objective 4e: Compatibility with Local Plans and Policies.

Compatibility with local plans and policies was determined by examining an alternative's general consistency with local jurisdictions' blueprints for development and transportation strategies.

EVALUATION SCALE (RATING OF ALTERNATIVES)

The proposed system for rating the performance of the alternatives under consideration is proposed to be a five-point scale, as shown below.

[8] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December.

[9] Cayan, D., M. Tyree, M. Dettinger, H. Hidalgo, T. Das, E. Maurer, P. Bromirski, N. Graham, and R. Flick. 2009. Climate Change Scenarios and Sea Level Rise Estimates for California 2008 Climate Change Scenarios Assessment. California Climate Change Center. CEC500-2009-014-

Evaluation Scale:

○ ◔ ◑ ◕ ●

Lower Performing ⟶ *Higher Performing*

ALTERNATIVE 1: EXPRESS BUS SERVICE

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not substantially change the visual character of the corridor. There would be some new High-Occupancy Vehicle (HOV) direct access ramps at two park-and-ride stops along I-80. Structured parking is proposed at the most highly utilized park-and-ride facilities, Richmond Parkway and Hercules Transit Centers.

Evaluation Rating: ◕

Agriculture Resources

There are no agricultural lands present in the project corridor and there would be no impacts to agricultural lands.[10]

Evaluation Rating: ●

Biological Resources

The corridor is fully developed, no sizable natural habitats remain, and no wetlands appear to be present within the construction area.[11] The project would be constructed along an existing freeway corridor and transitioning to developed urban roadways in Alameda County. Transitway improvements on Interstate 80 (I-80) would cross several creeks, but structures would not be widened. The two new park-and-ride lots at Richmond Parkway/Canal Boulevard and 23rd Street/Marina Bay Parkway do not have any water bodies in the vicinity. Creation of a new HOV connector near State Route (SR) 4/I-80 could potentially impact Refugio Creek. I-80 crosses the creek approximately 1,300 feet southeast of where I-80 and SR 4 intersect. A new HOV-only connector to I-80 southbound would be evaluated. This evaluation would need to consider possible impacts to the creek, depending how far the connector is extended.

Evaluation Rating: ◕

[10] Richmond General Plan 2030, adopted April 25, 2012 and Hercules General Plan, adopted September 22, 1998 with updates

[11] www.arcgis.com, San Francisco Bay Delta Watershed Map

Community Impacts

The alignment would be within three disadvantaged communities (I-580 east of Richmond Parkway, west of I-80 between McBryde Ave and El Portal Drive, and west of I-80 between Richmond Parkway and Appian Way)[12]. Further evaluation would be conducted as this alternative moves forward.

Evaluation Rating: ◕

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed primarily in the right-of-way of existing roadways and on land previously disturbed. While this area has been developed and is considered to have low to moderate sensitivity, there is potential for impact to archaeological and architectural historic resources where park-and-ride lots and station enhancements are proposed.

If this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the National Register of Historic Places (NRHP) and the California Register of Historical Places (CRHP).

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking, however, there are no unique geologic or seismic conditions associated with this alternative.[13]

Evaluation Rating: ◕

Hazards and Hazardous Materials

There appear to be two contamination sites within 1,000 feet of the alignment.[14] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding

[12] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

[13] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

[14] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

Transitway improvements on I-80 would cross creeks in areas that are fully developed. Encroachments or impacts on these bodies of water are not anticipated. The two new park-and-ride lots at Richmond Parkway/Canal Boulevard and 23rd Street/Marina Bay Parkway do not have any water bodies in the vicinity. Creation of a new HOV connector near SR 4/I-80 could potentially impact Refugio Creek, located 1,300 feet southeast of the I-80/SR 4 interchange, depending on how far the proposed improvements would extend. General construction activities could cause exposure and loosening of soils and subsurface materials, which could affect stormwater runoff into the creek, but this, would be minimized with the implementation of best management practices.

Evaluation Rating: ◕

Mineral Resources

No mineral resources are located within the area.[15]

Evaluation Rating: ●

Noise

Noise could potentially be reduced along the I-580 and I-80 corridors by shifting travel from private automobiles to transit, thereby reducing the anticipated increase in vehicle miles traveled (VMT) associated with new development in the surrounding areas.

Evaluation Rating: ●

Population/Housing

This alternative would support the growth strategies of the corridor cities. This alternative would not displace existing housing as improvements would be primarily within existing transportation corridor rights-of-way.

Evaluation Rating: ●

Public Services

There are four schools within 1,000 feet of the proposed alignment.[16] Fire and police protection, public facilities, and schools would not be impacted as this alternative would occur

[15] Contra Costa County General Plan, 2000.

[16] Google maps, www,google.com/maps

on fully developed land and would potentially reduce VMT within the corridor, thereby reducing the deleterious air quality and noise effects associated with increases in VMT.

Evaluation Rating: ●

Recreation/Open Space

The Rolling Hills Memorial Park cemetery, which covers a large open area, touches I-880 near Hilltop Drive. The alternative would not impact the cemetery as the transitway improvements would be constructed within existing right-of-way along I-80.

Evaluation Rating: ●

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. No Section 4(f) resources would affected by this alternative.

Evaluation Rating: ●

Transportation/Traffic

The Express Bus Alternative would have a positive impact on transportation as it would result in modal shifts and mitigate projected increases in VMT. Individual intersections near proposed park-and-ride lots may experience increases in travel demand and an increase in delays. There may be temporary traffic disruptions during construction throughout the alignment, particularly at the location where the new freeway access ramps are proposed.

Evaluation Rating: ◕

Utilities/Service Systems

Existing utilities would be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ●

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◕
Agriculture Resources	●
Biological Resources	◕
Community Impacts	◕
Cultural Resources	◕
Geology/Soils	◕
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	●
Noise	●
Population/Housing	●
Public Services	●
Recreation	●
Section 4(f)	●
Transportation/Traffic	◕
Utilities/Services Systems	●
Overall Rating Average	●

Criteria 4b: Improve Air Quality; Reduce Greenhouse Gas (GHG) Emissions

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). VMT reductions vary with the amount of automobile users that are shifted to transit and the length of the new trip on transit. This alternative would potentially decrease regional emissions by a substantial amount. The express bus trips would tend to be longer in nature compared to the BRT alternatives as this alternative would attract automobile drivers away from using I-80 for long distance trips to Berkeley, Emeryville, and Oakland. There could be an increase in localized pollutants near the new park-and-ride lots, but overall this alternative would perform well from an air quality standpoint. Construction emissions would occur, but could be reduced by using best management practices.

Evaluation Rating: ◕

Criteria 4c: Reduce Transportation Energy Demand

This alternative would potentially decrease energy by a substantial amount for the same reasons discussed under Criteria 4.b above. This alternative would potentially decrease energy consumption on a per person basis as a single bus uses less fuel than 40 to 60 single occupant autos. Energy savings would not be as great as for BART alternatives because they have the

potential to carry a much larger number of passengers per train. As result, while VMT may be reduced and would perform well, the energy use reduction may not be as great as the BART alternatives.

Evaluation Rating: ◕

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

Approximately 44,000 feet along I-580 and the park-and-ride lot at Richmond Parkway and Canal Boulevard would be in a low-lying areas that have the potential to flood with a sea level rise of 5 feet.[17] This amounts to 22 percent of the proposed alignment. The park-and-ride lot at Meeker Avenue and 23rd Street/Marina Bay Parkway would not be in a low-lying area.

Evaluation Rating: ◑

Criteria 4e: Be Compatible with Local Plans and Policies

This alternative would not conflict with local land use plans and policies. This alternative would not result in conversion of existing land uses to transportation use provided structured parking is used along I-580 and at the Hercules Transit Center. The use of large surface parking lots would have a high cost of right-of-way for land acquisition and would be a less desirable land use.

Evaluation Rating: ●

Summary of Overall Ratings – Alternative 1

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural Resources	●
Criteria 4b – Air Quality	◕
Criteria 4c – Energy	◕
Criteria 4d – Sea Level and Climate Change	◑
Criteria 4e – Local Plans and Policies	●
Overall Rating Average	◕

[17] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December.

ALTERNATIVE 2: SAN PABLO AVENUE/MACDONALD AVENUE BRT

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not disturb or remove any scenic resources. New parking structures at Hilltop Mall and the Hercules Transit Center would be constructed, but this alternative would not substantially change the visual character of the corridor.

Evaluation Rating: ◕

Agriculture Resources

There are no agricultural lands present in the project corridor and there would be no impacts to agricultural lands.[18]

Evaluation Rating: ●

Biological Resources

The corridor is fully developed, no sizable natural habitats remain, and no wetlands appear to be present within the construction area.[19] The project would be constructed along existing roadways. San Pablo Avenue crosses several creeks, but it is not anticipated that widening would be needed for implementation of the BRT.

Evaluation Rating: ●

Community Impacts

This alignment would be in the vicinity of four disadvantaged communities (an area bounded by Cutting Boulevard, Richmond Parkway, 37th Street, and Roosevelt Avenue; west and east of the alignment from Humphrey Avenue to Robert Miller Drive, east of the alignment between Hilltop Drive and Shamrock Drive, and west of the alignment between Shamrock Drive and Crestview Drive).[20] Further evaluation would be conducted as this alternative moves forward.

Evaluation Rating: ◕

[18] Richmond General Plan 2030, adopted April 25, 2012 and Hercules General Plan, adopted September 22, 1998 with updates

[19] www.arcgis.com, San Francisco Bay Delta Watershed Map

[20] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed primarily within the right-of-way of existing roadways and on land previously disturbed. While this area has been developed and is considered to have low to moderate sensitivity, there is potential for impact to archaeological and architectural historic resources where station enhancements are proposed.

In the future if this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the NRHP and the CRHP.

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking[21], however, there are no unique geologic or seismic conditions associated with this alternative.

Evaluation Rating: ◕

Hazards and Hazardous Materials

There appear to be four contamination sites within 1,000 feet of the alignment.[22] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

The alignment would cross creeks in areas that are fully developed. Encroachments or impacts on these bodies of water are not anticipated. Construction activities may cause exposure and

[21] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

[22] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

loosening of soils and subsurface materials, which could affect stormwater runoff into the creeks, but this, would be minimized with the implementation of best management practices.

Evaluation Rating: ◕

Mineral Resources

No mineral resources are located within the area.[23]

Evaluation Rating: ●

Noise

Noise could potentially be reduced on Macdonald Avenue, San Pablo Avenue, and Richmond Parkway due to lower traffic volumes associated with modal shift. On San Pablo Avenue between I-80 and San Pablo Dam Road, there would be more of a buffer between nearby receptors and the vehicle traffic lanes, which could further reduce noise levels.

Evaluation Rating: ●

Population/Housing

This alternative would support the growth strategies of the corridor cities. This alternative would not displace existing housing as improvements would be primarily within existing transportation corridor rights-of-way.

Evaluation Rating: ●

Public Services

There are eight schools and one hospital within 1,000 feet of the proposed alignment.[24] Fire and police protection, public facilities, and schools would not be impacted as this alternative would occur on fully developed land and would reduce VMT within the corridor, thereby reducing the deleterious air quality and noise effect associated with increases in VMT.

Evaluation Rating: ●

Recreation/Open Space

Macdonald Avenue is adjacent to two parks (Nevin Park and Nicholl Park). This alternative would not impact recreational uses as the addition of a dedicated BRT lane would be located in the median and would not change the existing right-of-way.

Evaluation Rating: ●

[23] Contra Costa County General Plan, 2000

[24] Google maps, www,google.com/maps

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. No Section 4(f) resources would affected by this alternative.

Evaluation Rating: ●

Transportation/Traffic

This BRT Alternative would have a positive impact on transportation as it would result in modal shifts and mitigate projected increases in VMT. Implementing this alternative would, however, affect existing traffic flows along the alignment as traffic lanes would be taken for exclusive bus use. There would be limited availability of on-street parking along San Pablo Avenue between Del Monte Drive and Appian Way and potentially at stations. There may be temporary traffic disruptions during construction.

Evaluation Rating: ◑

Utilities/Service Systems

Existing utilities would be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ◕

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◕
Agriculture Resources	●
Biological Resources	●
Community Impacts	◕
Cultural Resources	◕
Geology/Soils	◕
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	●
Noise	●
Population/Housing	●
Public Services	●
Recreation	●
Section 4(f)	●
Transportation/Traffic	◑
Utilities/Services Systems	◕
Overall Rating Average	◕

Criteria 4b: Improve Air Quality; Reduce Greenhouse Gas (GHG) emissions

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). VMT reductions vary with the amount of automobile users that are shifted to transit and the length of the new trip on transit. While this alternative could attract a high amount of riders, the BRT-related trips would be a relatively short distance. For example, the average bus trip for AC Transit is a little less than four miles.[25] Even with a high level of new ridership, the decreases in VMT would be smaller than for rail or express bus alternatives and therefore this alternative would potentially improve regional air quality and GHG emissions by a relatively small amount. There could also be an increase in localized pollutants near the new park-and-ride lots. Construction emissions would occur, but could be reduced by using best management practices.

Evaluation Rating: ◔

[25] National Transit Database, 2013

Criteria 4c: Reduce Transportation Energy Demand

This alternative would potentially decrease energy by a relatively small amount for the same reasons discussed under Criteria 4b above.

Evaluation Rating: ◔

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

Approximately 8,000 feet of the alignment from Richmond Parkway to the Tewksbury Turnaround would be in a low-lying area that would flood with a sea level rise of 5 feet.[26] This amounts to 6 percent of the alignment.

Evaluation Rating: ◑

Criteria 4e: Be Compatible with Local Plans and Policies

This alternative would not conflict with local land use plans and policies. This alternative would support the growth strategies of the corridor cities and not require any additional land use as the improvements would be primarily within existing transportation corridor rights-of-way.

Evaluation Rating: ●

Summary of Overall Ratings – Alternative 2

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural resources	◕
Criteria 4b – Air Quality	◔
Criteria 4c – Energy	◔
Criteria 4d – Sea level and Climate Change	◕
Criteria 4e – Local Plans and Policies	●
Overall Rating Average	◑

[26] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December

ALTERNATIVE 3: 23RD STREET BRT

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not disturb or remove any scenic resources. New parking structures at Hilltop Mall and the Hercules Transit Center would be constructed, but this alternative would not substantially change the visual character of the corridor.

Evaluation Rating: ◕

Agriculture Resources

There are no agricultural lands present in the project corridor and there would be no impacts to agricultural lands.[27]

Evaluation Rating: ●

Biological Resources

The corridor is fully developed; no sizable natural habitats remain, and no wetlands appear to be present within the construction area.[28] The project would be constructed along existing roadways. 23rd Street and San Pablo Avenue cross a few creeks, but would not be widened.

Evaluation Rating: ●

Community Impacts

This alignment would be in the vicinity of three disadvantaged communities (a large area west and east of the alignment from Cutting Boulevard north to Robert Miller Drive, east of the alignment between Hilltop Drive and Shamrock Drive, and west of the alignment between Shamrock Drive and Crestview Drive).[29] Further evaluation would be conducted if this alternative moves forward.

Evaluation Rating: ◕

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed on the surface of existing streets and on land previously disturbed. While this area has been developed and is considered to have low to moderate sensitivity, there is potential for

[27] Richmond General Plan 2030, adopted April 25, 2012 and Hercules General Plan, adopted September 22, 1998 with updates

[28] www.arcgis.com, San Francisco Bay Delta Watershed Map

[29] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

impact to archaeological and architectural historic resources where station enhancements are proposed.

If this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the NRHP and the CRHP.

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking, however, there are no unique geologic or seismic conditions associated with this alternative.[30]

Evaluation Rating: ◕

Hazards and Hazardous Materials

There appears to be one contamination site within 1,000 feet of the alignment.[31] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

This alternative would cross creeks in areas that are fully developed. Encroachments or impacts on these bodies of water are not anticipated. Construction activities may cause exposure and loosening of soils and subsurface materials, which could affect stormwater runoff into the creeks, but this, would be minimized with the implementation of best management practices.

Evaluation Rating: ◕

[30] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

[31] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

Mineral Resources

No mineral resources are located within the area.[32]

Evaluation Rating: ●

Noise

Noise would likely be reduced from the proposed Richmond Ferry Terminal, along Marina Way, 23rd Street, and San Pablo Avenue due to lower traffic volumes. On 23rd Street between Macdonald Avenue and Roosevelt Avenue there would be less buffer between nearby receptors and the vehicle traffic lanes, which could increase noise levels.

Evaluation Rating: ◕

Population/Housing

This alternative would support the growth strategies of the corridor cities. This alternative would not displace existing housing as improvements would primarily be within existing transportation corridor rights-of-way.

Evaluation Rating: ●

Public Services

There are seven schools within 1,000 feet of the proposed alignment.[33] Fire and police protection, public facilities, and schools would not be impacted as this alternative would occur on fully developed land and would reduce VMT within the corridor, thereby reducing the deleterious air quality and noise effects associated with increases in VMT.

Evaluation Rating: ●

Recreation/Open Space

Hilltop Park is next to Robert Miller Drive. This alternative would not be expected to encroach into the park as improvements are within the public right-of-way, however, construction noise could have a temporary adverse impact on the use of the park.

Evaluation Rating: ●

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of

[32] Contra Costa County General Plan, 2000

[33] Google maps, www,google.com/maps

the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. No Section 4(f) resources would affected by this alternative.

Evaluation Rating: ●

Transportation/Traffic

This BRT Alternative would have a positive overall impact on transportation as it would result in modal shifts and mitigate projected increases in VMT. Implementing this alternative would, however, affect existing traffic flows along the alignment as traffic lanes would be taken for exclusive bus use; however, the benefits of transit such as a reduction in VMT would offset these impacts. There would be limited availability of on-street parking on 23rd Street between Macdonald Avenue and Roosevelt Avenue and potentially at stations. There may be temporary traffic disruptions during construction.

Evaluation Rating: ◑

Utilities/Service Systems

Existing utilities would be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ◕

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◕
Agriculture Resources	●
Biological Resources	●
Community Impacts	◕
Cultural Resources	◕
Geology/Soils	◕
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	●
Noise	◕
Population/Housing	●
Public Services	●
Recreation	●
Section 4(f)	●
Transportation/Traffic	◑
Utilities/Services Systems	◕
Overall Rating Average	◕

Criteria 4b: Improve Air Quality; Reduce Greenhouse Gas (GHG) Emissions

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). VMT reductions vary with the amount of automobile users that are shifted to transit and the length of the new trip on transit. While this alternative could attract a high amount of riders, the BRT-related trips would be a relatively short distance. As example, the average bus trip for AC Transit is a little less than four miles.[34] This assumption would result in a limited amount of decreased VMT and therefore this alternative would potentially improve regional air quality and GHG emissions by a relatively small amount. There could also be an increase in localized pollutants near the new park-and-ride lots. Construction emissions would occur, but could be reduced by using best management practices.

Evaluation Rating: ◔

Criteria 4c: Reduce Transportation Energy Demand

This alternative would potentially decrease energy use by a relatively small amount for the same reasons discussed under Criteria 4b above.

[34] National Transit Database, 2013

Evaluation Rating: ◔

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

Approximately 3,000 feet along Marina Way would be in a low-lying area that would be subject to flooding with a sea level rise of 5 feet.[35] This amounts to 4 percent of the alignment.

Evaluation Rating: ◕

Criteria 4e: Be Compatible with Local Plans and Policies

This alternative would not conflict with local land use plans and policies. This alternative would support the growth strategies of the corridor cities and not require any additional land use as the improvements would be primarily within existing transportation corridor rights-of-way.

Evaluation Rating: ●

Summary of Overall Ratings – Alternative 3

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural Resources	◕
Criteria 4b – Air Quality	◔
Criteria 4c – Energy	◔
Criteria 4d – Sea level and Climate Change	◕
Criteria 4e – Local Plans and Policies	●
Overall Rating Average	◑

ALTERNATIVE 4: UPRR CORRIDOR COMMUTER RAIL

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not disturb or remove any scenic resources. The addition of a third track between Oakland and Martinez would most likely require widening of bridges and some trenching or a tunnel at Jack London Square in Oakland. The tunnel and pedestrian overpass has the potential to alter the visual character of a corridor in this area.

Evaluation Rating: ◑

[35] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December

Agriculture Resources

There are no agricultural lands present in the project corridor and there would be no impacts to agricultural lands.[36]

Evaluation Rating: ●

Biological Resources

This corridor currently runs through three regional shoreline parks, but would not cross any wetlands in these areas.[37] Because the rail line is within 100 feet of the bay shoreline in various places, a permit for improvements would be required from the San Francisco Bay Conservation and Development Commission and they would likely require mitigation. While the existing right-of-way has no natural habitats, construction could affect nesting birds if there are any in the vicinity of the project. Drainage facilities would need to be extended or widened at several creeks, which could affect special status species. In addition, the required extension from Richmond to Oakland would require 20-30 feet of additional right-of-way between Grand Avenue and 65th Street. This area would need to be further evaluated for biological resources.

Evaluation Rating: ◕

Community Impacts

The alignment, including an extension to Oakland, would be in the vicinity of five disadvantaged communities (west of the alignment from Park Avenue to Powell Street in Oakland and Emeryville, west and east of the alignment between University Avenue and Buchanan Street in Berkeley, the Contra Costa/Alameda County boundary to Richmond Parkway, south of the alignment from Parker Avenue to California Street in Rodeo, and from the Carquinez Strait Regional Shoreline Park to the Martinez Amtrak Station).[38] Further evaluation would be conducted if this alternative moves forward.

Evaluation Rating: ◕

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed on land previously disturbed and used for rail uses. However, additional right-of-way would be required for track expansion in the vicinity of the Emeryville/Oakland border.

[36] Richmond General Plan 2030, adopted April 25, 2012, Hercules General Plan, adopted September 22, 1998 with updates, Pinole General Plan, adopted 2010, and Contra Costa County General Plan, 2000

[37] www.arcgis.com, San Francisco Bay Delta Watershed Map

[38] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

While the corridor has been disturbed and is considered to have low to moderate sensitivity, there is potential for impact to archaeological and architectural historic resources. The addition of a third track would potentially bring rail service closer to historic properties, and the railroad itself has the potential to be eligible for the NRHP and the CRHR.

In the future if this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the NRHP and the CRHP.

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking[39], however, there are no unique geologic or seismic conditions associated with this alternative. Construction could result in soil erosion from excavation and grading activities.

Evaluation Rating: ◕

Hazards and Hazardous Materials

There appear to be four contamination sites within 1,000 feet of the alignment in Richmond.[40] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

Construction activities may cause exposure and loosening of soils and subsurface materials, which could affect stormwater runoff into the creeks. Impact would be minimized through the implementation of best management practices. Drainage facilities would need to be extended or widened at five creeks in Pinole and Richmond.

[39] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

[40] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

Evaluation Rating: ◕

Mineral Resources

Shale has been mined in Port Costa over the years by various companies as mentioned in the Contra Costa County General Plan.[41] The closest activity has been about 800 feet away from the railroad tracks in this area and would not be affected by this alternative.

Evaluation Rating: ◕

Noise

This alternative would generate eight additional commuter trains per day, which may have noise impacts depending on what time they occur. There is the potential for increased noise levels at nearby residences and public facilities during construction and operation.

Evaluation Rating: ◑

Population/Housing

This alternative would support growth strategies of the corridor cities. This alternative would require a third track between Oakland and Martinez, which would require an additional 20-30 feet of right-of-way between West Grand Ave in Oakland and 65th Street in Emeryville. This has the potential to displace existing land uses.

Evaluation Rating: ◕

Public Services

There are two schools and a library within 1,000 feet of the proposed alignment.[42] Fire and police protection would not be impacted as this alternative would occur on fully developed land and would not affect traffic in these areas as they are not near stations. There is the potential for increased noise levels at the nearby schools and library during construction and operation.

Evaluation Rating: ◑

Recreation/Open Space

The alignment runs through three regional parks and goes near several additional parks.[43] This alternative should not substantially affect recreational uses as the additional eight commuter trains per day would occur within an existing rail corridor. There would be the potential for additional train noise as the frequency of trains would increase in the corridor.

[41] Contra Costa County General Plan, 2000

[42] Google maps, www,google.com/maps

[43] Google maps, www,google.com/maps

Evaluation Rating: ◕

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. This alternative could be subject to Section 4(f). Further evaluation of publicly owned parks, historic or archaeological resources, and wildlife refuges is needed to confirm the potential 4(f) impact.

Evaluation Rating: ◑

Transportation/Traffic

This Alternative would have a positive impact on transportation as it would result in modal shifts and mitigate projected increases in VMT. Individual intersections near a new Hercules Intermodal Transit Center may experience increased congestion. There may be temporary traffic disruptions during construction.

Evaluation Rating: ◕

Utilities/Service Systems

Existing utilities will be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ●

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◑
Agriculture Resources	●
Biological Resources	◕
Community Impacts	◕
Cultural Resources	◕
Geology/Soils	◕
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	◕
Noise	◑
Population/Housing	◕
Public Services	◑
Recreation	◕
Section 4(f)	◑
Transportation/Traffic	◕
Utilities/Services Systems	●
Overall Rating Average	◕

CRITERIA 4B: IMPROVE AIR QUALITY; REDUCE GREENHOUSE GAS (GHG) EMISSIONS

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). This alternative would potentially decrease regional emissions by a moderate amount overall. The average trip length is expected to be the longest of any of the alternatives. The Altamont Corridor Express (ACE) and Caltrain trains have trip lengths of approximately 45 and 22 miles, respectively.44 However, this alternative has the potential to attract a low to moderate amount of new riders due to the fact that service would be limited and would have less direct access to employment centers.

The following items would result in some limited increases in air pollutants and would reduce the benefit of this alternative by a small amount. The use of commuter trains would introduce some new air criteria pollutants, air toxics, and GHG emissions. Implementation of this alternative would potentially attract local traffic to the existing rail stations (Richmond and

[44] National Transit Database, 2013

Martinez) and new stations in Richmond at Atlas Road and Hercules, which could increase localized congestion and traffic delays. This could create an increase in localized pollutants. Construction emissions would occur, but could be reduced by using best management practices.

Evaluation Rating: ◑

Criteria 4c: Reduce Transportation Energy Demand

This alternative would potentially decrease energy use by a moderate amount for the reasons discussed in Criteria 4b above.

Evaluation Rating: ◑

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

The rail line runs along the shoreline between Point Pinole to Martinez. This area currently floods during winter storm events and would become more susceptible to frequent flooding with sea level rise (assuming a rise of 5 feet), especially the areas around Pt Pinole Regional Park, San Pablo Bay Regional Park, near Rodeo Creek, the Crockett waterfront, and Martinez. The alignment has the potential for extension to Oakland, which could occur in a couple of low-lying areas in the Jack London/West Oakland area and the Contra Costa/Alameda County Boundary Area.

Approximately 109,000 linear feet or nearly 21 miles of the alignment would be in low-lying areas that would flood with a sea level rise of 5 feet.[45] This amounts to 62 percent of the alignment.

Evaluation Rating: ○

Criteria 4e: Be Compatible with Local Plans and Policies

This alternative could require a third track between Oakland and Martinez, which would require an additional 20-30 feet of right-of-way between West Grand Ave in Oakland and 65th Street in Emeryville. This acquisition may not be compatible with land use elements of the general plans of these cities. This alternative would be consistent with circulation elements of the Richmond and Hercules general plans in that it supports regional connectivity and the expansion of transit services at the planned Hercules Intermodal Transit Center. This alternative would exceed the negotiated capacity allowed by UPRR and would require new negotiated track rights to implement.

[45] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December

Evaluation Rating: ◑

Summary of Overall Ratings – Alternative 4

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural resources	◕
Criteria 4b – Air Quality	◑
Criteria 4c – Energy	◑
Criteria 4d – Sea Level and Climate Change	○
Criteria 4e – Local Plans and Policies	◑
Overall Rating Average	◑

ALTERNATIVE 5: UPRR-BNSF CORRIDOR COMMUTER RAIL

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not disturb or remove any scenic resources. The addition of a third track between Oakland and Martinez would most likely require widening of bridges and some trenching or a tunnel at Jack London Square in Oakland. The tunnel and pedestrian overpass has the potential to alter the visual character of a corridor in this area.

Evaluation Rating: ◑

Agriculture Resources

There is agricultural and open space east of I-80 to Alhambra Avenue in Martinez, including the Briones Hills Agricultural Preservation Area.[46] Since construction would predominately occur within the existing right-of-way, there would be no substantial impacts to agricultural lands.

Evaluation Rating: ◕

Biological Resources

The corridor from Richmond to Hercules is largely developed with residential and commercial/industrial land uses with most of the corridor east being agricultural and open space.[47] The alignment would cross several creeks, but would not cross any wetlands. The San Pablo Creek Bridge would need to be widened and the box culvert at Wild Creek would need to be extended, which could affect special status species. Construction could affect biological resources such as nesting birds, special status species or the removal of trees and vegetation. In

[46] Contra Costa County General Plan, 2000

[47] www.arcgis.com, San Francisco Bay Delta Watershed Map

addition, the required extension from Richmond to Oakland would require 20-30 feet of additional right-of-way between West Grand Ave and 65th Street. This area would need to be further evaluated for biological resources.

Evaluation Rating: ◑

Community Impacts

The alignment, including an extension to Oakland, would be in the vicinity of five disadvantaged communities (west of the alignment from Park Avenue to Powell Street in Oakland and Emeryville, west and east of the alignment between University Avenue and Buchanan Street in Berkeley, the Contra Costa/Alameda County boundary to Richmond Parkway, south of the alignment from Heather Drive to Crestview Drive in Rodeo, and north of the alignment from Vista Way to Howe Road).[48] Further evaluation would be conducted as this alternative moves forward.

Evaluation Rating: ◕

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed on land previously disturbed and used for rail uses. However, additional right-of-way would be required for track expansion in the vicinity of the Emeryville/Oakland border. While the corridor has been disturbed and is considered to have low to moderate sensitivity, there is potential for impact to archaeological and architectural historic resources. The addition of a third track would potentially bring rail service closer to historic properties, and the railroad itself has the potential to be eligible for the NRHP and the CRHP.

In the future if this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the NRHP and the CRHP.

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking, however, there are no unique geologic or seismic conditions

[48] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

associated with this alternative. Construction could result in soil erosion from excavation and grading activities.[49]

Evaluation Rating: ◕

Hazards and Hazardous Materials

There appear to be five contamination sites within 1,000 feet of the alignment in Richmond.[50] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

The San Pablo Creek Bridge would need to be widened and the box culvert at Wild Creek would need to be extended. Construction activities may cause exposure and loosening of soils and subsurface materials, which could affect stormwater runoff into the creeks. Impact would be minimized through the implementation of best management practices.

Evaluation Rating: ◕

Mineral Resources

No mineral resources are located within the area.[51]

Evaluation Rating: ●

Noise

This alternative would introduce eight new commuter trains per day in areas not currently experiencing passenger train noise. There is the potential for increased noise levels at nearby residences and schools during construction and operation.

Evaluation Rating: ◑

Population/Housing

This alternative would support growth strategies of Richmond and Hercules; however, the extension would go through relatively undeveloped areas east of Hercules. The City of Martinez

[49] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

[50] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

[51] Contra Costa County General Plan, 2000

planning documents focus on the Downtown area and Transit Oriented Development. This alternative could require a third track between Oakland and Martinez, which would require an additional 20-30 feet of right-of-way between West Grand Ave in Oakland and 65th Street in Emeryville.

Evaluation Rating: ◑

Public Services

There are two schools within 1,000 feet of the proposed alignment.[52] Fire and police protection, and public facilities would not be impacted as this alternative would occur on fully developed land and would not affect traffic in these areas as they are not near stations. There is the potential for increased noise levels at the nearby schools during construction and operation.

Evaluation Rating: ◕

Recreation/Open Space

This alignment goes near several parks, golf courses, and cemeteries. This alternative should not substantially affect recreational uses as the additional eight commuter trains per day would occur within an existing freight rail corridor. There would be the potential for additional train noise as the frequency of trains would increase in the corridor.

Evaluation Rating: ◕

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. This alternative could be subject to Section 4(f) due to the countryside east of Hercules, public parks, and possible historic resources related to the rail line. Further evaluation is needed.

Evaluation Rating: ◑

Transportation/Traffic

Individual intersections near proposed new stations (Atlas Road in Richmond and Muir and Pacheco in Martinez) and at the Hercules Transit Center may experience increased congestion. There may be temporary traffic disruptions during construction.

Evaluation Rating: ◑

[52] Google maps, www,google.com/maps

Utilities/Service Systems

Existing utilities will be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ●

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◑
Agriculture Resources	◕
Biological Resources	◑
Community Impacts	◕
Cultural Resources	◕
Geology/Soils	◕
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	●
Noise	◑
Population/Housing	◑
Public Services	◕
Recreation	◕
Section 4(f)	◑
Transportation/Traffic	◑
Utilities/Services Systems	●
Overall Rating Average	◕

Criteria 4b: Improve Air Quality; Reduce Greenhouse Gas (GHG) Emissions

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). This alternative would potentially decrease regional emissions by a moderate amount overall. The average trip length is expected to be the longest of any of the alternatives. The Altamont Corridor Express (ACE) and Caltrain trains have trip lengths of approximately 45 and 22 miles, respectively.53 However, this alternative has the potential to attract a low to moderate amount of new riders due to the fact that service would be limited and would have less direct access to employment centers.

The use of commuter trains would introduce some new air criteria pollutants, air toxics, and GHG emissions, thereby reducing the benefit of this alternative. Implementation of this

[53] National Transit Database, 2013

alternative would potentially attract local traffic to the existing Richmond rail station and the new stations proposed in Richmond, Hercules, and Martinez, which could increase localized congestion and traffic delays. This could create an increase in localized pollutants. Construction emissions would occur, but could be reduced by using best management practices.

Evaluation Rating: ◑

Criteria 4c: Reduce Transportation Energy Demand

This alternative Criteria 4b above.

Evaluation Rating: ◑

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

There is a segment of the corridor just west of Garrity Creek that would flood with a sea level rise of 5 feet. The alignment has the potential for extension to Oakland, which could experience sea level rise inundation with a 5 feet rise in a couple of low-lying areas in Jack London/West Oakland and the Contra Costa/Alameda County boundary.

Approximately 31,000 feet of the alignment would be in low-lying areas that would flood with a sea level rise of 5 feet.[54] This amounts to 17 percent of the alignment.

Evaluation Rating: ◔

Criteria 4e: Be compatible with local plans and policies

This alternative could require a third track between Oakland and Richmond, which would require an additional 20-30 feet of right-of-way between West Grand Ave in Oakland and 65th Street in Emeryville. This acquisition may not be compatible with land use elements of the general plans of these cities. City of Martinez planning documents, including the draft General Updates due to be finalized in 2016, focus on the downtown area and Transit Oriented Development. Their Transportation Element discusses developing the existing Amtrak station as a multi-modal terminal to provide facilities for both local and intercity transit services.[55] The addition of stations at Muir Station Road and Pacheco Boulevard may is not consistent with city strategies. This alternative would exceed the negotiated capacity allowed by UPRR and would require new negotiated track right to implement.

Evaluation Rating: ◑

[54] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December.

[55] Draft City of Martinez General Plan 2035, September 2015

Summary of Overall Ratings – Alternative 5

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural Resources	◕
Criteria 4b – Air Quality	◑
Criteria 4c – Energy	◑
Criteria 4d – Sea Level and Climate Change	◔
Criteria 4e – Local Plans and Policies	◑
Overall Rating Average	◑

ALTERNATIVE 6: BART EXTENSION FROM RICHMOND STATION TO HERCULES

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not disturb or remove any scenic resources. Aerial structures would be placed along the majority of the alignment and could be obtrusive. This alternative could potentially introduce new sources of light and glare along the trackway and at the proposed stations potentially impacting adjacent commercial and residential properties. The impact of lighting glare can be minimized by appropriate design, intensity, and hardware specifications.

Evaluation Rating: ◑

Agriculture Resources

There are no agricultural lands present in the project corridor and there would be no impacts to agricultural lands.[56]

Evaluation Rating: ●

Biological Resources

The corridor is largely developed with residential and commercial/industrial uses, open areas along I-80, and no wetlands appear to be present.[57] The alignment would cross Wildcat, San Pablo, Pinole and Refugio Creeks on an aerial structure. Alternative specificity is not available at this time to determine potential impacts to Hilltop Lake and Park. Construction could affect biological resources such as nesting birds, special status species or the removal of trees and vegetation.

[56] Richmond General Plan 2030, adopted April 25, 2012 and Hercules General Plan, adopted September 22, 1998 with updates

[57] www.arcgis.com, San Francisco Bay Delta Watershed Map

Evaluation Rating: ◕

Community Impacts

The alignment would be in the vicinity of two disadvantaged communities (from the Richmond Bart Station to Robert Miller Road and west of the alignment from Richmond Parkway to Appian Way).[58] The housing along 13th Street/Rumrill Boulevard serves lower income families and could have environmental issues.

Evaluation Rating: ◑

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed primarily on land previously disturbed. While this area has been developed and is considered to have low to moderate sensitivity, there is potential for impact to archaeological and architectural historic resources where the BART service comes close to historic properties and where new stations and maintenance facility expansion are proposed.

In the future if this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the NRHP and the CRHP.

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking; however, there are no unique geologic or seismic conditions on this alignment.[59] A tunnel would be needed in areas with steep vertical grades and soil instability. Construction could result in soil erosion from excavation and grading activities.

Evaluation Rating: ◑

[58] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

[59] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

Hazards and Hazardous Materials

There appear to be two contamination sites within 1,000 feet of the alignment.[60] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

The alignment would cross Wildcat, San Pablo, Pinole and Refugio Creeks on an aerial structure. Construction activities may cause exposure and loosening of soils and subsurface materials, which could affect stormwater runoff. Impacts would be minimized through the implementation of best management practices.

Evaluation Rating: ◕

Mineral Resources

No mineral resources are located within the area.[61]

Evaluation Rating: ●

Noise

There is the potential for increased noise levels at nearby residences along the new alignment from approximately the Richmond BART station to Hilltop Mall during construction and operation.

Evaluation Rating: ◕

Population/Housing

This alternative would support the growth strategies of the corridor cities. This alternative would for the most part not displace existing housing because the construction would predominately be within the existing right-of-way. However, there is the potential for take of homes along Rumrill Boulevard in San Pablo that serves lower income families. In addition, right-of-way requirements have not been determined for a potential new Hercules maintenance facility or expansion of the Richmond maintenance facility and for the required turn back tracks in Hercules.

[60] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

[61] Contra Costa County General Plan, 2000

Evaluation Rating: ◔

Public Services

There are four schools within 1,000 feet of the proposed alignment.[62] Fire and police protection, and public facilities would not be impacted during operation of this alternative as the alignment would be on an elevated structure and would not affect local traffic as the schools are not near stations. Construction could impact access for emergency response vehicles. There is the potential for increased noise levels at the nearby schools during construction and operation.

Evaluation Rating: ◕

Recreation/Open Space

The alignment would be near Lucas Park, Hilltop Park, and Hilltop Lake. Since the alignment for the most part would be an aerial structure, recreational uses should not be affected. Alternative specificity is not available at this time to determine potential impacts to Hilltop Lake and Park. There would be the potential for increased train noise as new areas would be exposed to BART train operations.

Evaluation Rating: ◕

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. This alternative could be subject to Section 4(f) due to potential impacts to Hilltop Lake and Park. Further evaluation of publicly owned parks, historic or archaeological resources, and wildlife refuges is needed.

Evaluation Rating: ◕

Transportation/Traffic

This BART alternative would have a positive impact on transportation as it would result in modal shifts and mitigate projected increases in VMT. Individual intersections near the existing Richmond station and the proposed new stations at Hilltop Mall and the Hercules Transit Center may experience localized increased congestion. There may be temporary traffic disruptions during construction.

Evaluation Rating: ◑

[62] Google maps, www,google.com/maps

Utilities/Service Systems

Existing utilities will be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ●

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◑
Agriculture Resources	●
Biological Resources	◕
Community Impacts	◑
Cultural Resources	◕
Geology/Soils	◑
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	●
Noise	◕
Population/Housing	◔
Public Services	◕
Recreation	◕
Section 4(f)	◕
Transportation/Traffic	◑
Utilities/Services Systems	●
Overall Rating Average	◕

Criteria 4b: Improve Air Quality; Reduce Greenhouse Gas (GHG) Emissions

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). This alternative has the potential to be one of the best performing from an air quality and GHG standpoint due to substantial VMT reduction. This alternative has the potential to attract a large amount of riders. It would also have a relatively long trip length. The typical BART trip under current conditions is approximately 13 miles.[63] In addition, current BART riders may also be able to reduce their driving distances to the stations as there would be additional stations. Implementation of this alternative would attract local traffic to the existing station in Richmond and the new stations proposed at Contra Costa College, Hilltop Mall, the Richmond Parkway Transit Center, and the Hercules Transit Center,

[63] National Transit Database, 2013

which could increase congestion and traffic delays in these areas. This could create an increase in localized pollutants, but overall this alternative would perform well from an air quality standpoint. Construction emissions would occur, but could be reduced by using best management practices.

Evaluation Rating: ◕

Criteria 4c: Reduce Transportation Energy Demand

This alternative has the potential to decrease energy use by a relatively high amount because the nature of this alternative has the potential to attract a large amount of riders, which would reduce VMT.

Evaluation Rating: ◕

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

The alignment would not be in any areas subject to sea level rise.[64]

Evaluation Rating: ●

Criteria 4e: Be Compatible with Local Plans and Policies

This alternative would support the growth strategies of the corridor cities. This alternative would generally not displace existing housing because the construction would predominately be within the existing right-of-way. However, there is the potential for take of homes along Rumrill Boulevard in San Pablo that serves lower income families. The right-of-way requirements have not yet been determined for a potential new Hercules maintenance facility or expansion of the Richmond maintenance facility and for the required turn back tracks in Hercules.

Evaluation Rating: ◑

[64] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December

Summary of Overall Ratings Alternative 6

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural Resources	◕
Criteria 4b – Air Quality	◕
Criteria 4c – Energy	◕
Criteria 4d – Sea Level and Climate Change	●
Criteria 4e – Local Plans and Policies	◕
Overall Rating Average	◕

ALTERNATIVE 7: BART EXTENSION FROM THE EL CERRITO DEL NORTE STATION TO HERCULES

Criteria 4a: Avoid Impacts to Natural and Cultural Resources

Aesthetics

This alternative would not disturb or remove any scenic resources. Aerial structures would be placed along the majority of the alignment and could be obtrusive. This alternative could potentially introduce new sources of light and glare along the trackway and at the proposed stations, potentially impacting adjacent commercial and residential properties. The impact of lighting glare can be minimized by appropriate design, intensity, and hardware specifications.

Evaluation Rating: ◕

Agriculture Resources

There are no agricultural lands present in the project corridor and there would be no impacts to agricultural lands.[65]

Evaluation Rating: ●

Biological Resources

The corridor is largely developed with residential and commercial uses and open areas. No wetlands appear to be present, but the alignment would cross Wildcat, San Pablo, Garrity, Pinole, and Refugio Creeks on an aerial structure.[66] Construction could affect biological resources such as nesting birds, special status species or the removal of trees and vegetation.

Evaluation Rating: ◕

[65] City of El Cerrito 1999 General Plan and Hercules General Plan, adopted September 22, 1998 with updates

[66] www.arcgis.com, San Francisco Bay Delta Watershed Map

Community Impacts

The alignment would be in the vicinity of three disadvantaged communities (just south of the El Cerrito del Norte BART Station, west and east between McBryde Avenue and El Portal Drive, and north between Richmond Parkway and Appian Way).[67] Further evaluation would be conducted as this alternative moves forward.

Evaluation Rating: ◕

Cultural Resources

Cultural resources include buildings, sites, districts, structures, or objects having historical, architectural, archaeological, cultural, or scientific importance. This alternative would be constructed primarily on land previously disturbed. While this area has been developed and is considered to have low to moderate sensitivity, there is potential for impact to archaeological and architectural historic resources where the BART service comes close to historic properties and where new stations and maintenance facility expansion are proposed.

In the future if this alternative is advanced, a records search would be conducted at the California Historical Resources Information Center to identify known historic resources in the project vicinity. This would be followed by a pedestrian survey for both archaeological and architectural resources, and the evaluation of any resources that have the potential to be eligible for the NRHP and the CRHP.

Evaluation Rating: ◕

Geology/Soils

This alternative is subject to earthquakes from the Hayward Fault and can experience very strong to violent shaking.[68] The alignment would cross the Hayward Fault Zone near San Pablo Dam Road and I-80. There is also an area of soil instability east of I-80 in this vicinity. Both of these conditions would require special design considerations. A tunnel would be needed in areas with steep vertical grades and soil instability. Construction could result in soil erosion from excavation and grading activities.

Evaluation Rating: ◔

[67] State of California, Department of Water Resources, Disadvantaged Communities Mapping Tool, https://gis.water.ca.gov/app/dacs/

[68] Association of Bay Area Governments Resilience Program, Contra Costa Earthquake Hazard Map, http://resilience.abag.ca.gov/earthquakes/contracosta/

Hazards and Hazardous Materials

There does not appear to be any contamination sites within 1,000 feet of the alignment.[69] Construction activities in a densely developed urban area have the potential to affect workers, residents, and businesses if hazardous materials used in construction are released into the surrounding environment. All hazardous wastes would be appropriately managed and remediated per regulatory requirements.

Evaluation Rating: ◕

Water Quality

The alignment would cross Wildcat, San Pablo, Garrity, Pinole, and Refugio Creeks on an aerial structure. Construction activities may cause exposure and loosening of soils and subsurface materials, which could affect stormwater runoff in to creeks, however, the impacts of which would be minimized by implementation of best management practices.

Evaluation Rating: ◕

Mineral Resources

No mineral resources are located within the area.[70]

Evaluation Rating: ●

Noise

There is the potential for increased noise levels at nearby residences along the new alignment during construction and operation.

Evaluation Rating: ◕

Population/Housing

This alternative would support the growth strategies of the corridor cities with the exception of Richmond. The Richmond General Plan 2030 assumes that BART would serve downtown Richmond and would support transit-friendly, high-density development in the vicinity of the existing station. This alternative would most likely not displace existing housing because the construction would predominately be within the existing right-of-way. However, right-of-way requirements have not been determined for a potential new Hercules maintenance facility or expansion of the Richmond maintenance facility and for the required turn back tracks in Hercules.

[69] U.S. Environmental Protection Agency, Cleanups in My Community, http://www.epa.gov/cleanups/cleanups-my-community

[70] Contra Costa County General Plan, 2000

The use of Diesel Multiple Units (DMUs), as proposed in Alternative 7.2, would also require a transfer between BART and DMU service at El Cerrito del Norte. Right-of-way requirements have not been determined for this project element.

Evaluation Rating: ◑

Public Services

There are five schools and a hospital within 1,000 feet of the proposed alignment.[71] Fire and police protection and public facilities would not be impacted during operation of this alternative as the alignment would be on an elevated structure and therefore would not affect traffic in these areas as they are not near stations. There is the potential for increased noise levels at the nearby schools during construction and operation. Summit Elementary School is near the El Cerrito del Norte Station and Riverside Elementary School is near the proposed San Pablo Dam Road station. In addition, station traffic could affect these schools. Construction could impact access for emergency response vehicles.

Evaluation Rating: ◑

Recreation/Open Space

The alignment would be near several parks (Tiller Park, Alvarado Park, St. Joseph Cemetery, Rolling Hills Memorial Park Cemetery, Stewart Draw Park, and Ohlone Park). Since the alignment for the most part would be an aerial structure, recreational uses should not be affected.

Evaluation Rating: ◕

Section 4(f)

The Department of Transportation Act of 1966 includes a special provision - Section 4(f). The Section 4(f) process states that a special effort must be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. No Section 4(f) resources would be affected by this alternative.

Evaluation Rating: ●

Transportation/Traffic

This BART alternative would generally have a positive impact on transportation as it would result in modal shifts and mitigate projected increases in VMT. Individual intersections near the existing El Cerrito del Norte station, the proposed new Richmond stations at San Pablo Dam Road, Richmond Parkway, and/or Appian Way, and the Hercules Transit Center may experience increased congestion. There may be temporary traffic distributions during construction.

[71] Google maps, www,google.com/maps

Evaluation Rating: ◑

Utilities/Service Systems

Existing utilities would be identified and any necessary relocations would be accomplished before construction starts. Short-term scheduled and unanticipated interruptions of service may occur during construction.

Evaluation Rating: ●

Summary of Criteria 4a Ratings

Environmental Factor	Rating
Aesthetics	◕
Agriculture Resources	●
Biological Resources	◕
Community Impacts	◕
Cultural Resources	◕
Geology/Soils	◔
Hazards and Hazardous Materials	◕
Water Quality	◕
Mineral Resources	●
Noise	◕
Population/Housing	◑
Public Services	◑
Recreation	◕
Section 4(f)	●
Transportation/Traffic	◑
Utilities/Services Systems	●
Overall Rating Average	◕

Criteria 4b: Improve Air Quality; Reduce Greenhouse Gas (GHG) Emissions

Improvements in air quality and GHG emissions are closely related to reductions in traffic congestion and Vehicle Miles Traveled (VMT). This alternative has the potential to be one of the best performing from an air quality and GHG standpoint due to substantial VMT reduction. This alternative has the potential to attract a large amount of riders. It would also have a relatively long trip length. The typical BART trip under current conditions is approximately 13 miles.[72] In addition, current BART riders may also be able to reduce their driving distances to the stations as there would be additional stations. Implementation of this alternative would attract local traffic to the new stations proposed in Richmond, San Pablo, and the Hercules Transit Center,

[72] National Transit Database, 2013

which could increase congestion and traffic delays in these areas. The creation of a new terminus station could also alleviate some of the traffic demand at the El Cerrito del Norte Station. The increases in traffic at the new proposed stations could create an increase in localized pollutants, but overall this alternative would perform well from an air quality standpoint. Construction emissions would occur, but could be reduced by using best management practices.

The use of DMUs would potentially reduce the benefits of this alternative because some new regional emissions and air toxics would be introduced from the DMU trains. In addition, some riders may choose not to use this alternative with the DMU option due to the transfer issues in getting to the BART El Cerrito del Norte station and other modes of transit.

Evaluation Rating: ◕ (with BART trains) and ◑ (with DMU trains)

Criteria 4c: Reduce Transportation Energy Demand

This alternative has the potential to decrease energy use by a relatively high amount because the nature of this alternative has the potential to attract a large amount of riders, which would reduce VMT.

The use of DMUs would potentially reduce the benefits of this alternative because the DMUs would require some additional energy to operate due to the use of fossil fuel. According to Federal Transit Administration New Start Templates, a DMU would require an additional 0.096 million British Thermal Units per vehicle mile compared to a BART vehicle.[73] In addition, some riders may choose not to use this alternative with the DMU option due to the transfer issues in getting to the BART El Cerrito del Norte station and other modes of transit.

Evaluation Rating: ◕ (with BART trains) and ◑ (with DMU trains)

Criteria 4d: Consider Risks of Sea Level Rise and Climate Change

The alignment would not be in any areas subject to sea level rise.[74]

Evaluation Rating: ●

Criteria 4e: Be Compatible with Local Plans and Policies

This alternative would conflict with Richmond General Plan 2030 which assumes that BART would serve downtown Richmond. Right-of-way requirements have not been determined for a

[73] Federal Transit Administration – Office of Planning and Environment, 2015. Reporting Instructions for the Section 5309 Capital Investment Grant Program – New Starts, August

[74] National Oceanic and Atmospheric Administration – Office for Coastal Management, 2015. Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer, Version 2.0, https://coast.noaa.gov/digitalcoast/tools/slr/, December

potential new Hercules maintenance facility or expansion of the Richmond maintenance facility and for the required turn back tracks in Hercules.

In addition, the use of DMUs would also require a transfer between BART and DMU service at El Cerrito del Norte and right-of-way requirements have also not been determined for this item as well.

Evaluation Rating: ◑

Summary of Overall Ratings – Alternative 7

Criteria	Rating
Criteria 4a – Impacts to Natural and Cultural Resources	◕
Criteria 4b – Air Quality (with Bart Trains)	◕
Criteria 4b – Air Quality (with DMU Trains)	◑
Criteria 4c – Energy (with BART trains)	◕
Criteria 4c – Energy (with DMU trains)	◑
Criteria 4d – Sea Level and Climate Change	●
Criteria 4e – Local Plans and Policies	◑
Overall Rating Average (with BART Trains)	◕
Overall Rating Average (with DMU Trains)	◕

COMPARISON OF THE ALTERNATIVES

Alternative	Criteria 4a – Impacts to Natural and Cultural Resources	Criteria 4b – Air Quality	Criteria 4c - Energy	Criteria 4d – Sea Level Rise	Criteria 4e – Local Plans and Policies	Overall Rating
Alternative 1: Express Bus Service	●	◕	◕	◑	●	◕
Alternative 2: San Pablo Avenue/Macdonald Avenue BRT	◕	◔	◔	◕	●	◑
Alternative 3: 23rd Street BRT	◕	◔	◔	◕	●	◑
Alternative 4 – UPRR Corridor Commuter Rail	◕	◑	◑	○	◑	◑
Alternative 5 – UPRR-BNSF Corridor Commuter Rail	◕	◑	◑	◑	◑	◑
Alternative 6 – BART Extension from Richmond Station to Hercules	◕	◕	◕	●	◕	◕
Alternative 7A – BART Extension from El Cerrito del Norte	◕	◕	◕	●	◑	◕
Alternative 7B – BART Extension from El Cerrito del Norte with DMU	◕	◑	◑	●	◑	◑