THE CALTRAIN CORRIDOR VISION PLAN

Appendix B

Vision Plan Cost and Revenue Detail

Appendix B explains the assumptions used to develop the costs estimates in Chapter 9 of the Caltrain Corridor Vision Plan and explains the assumptions used to develop the revenue estimates in Chapter 10 of the vision plan.

1. Cost Assumptions

1.1 Rail Cost Assumptions

1.1.1 Rail Elements Considered

Physical elements considered in this cost analysis include:

Track

New guideway structure (aerial, at-grade, or below-grade / tunnel)

New station facilities (including pedestrian overcrossings)

Existing station demolition

A contingency for right-of-way acquisition

Physical elements excluded from the rail cost analysis include:

Turnouts / switches

Railroad track removal

Connection of new track to existing track

Grade separations (separate line item)

Utility connections and relocations

Parking facilities

Communications

New tunnels for new track adjacent to existing San Francisco Caltrain tunnels:

Tunnel 1 (MP 1.3 to 1.7)

Tunnel 2 (MP 1.9 to 2.1)

Tunnel 3 (MP 3.2 to 3.6)

Tunnel 4 (MP 4.3 to 4.9)

Wayside signaling equipment

Traction power supply and distribution

Construction of soundwalls or retaining walls

Construction staging areas

Miscellaneous costs excluded:

Handling / removal of hazardous wastes

Financing charges

Planning or enquiry costs, including legal expenses and fees

Cost or impacts of latent environmental issues that result in litigations or development delays

Additional assumption details include:

A Right-of-Way Estimate Contingency of 30%.

A Professional Services estimate contingency of 10%.

1.1.2 Rail Unit Cost Assumptions

Grade separations (specifically highway-rail) are not required for any of the studied service scenarios and are therefore not included in the costs in the figure that follows. However, several of the alternatives call for train frequencies significantly greater than existing conditions and service plans that have been formally analyzed to-date; some impacts to local street circulation could be expected, and we expect that grade separations would be pursued.

Caltrain has estimated that grade separations cost between $50 million and $150 million for each location. Caltrain does not consider grade separations to be part of the CalMod 2.0 program and no timeline for implementation has been identified. As a point of reference, grade separation projects being considered are estimated to cost between $100 million and $600 million, depending on the size, scale, and included elements within the project[1].

[1] The grade crossing project proposed at 25th Avenue in San Mateo is estimated to cost $165M, while Burlingame is considering alternatives at Broadway Station that range from $120M-$600M. http://www.greencaltrain.com/2015/11/san-mateo-sprints-ahead-for-san-mateo-county-grade-separation-funding-menlo-park-and-burlingame-advance/

Figure 1. Vision Plan: Rail Cost Detail

Project or Program	Fleet Cost	Capital Cost	Operations and Maintenance	Notes/Assumptions
Caltrain short-term (2017 – 2020)	n/a	n/a	$600 million*	Additional funding will be required if short-term capacity increases are pursued. Estimated time frame is 2017-2020. Source: Caltrain operating costs.
Caltrain Modernization (2021-2024)	n/a	n/a	$700 million	Planned project, funding underway. Estimated time frame is 2021-2024. Source: Caltrain
Caltrain Modernization 2.0 (2025-2026)	$60 million	$30 million	$350 million	These projects are planned but not funded. Includes platform lengthening, 96 new electric cars, state of good repair funding and Gilroy shuttle service. Estimated timeframe is 2025-26.
Rail Modernization 3.0 (2027-2028)	$36 million	$460 million	$660 million	Includes track, new structures for track, new stations with pedestrian overcrossings, station demolition, contingency for ROW acquisition, program management, state of good repair funding. Estimated timeframe is 2027-28. Source: Caltrain, SPUR analysis
Rail Modernization 4.0 (2029-2033)	n/a	$120-130 million	$1.3 billion	Includes track, new structures for track, new stations with pedestrian overcrossings, station demolition, contingency for ROW acquisition, program management, state of good repair funding. Estimated timeframe is 2029-2033. Source: Caltrain, SPUR analysis
Rail Modernization 5.0 (2033-2037)	$45 million	$600-$620 million	$1.3 billion	Includes track, new structures for track, new stations with pedestrian overcrossings, station demolition, contingency for ROW acquisition, program management, state of good repair funding. Estimated timeframe is 2033-2037. Source: Caltrain, SPUR analysis

Rail Grade Separations	n/a	$2-$6 billion	n/a	Assumes $50-$150 million per grade crossing, 40 at-grade crossings. Most likely, some crossings may cost much more, and some crossings will be closed to through traffic. Source: Caltrain
Downtown SF Rail Extension	n/a	$4.5 billion	n/a	Cost estimate is for Transbay Transit Center Phase II which includes: 1.3 mile tunnels, 4th and Townsend street station, build out of TTC rail levels, intercity bus facility, pedestrian connector between TTC and BART/Muni. Source: Metropolitan Transportation Commission RM2 Phase 2 Cost Review (November 2015)
Caltrain Maintenance Facility	n/a	$165 million	n/a	Maintenance facility is not yet in any Caltrain plans but is expected to be needed with Rail Modernization 3.0 service levels. Cost based on Caltrain's existing maintenance facility cost ($140 million dollars in 2007) escalated for 2016 dollars.
Caltrain Terminal Improvements	n/a	$250 million	n/a	Improvements at Caltrain's South (Gilroy) and North (4th and King) terminals. Source: Caltrain SRTP 2016-25
Caltrain Level Boarding	n/a	$160 million	n/a	Assumes average of $2.7 million per platform face, 27 stations, most with two platform faces. More policy discussions needed for the final height decision. Source: Caltrain
Rail Total	$140 million	$8.2 - $12.3 billion	$4.95 billion	

1.2 Station/First-Last Mile Cost Assumptions

In order to estimate what it would take to upgrade stations to accommodate the 312,000 riders described in the vision plan, station types were developed. Developing the station types relied on the average weekday boardings (AWB) as the first metric to categorize the stations. Using the 2015 intercept survey, three levels were identified:

Low: Above 1,500 passengers;

Medium: between 1,500 and 3,500 passengers;

High: over 3,500 passengers.

In addition to AWB and level of services provided, the connectivity to other systems (light rail, bus lines, shuttles, airports) and individual station context was factored. Four station types were defined, based on today's activity:

Intermodal: intermodal or terminal stations with high AWB and attended by high number of baby bullets. In general, the catchment area is large due to regional connections provided. This type includes the following stations: San Francisco (4th and King), Millbrae, Palo Alto, Mountain View and Diridon (San José);

Large: Stations with medium AWB numbers attended by 5 or 6 baby bullets and a high number of limited services. Includes: 22nd, Hillsdale and Redwood City;

Intermediate: with AWB similar to large stations, they are attended by few baby bullets (or are not attended by baby bullets) but provide a high number of limited services. Includes: Menlo Park, Sunnyvale, San Mateo and San Carlos;

Local: small stations with low AWB and attended by few limited services on peak hour. Includes; San Bruno, Lawrence, Cal Avenue, Santa Clara, Belmont, South San Francisco, Bayshore, Burlingame, Hayward Park and San Antonio.

For the purposes of estimating costs, two scenarios for station access modes were developed: a *transit strategy* and a *personal mobility strategy*. The transit strategy assumes that transit — including fixed route, shuttle, autonomous vehicles, ridesharing, etc. — provide the lion's share of access to the station. If we assume a high mode share for transit (inclusive of autonomous vehicles and ridesharing), then more curb and circulation space is required at the station. The personal mobility strategy assumes that bicycles (foot pedal and electric), scooters, and other transportation devices that are carried on the person are the main mode of access to the station. If we assume a high mode share is for bicycles, then more bicycle parking and storage space is required. Figure 2 presents the mode share for existing conditions and the proposed mode share for both strategies at the full build out of the vision plan.

Figure 2. Mode Share Scenarios for Full Buildout of Vision Plan

Station Type	Existing Conditions				Transit Strategy					Personal Mobility Strategy				
	Walk	Auto	Transit	Bike	Walk	Auto (parking)	Auto (drop-off)	Transit	Personal Mobility	Walk	Auto (parking)	Auto (drop-off)	Transit	Personal Mobility
Intermodal	17%	40%	29%	14%	20%	5%	20%	45%	10%	20%	5%	20%	35%	20%
Large	25%	48%	9%	18%	30%	5%	20%	30%	15%	30%	5%	20%	20%	25%
Intermediate	35%	43%	8%	14%	40%	5%	15%	30%	10%	40%	5%	15%	20%	20%
Local	40%	37%	7%	15%	45%	5%	15%	25%	10%	45%	5%	15%	15%	20%

It is important to note that the actual future train schedules are not known: The station types presented in this appendix would need to be update reflect the changes in the way service is delivered across the corridor. Appendix A explains several schedule scenarios that are possible over the long term.

The following figure presents an average mode split for each station type. Averaging the stations by type masks the nuances that are shown in the figures above but provides a general sense of how to reflect the corridor as a whole. Figure 3 provides a basis for developing the program elements and a future range of potential growth.

Figure 3. Average Mode Split for Each Station Type

Station Type	AWB	Walk	Auto	Transit	Bike	Total number of trains on peak hour
Intermodal	6,607	17%	40%	29%	14%	9
Large	2,523	25%	48%	9%	18%	6
Intermediate	2,035	35%	43%	8%	14%	5
Local	776	40%	37%	7%	15%	3

1.2.1 Stations: Phasing

Phase A of the Station Modernization and Access Program covers the short term and electrification timeframe. During this phase service is expected to accommodate approximately 80,000 passengers per day. Improvements during this phase will be to elements both within the station/station platform and in the station area circulation spaces:

Within station:

CCTV: video surveillance system in all stations, parking lots and bus terminals (when existing)

Wi-Fi: to be installed on the platform areas, to make the travel experience more comfortable, allow the use of mobile apps, etc.

Wayfinding: visual identity, improving identification of stations from streets next to the station and from passengers inside the train that wants to check where they are, as well as from bus terminals next to the stations and location of bicycle facilities and real time information.

Within station area:

Auto drop-off areas: for vehicles, incentivizing rideshare (Phase A is 30% of total planned for the vision plan)

Bicycle parking: racks and bike share station

Transit (Bus, shuttle and other transit services): bus stop next to station including shelters and curb (Phase A is 50% of total planned for the vision plan)

Station area amenities are calculated according to number of passengers by phase. Internal station amenities will be based on average area (square feet) of platforms, stations, bus terminal or parking lot. Additionally to the direct costs (external applications and internal applications), other costs were estimated including the following: indirect costs[2], overhead and profit , contingency[3] and accuracy range[4].

[2] Costs related to construction and operational items to enable implementation of external and internal applications, such as administrative costs, equipment or insurance.

[3] Percentage dedicated for any unexpected event on construction process that is going to result on additional costs.

[4] Defined as low or high, it is the range related to the actual stage of the project used for estimating the costs. As the project is on a conceptual level, the range is large (-10% for low and 100% for high). Once the project starts to be more clearly defined, the range is reduced. For this study, accuracy of 50% was applied.

The figure below presents a summary for Phase 1, with estimated costs for Transit Strategy and Personal Mobility Strategy.

Figure 4. Stations: Phase A Estimated Costs

Phase A	Description	Transit Strategy	Personal Mobility Strategy
Station Area	Auto drop-off area	$ 375,000	$ 375,000
	Bicycle Parking	$ 7,800,000	$ 7,740,000
	Transit	$ 3,266,000	$ 2,886,000
Internal Station	Wi-Fi	$ 908,000	$ 908,000
	Surveillance System	$ 13,715,000	$ 13,715,000
	Wayfinding	$ 2,889,000	$ 2,889,000
Other	Other	$ 19,533,000	$ 19,238,000
	Accuracy	$ 24,244,000	$ 23,877,000
TOTAL		$ 72,730,000	$ 71,628,000

Phase B covers the CalMod 2.0, Rail Modernization 3.0 and Rail Modernization 4.0 timeframe, which assume service levels to move 269,000 passengers a day. Improvements during this phase will be elements in station area circulation spaces:

Auto drop-off areas: for vehicles, incentivizing rideshare and possible use for autonomous vehicles (Phase B is 50% of total planned through Modernization 5.0)

Bicycle Parking: lockers and barn

Transit (Bus, shuttle and other transit services): bus stop next to station including shelters and curb space that can accommodate autonomous vehicles (Phase C is 50% of total planned through Modernization 5.0)

Figure 5. Stations: Phase B Cost Estimates

Phase B	Description	Transit Strategy	Personal Mobility Strategy
External Applications	Auto drop-off area	$ 624,000	$ 624,000
	Bicycle Parking	$ 10,421,000	$ 24,000,000
	Transit	$ 3,435,000	$ 2,886,000
Amenities	Concierge[5]	$ 63,070,000	$ 63,070,000
	EV Charging Station	$ 3,300,000	$ 3,300,000
	Internal Improvements	$ 11,000,000	$ 11,000,000
Other	Other	$ 61,952,000	$ 70,740,000
	Accuracy	$ 76,902,000	$ 87,811,000
TOTAL		$ 230,704,000	$ 263,431,000

Phase C covers the Rail Modernization 5.0 timeframe, with service accommodating approximately 312,000 passengers per day.

Figure 6. Stations: Phase C Cost Estimates

Phase C	Description	Transit Strategy	Personal Mobility Strategy
External Applications	Auto drop-off area	$ 251,000	$ 251,000
Other	Other	$ 176,000	$ 176,000
	Accuracy	$ 215,000	$ 215,000
TOTAL		$ 642,000	$ 642,000

[5] This is operating costs

1.2.2 Stations: Cost Methodology

The following chart summarizes the investments required for stations according to ridership growth. Cost ranges will have a variation according to the adopted strategy: Transit or Personal Mobility. Figure 7 shows estimated costs for the Transit Strategy and Personal Mobility Strategy.

Figure 7. Transit and Personal Mobility Strategy Cost Estimates

Description	Transit Strategy	Personal Mobility Strategy
Internal Station	$17,500,000	$17,500,000
Auto Drop-Off	$1,250,000	$1,250,000
Bicycle Parking Facilities	$18,200,000	$18,200,000
Transit	$6,700,000	$5,800,000
Amenities	$77,400,000	$77,400,000
Other	$62,000,000	$71,000,000
Accuracy	$77,000,000	$ 88,000,000
Total	$260,050,000	$279,150,000

Personal mobility represents a bold investment on bicycle facilities for parking. Figure 8 describes expected structure required for a station per type.

Figure 8. Personal Mobility Strategy: Bicycle Needs

Station Type	Projected AWB Phase 3	Racks		Lockers		Bike Barn	
		Transit Strategy	Personal Mobility Strategy	Transit Strategy	Personal Mobility Strategy	Transit Strategy	Personal Mobility Strategy
Intermodal	30,403	50	50	0	0	1900	4200
Large	11,609	50	50	0	0	850	1800
Intermediate	9,363	50	50	0	0	380	1150
Local	3,571	80	50	60	50	0	300

1.2.3 First- and Last-Mile Cost Methodology

In order to estimate costs for first- and last-mile connections to stations, a $5 per-trip operating subsidy (2016 dollars) was used. There are already many types of service for first- and last-mile connections: public bus or train, bikeshare, taxi, ridehailing, etc. We anticipate that in the future there will be far more. First- and last-mile funding would grow in size as rail capacity and ridership grow. Note that this cost is a public subsidy and does not apply when the first- or last-mile connection is privately funded.

Figure 9. First- and Last-Mile Connection Subsidy Estimates

Rail Phase	Number of Years	Weekday Riders Funded (per day)	Weekend Riders Funded (per day)	Annual Total*
CalMod	3	5,000	2,000	$21,061,560
CalMod 2.0	1	10,000	5,000	$14,300,520
Rail Modernization 3.0	4	20,000	10,000	$114,402,080
Rail Modernization 4.0	5	20,000	10,000	$143,002,600
Rail Modernization 5.0	5	40,000	20,000	$312,000,000
Total Across Phases				**$604,766,760**

*Assumes $5 per trip subsidy (2016 dollars)

The cost estimates for station upgrades for the high-speed rail stations were based on existing estimates and comparable projects. The actual capital costs will depend greatly on the vision developed for each of these stations. Similarly, operating costs were not estimated for these stations and will depend on the actual functioning of the facilities.

Figure 10. Cost of Caltrain/High-Speed Rail Station Upgrades

Station	Capital Cost	Notes/Assumptions
Diridon Station Upgrade	$820 million	Estimated cost to build a new station that would integrated Caltrain, BART and high speed rail. Actual project and plans are under development. Source: CAHSR Capital Cost Estimate Report - Merced to Fresno Section High Speed Train Project EIS/EIR 2011. Shown under ""San Jose"" Station
Millbrae Station Upgrade	$500 million	Estimated cost to build a new station that would integrated Caltrain, BART and high speed rail. Actual project and plans are under development. Source: CAHSR Capital Cost Estimate Report - Merced to Fresno Section High Speed Train Project EIS/EIR 2012
4th and King Station Upgrade	$100 - $200 million	It may be possible to avoid some of this cost if the extension to the Transbay Transit Center is built by 2025 as currently planned. Source: SPUR analysis based on similar projects.

Figure 11. Vision Plan: Station First- and Last-Mile Cost Detail

Project or Program	Capital Cost	Operations and Maintenance	Notes/Assumptions
Station Modernization and Station Access Program	$260 million - $279 million	n/a	Includes drop-off areas, bicycle parking, transit drop-off, wi-fi, surveillance, wayfinding, allowance for other costs. Does not include additional HSR improvements needed at Millbrae and Diridon (see below for those costs).
First- and Last-Mile Program	n/a	$610 million	A $5 per-trip operating subsidy (2016 dollars) was used. Numbers of riders subsidized scaled as ridership grows over 15 years.
Diridon Station Upgrade	$820 million	n/a	Estimated cost to build a new station that would integrate Caltrain, BART and high-speed rail. Actual project and plans are under development. CAHSR Capital Cost Estimate Report - Merced to Fresno Section High Speed Train Project EIS/EIR 2011. Shown under ""San Jose"" Station"

Millbrae Station Upgrade	$500 million	n/a	Estimated cost to build a new station that would integrated Caltrain, BART and high-speed rail. Actual project and plans are under development. Source: CAHSR Capital Cost Estimate Report - Merced to Fresno Section High Speed Train Project EIS/EIR 2012
4th and King Station Upgrade	$100 - $200 million	n/a	It may be possible to avoid some of this cost if the extension to the Transbay Transit Center is built by 2025 as currently planned. Source: SPUR analysis based on similar projects.

1.3 Highway Cost Assumptions

The vision plan Highway 101 cost estimates relied on costs estimates for comparable projects and costs estimates developed in other studies. Figure 12 shows the existing Highway 101 lane arrangement, and Figure 13 shows the preferred concept described in the vision plan (a high-occupancy/toll 3+ managed lane).

The preferred concept includes the following facilities:

In the northbound direction

A HOT/3+ lane on Highway 101 (converted from a general purpose lane) from the county line to Highway 101 (Central Freeway) / I-80 interchange (primarily intended for traffic bound for the Central Freeway)

A HOT/3+ lane on I-280 (converted from a general purpose lane) from 20th St to 5th St / King St (primarily intended for traffic bound for Downtown)[6]

In the southbound direction

A HOT/3+ lane on I-280 (converted from a general purpose lane) from 5th St / King St to Highway 101 and, from there, to the county line.

South of Whipple Ave (in Redwood City) existing HOV lanes would be converted to HOT lanes. North of Whipple Ave, one general-purpose lane in each direction would be converted to an HOT lane. At the US-101/SR-85 interchange, HOV direct connector ramps currently connect the US-101 HOV lanes with HOV lanes on SR-85. The HOV lanes on SR-85 (from US-101 to I-280) are already planned to be converted to HOT lanes in 2020, pending availability of funding.[7] At that time, the HOV direct connector ramps between US-101 and SR-85 would operate as HOT direct connector ramps. In future phases of the VTA Silicon Valley Express Lanes program, HOT lanes are planned to be extended on US-101 as far south as Morgan Hill. In addition, HOT lanes are planned for the entire length of SR-85.

[6] The configuration of the US-101/I-280 interchange in San Francisco (the "Alemany Maze") presents specific constraints and opportunities for the implementation of HOV and HOT lanes along the corridor into San Francisco. Importantly, the ramp from southbound I-280 to southbound US-101 has a non-standard design, joining the US-101 lanes from the left (instead of from the right as is standard). This ramp "interrupts" the "inside" lanes of the southbound US- 101, making it difficult to implement a continuous southbound HOT facility on US-101 in San Francisco (short of constructing elaborate new HOT ramps within the US-101/I-280 interchange). Considering both US-101 and I-280 together, however, a comprehensive HOT treatment can be feasibly created in San Francisco.

[7] "State Route 85 and US 101 Express Lanes Projects." Santa Clara Valley Transportation Authority. http://www.vta.org/projects-and-programs/vta-express-lanes-85-101-project. May 5, 2016.

In the future, traffic could connect to/from other existing or future HOV/HOT facilities via existing general purpose ramps or future direct connector ramps. Potential future connections include to/from:

State Route 92 (SR-92) to/from the San Mateo – Hayward Bridge – HOV lanes currently exist at the westbound toll plaza east of the bridge in Hayward but not on the bridge itself.

State Route 84 (SR-84) to/from the Dumbarton Bridge – HOV lanes currently exist at the westbound toll plaza east of the bridge in Fremont but not on the bridge itself. However, there is currently no freeway connection from US-101 to the west end of the Dumbarton Bridge.

State Route 237 (SR-237, Southbay Freeway) – HOV lanes currently exist from US-101 to First St. As part of Phase 2 of the SR-237 Express Lanes project, these HOV lanes are planned to be converted to HOT lanes by 2018.

State Route 87 (SR-87, Guadalupe Freeway) – HOV lanes currently exist on SR-87 from US-101 to SR-85.

Santa Clara County Expressways – several expressways in Santa Clara County (e.g., the Lawrence Expressway, the Montague Expressway, or the San Tomas Expressway) have HOV lanes in effect during peak periods.

Figure 12. Highway 101 Existing Conditions

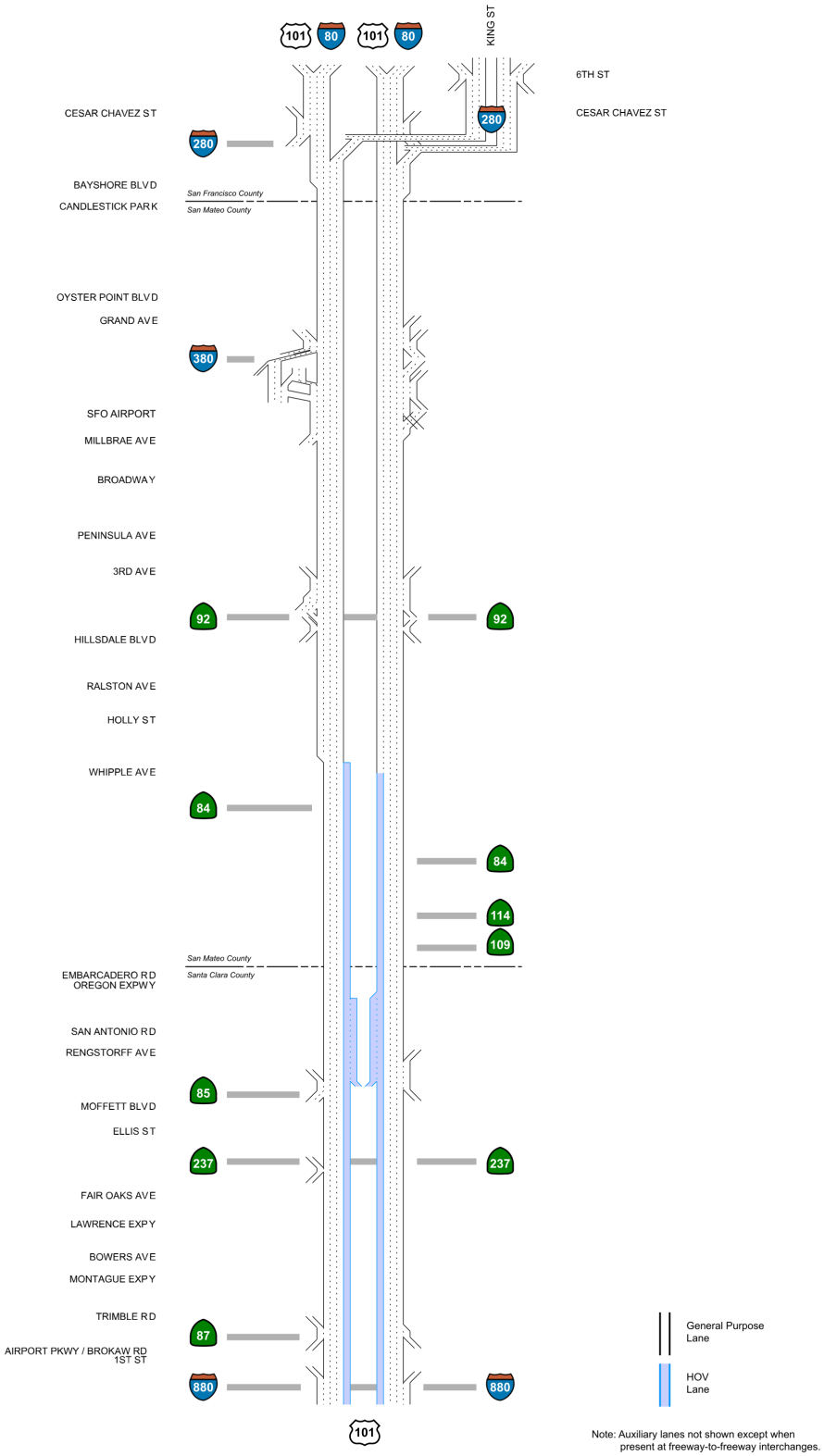
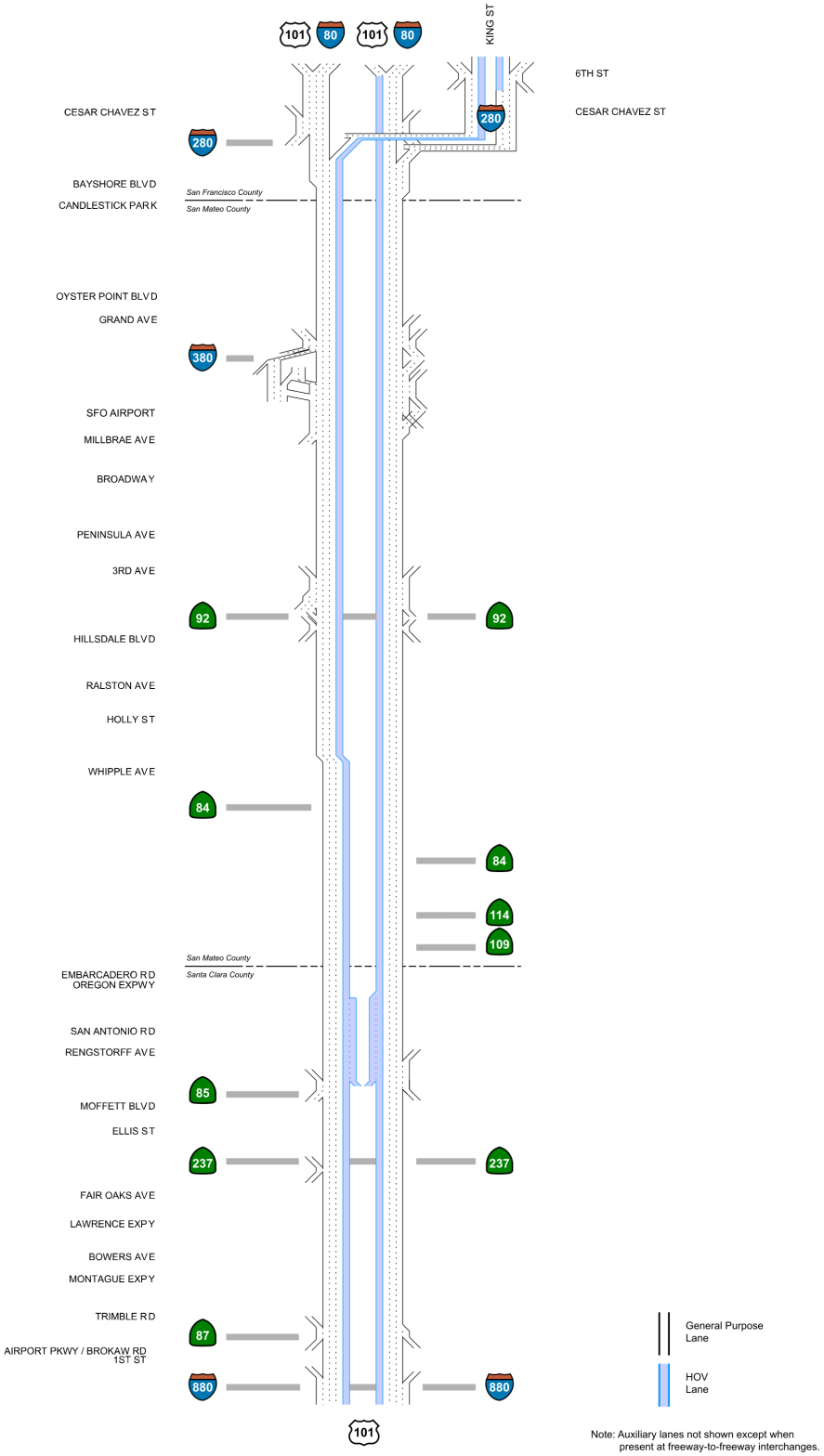


Figure 13. Highway 101 Vision Plan Preferred Lane Management

Blue indicates HOT/3+ lane.



Not requiring pavement or structures work, construction for the preferred concept would only include:

Roadway restriping

Updated roadway signage

Electronic toll equipment

Five recently completed or planned HOT lane projects in California were consulted to estimate the approximate capital/construction cost of the preferred concept. (See Figure 14.) Only conversion projects were considered; projects with roadway widening or major structural work involved significantly project costs. The average unit cost of these projects was $1.6 million per lane-mile converted.

Figure 14. Capital Costs of Recent Similar HOT Projects in California

Project	Project Phase	Cost (in millions)	Lane-Miles	Cost per Lane-Mile (in millions)
Los Angeles Express Lanes	In Operation	$ 129	78	$ 1.65
SR-237 Express Lanes (Phase I)	In Operation	$ 12	11	$ 1.07
I-680 Contra Costa Phase I	Under Construction	$ 45	25	$ 1.79
I-680 Walnut Creek to San Ramon	Under Construction	$ 45	23	$ 1.96
I-880 Alameda HOV Lane Conversion	Under Construction	$ 76	51	$ 1.49
Average				$1.59

Figure 15 gives estimated costs for the preferred concept, by county.

Figure 15. Vision Plan Preferred Concept: Project Costs, by County

County	Lane-Miles	Cost (in millions)
San Francisco	10.3	$ 16
San Mateo	52.2	$ 83
Santa Clara	33.2	$ 53
TOTAL	95.7	$ 152

Figure 16. Vision Plan: Highway Cost Detail

Project or Program	Fleet Cost	Capital Cost	Operations and Maintenance	Notes/Assumptions
Highway 101 Managed Lane (HOV/3+ - HOT/3+)	n/a	$20 million - $150 million	$10-15 million	Low cost assumes conversion to HOT lane, high capital costs assumes connecting auxiliary lanes to create new HOT lane. Assumes 96 miles, free access for buses/carpools, others pay dynamic fare. Source: C/CAG San Mateo – 101 HOV Lane Feasibility Study. Dowling/Kittelson & Associates, Inc., June 2012, unpublished. O&M costs based on average operating costs taken from six peer benchmarking projects.
Regional Bus Service	$40 million	n/a	$200 – 720 million	Assumes 20-25 bus routes, 15 hour service day operating on weekdays only, over 20 years. Source: Based on Samtrans regional bus operating costs.
Highway 101 Total	**$40 million**	**$20 -$150 million**	**$210 - $735 million**	

1.4 Ferry Cost Assumptions

Cost estimates for a Redwood City Ferry terminal, new ferry boats and for ferry service came from the WETA Strategic Plan (information verified by WETA staff).

Figure 17. Vision Plan: Ferry Cost Detail

Project or Program	Fleet Cost	Capital Cost	Operations and Maintenance	Notes/Assumptions
New Vessels	$80 million	n/a	n/a	Includes three new boats. Source: WETA
Ferry Operations	n/a	n/a	$260 million	60 minute service years 1-5 and 30 minute service years 5-20. Source: WETA
Port of Redwood City Ferry Landing		$40 million		New ferry terminal construction. Source: WETA
Ferry Total	**$80 million**	**$40 million**	**$260 million**	

1.5 Seamless Transit Cost Assumptions

The Seamless Transit programs are for the Caltrain Corridor specifically, although it is anticipated that there would be management of these programs at the regional level. For example, while integrated trip planning and payment systems are included in the Seamless Transit cost estimates, the vision plan assumes that there will continue to be a regional transit fare payment program (Clipper) and development of improved fare payment system (Clipper 2.0). The local funding would be use for policy development, technology and fare pilots, and local initiatives that exceed the capabilities of the regional programs.

Figure 18. Vision Plan: Seamless Transit Cost Detail

Project or Program	Fleet Cost	Capital Cost	Operations and Maintenance	Notes/Assumptions
Integrated trip planning and payment	n/a	$15 million	$10-$20 million	Planning, software and app development for integrated trip information, planning, and booking/fare payment, schedule coordination, mobility-on-demand. May be pilot projects that inform future regional initiatives. Modification of fare payment machines and signage. Assumes that Clipper will continue to be regional fare payment system – costs for Clipper not included here.
Targeted fare subsidies	n/a	n/a	$100 million	Lower cost-fare products/passes made available through a means-tested or needs-based program. Source: Based on peer comparison - Muni program $6 million over two years.
Coordinated long-range planning	n/a	n/a	$30 million	Long range corridor transportation, land use studies, environmental analysis, implementation and management.
Seamless Transit Total		**$15 million**	**$140-150 million**	

2. Revenue Detail

This section provides more background and detail about the revenue sources suggested in Chapter 10 of the vision plan. Note that the cost estimates provided in the Vision plan are high-level estimates, developed to understand the order-of-magnitude of revenue possible from each source. More detailed scenarios should be developed for each funding source.

Figure 19. Vision Plan Funding Sources Summary

Funding Source	Anticipated Revenue
1. Anticipated regional, state and federal revenue	$3.0 billion
2. Transit fares and highway tolls	$5.0 billion
3. Countywide sales tax	$2.0 billion
4. Corridor parcel tax	$2.5 billion
5. Local property-based and business-based funding	$3.0 billion
6. New regional and state funding	$3 billion
7. Public-private partnerships	TBD*
Total	$18.5 billion+

3. Revenue Assumptions

The majority of this revenue analysis was completed by NWC Partners, Inc.

3.1 Anticipated Regional, State and Federal Revenue ($3 Billion)

Many projects in the vision plan are already identified projects, in a queue for funding, in the Regional Transportation Plan (RTP). The RTP, developed by MTC in cooperation with local agencies every two years, sets the stage for all major capital and operating programs within the Bay Area. RTP projects are reprioritized every two years during the update process (most recently in 2016). While the funding is largely allocated based on formulas and existing agreements, advocacy on the part of agencies and business and civic leaders could lead projects in the vision plan to be prioritized and funded sooner.

Figure 20. Revenue Estimates for Regional Transportation Plan (Billions)

Fund Source	Plan Bay Area Revenue FY 12-13 to FY 39-40	Plan Bay Area 2040 Revenue FY 16-17 to FY 39-40	Difference (%)
Federal Fund Total	33.5	28.59	15%
State Funds Total*	45.6	55.61	22%
Regional Funds Total	36.9	44.07	19%
Local Funds Total	148.3	153.79	4%
Anticipated/Unspecified Total	14	14	0%
Other **	13.7	2.5	-82%
Total	292.00	298.56	2%

* Plan Bay Area 2040 includes anticiated funding for the Bay Area segment of the California High Speed Rail (HSR) project which was not inlcuded in Plan Bay Area. It also assumes a "Fuel Augmentation Measure" placeholder in light of current negotiations in the State Legislature.

**Note that the significant difference is due to the assigment of regional gas tax, Cap and Trade, and county managed express lane revneues to other categories in Plan Bay Area 2040 as compated to Plan Bay Area. "Other" now include ONLY San Francisco cordon congestion pricing.

Source: NWC Partners Inc. analysis

There are several revenue sources that are being considered or assumed for the upcoming RTP cycle in addition to those funds that come to the region via a state or federal formula. Consequently, any additional revenue source would need to consider whether potential generated funds have already been prescribed in order to determine the potential for additional revenue streams. The creation of these new funding pots is essential to maximize available RTP funding and therefore maximize vision plan project funding:

$2-$3 Regional Bridge Toll Increase

10¢ Regional Gas Tax (or Road Charges)

Unanticipated Revenue (such as Prop 1B, ARRA or other unidentified)

Other revenues such as San Francisco congestion pricing projects in Downtown and on Treasure Island

To determine what level of funding could be expected over the life of the RTP for the vision plan's corridor investments, we compared the corridor projects presented in the 2013 RTP to the discretionary

funding that was recommended for the projects. This included both expansion plans as well as those funds allocated to Caltrain for vehicle replacement and rehabilitation, and station improvements. In PBA 2040, the total revenue estimates are approximately 2% higher than the 2013 plan. It should also be noted that preliminary estimates for the transit capital backlog for the 2040 RTP has increased by 100%. This means that funding for expansion projects may be even harder within this RTP cycle.

In the 2013 plan, approximately $11.3 billion in total project costs were submitted for consideration. As seen in the figure below, approximately $2.6 billion—or about 23% of the total projects cost – was recommended for discretionary funds. However, when comparing the investments against the total RTP revenue in the 2013 plan, only about 0.87% of the total available revenue was recommended for the corridor projects. It should be noted that some projects in the 2013 plan were identified as fully funded such as HOT or Express lane implementation, as these projects generate revenue to offset the costs.

Figure 21. RTP Corridor Project Discretionary Funding, 2013

2013 Total RTP Revenue	2013 Total Corridor Project Costs	Discretionary Funding	Percentage of Project Cost	Percentage of Total RTP Revenue
292 Billion	11.3 Billion	2.553 Billion	23%	0.87%

Source: NWC Partners Inc. analysis

If the project priorities remain constant in Plan Bay Area 2040, it would be likely that similar recommendations for discretionary funds will be included in the plan. Using this logic, approximately 23% of the project cost, or $2.610 billion, would likely be recommended for the vision plan's corridor projects. While potentially one-quarter of the funding for some of the corridor projects could be expected from existing discretionary funding sources, significant new revenues would be needed to secure the vision plan's future investments.

In general, the following sources are used to fund the vision plan projects:

State Transportation Development Act (TDA)

State Transit Assistance (STA)

State Transportation Improvement Program/Regional Transportation Improvement Program (STIP/RTIP)

Regional Measure 2 Bridge Tolls (RM-2)

Sales Tax measure funds

Passenger Fares

Vehicle License Fees

The specific mix of capital funding depends on the type and timing of the capital investments. Some types of capital funding are limited in what they can purchase, and others are only available during a specific timeframe (such as bond proceeds). In general, the following funding sources have been used for the transit agencies' capital and/or operating programs:

Federal Transit Administration Section 5307, 5309 and 5339 Urbanized Area Formula Program

Transit Development Act funds (TDA)

State Transit Assistance (STA)

Regional bridge tolls (RM-1 and RM-2)

Proposition 1B

State Cap and Trade

New Funding Sources

With the total capital cost of all projects in the Caltrain Corridor Vision Plan anticipated to be at least $18 billion, which may or may not include those projects that are prioritized through the RTP process, a large infusion of private or local revenue would be needed on top of what is already anticipated through traditional methods. Figure 22 summarizes new funding sources that could be developed for this corridor. Those with the most promise were used to develop the funding proposal in the vision plan.

Figure 22. Potential New Funding Sources

Source	Eligible Uses	Type of Approvals	Level of Difficulty to Implement	Implementation Timeframe
Express (HOT) Lanes	Potential operating cost reductions	None for transit agency; benefits may or may not accrue when express lanes are implemented	Easy	5 – 10 Years
Bridge Tolls	Capital Operating	State legislative and Voter Approval	Difficult	Less than 5 Years
Vehicle Registration Fee	Capital Operating	State legislative approval to increase $10 cap Voter approval	Difficult	Less than 5 years
Regional Gas or Road Use Tax	Capital Operating	Voter Approval	Difficult	5 – 10 Years
Local Development Impact Fees	Capital Operating	Local legislative approval	Medium	Less than 5 years
Local Public Transit Assessment District	Capital	Transit agency and voter approval	Difficult	Varies by local jurisdiction
Regional Transportation Impact Fees (RTIF)	Capital Operating	Joint Authority approval	Medium	Less than 5 years
Parcel Taxes	Capital Operating	Local legislative and voter approval	Difficult	Varies by local jurisdiction
Property-Based Business Improvement District	Capital Operating	Approval by majority of impacted property owners	Medium	Less than 5 years
Business Based Improvement District	Capital Operating	Approval of property owners that will pay 50% or more of fee	Medium	Less than 5 years
Gross Receipts or Payroll Tax	Capital Operating	Local legislative approval	Medium	Less than 5 years
New Transportation Sales Taxes	Capital Operating	Local legislative and voter approval	Difficult	Varies by local jurisdiction
Parking Taxes and Revenues	Capital Operating	Local legislative approval	Medium	Varies by local jurisdiction
Transit Fare or Surcharge	Capital Operating	Transit Agency analysis and approval	Easy	Less than 5 years

Source	Eligible Uses	Type of Approvals	Level of Difficulty to Implement	Implementation Timeframe
Private Funding	Capital Operating	Agency or jurisdiction MOU	Easy	Less than 5 years

Source: NWC Partners Inc. Analysis

Bonding, Loans or Other Funding Instruments

While technically not a revenue generating mechanism, bonds or loans — such as the Transportation Infrastructure Finance and Innovation Act (TIFIA) or the Railroad Rehabilitation and Improvement Financing (RRIF) — can provide essential components of project delivery. Federal infrastructure loans and project bond financing is a type of borrowing that transit agencies, states and local governments frequently use to raise money, primarily for long-lived infrastructure assets. Government bonds generate funding by selling the bonds to investors. In exchange, they promise to repay this money, with interest, according to specified schedules. Federal infrastructure loans (TIFIA and RRIF) provide direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance.

There are a variety of ways that these funding instruments can be secured, whether it is through tax increments from redevelopment, sales tax, development impact fees, special assessment district revenues, land sales proceeds or other methods. However, unless those methods of fund generation are in place, these mechanisms would not be feasible.

3.2 Transit Fares and Highway Tolls ($5 Billion)

Transit fare revenue is commonly used to fund transit in the Bay Area. Transit fare surcharges can be levied to pay for specific improvements, with the approval of the transit agency (for example BART's SFO surcharge). Surcharges were not considered in the vision plan proposal.

For the vision plan fare revenue estimates, the assumption for fare revenue from each passenger used was $5.00 (2016 dollars), similar to today's average Caltrain fare.

Figure 23. Estimated Fare Revenue per Phase

Phase	Number of Years	Average Boardings Each Weekday (per day)	Average Boardings Each Weekend Day (per day)*	Estimated Fare Revenue for Phase
Short Term (pre-electrification)	4	60,000	20,000	$353,600,000
CalMod	3	84,000	28,000	$371,280,000
CalMod 2.0	1	125,000	41,667	$184,166,667
Rail Modernization 3.0	4	269,000	89,667	$1,585,306,667
Rail Modernization 4.0	5	269,000	89,667	$1,981,633,333
Rail Modernization 5.0	2	312,000	104,000	$919,360,000
Total:				**$5,041,746,667**

*Weekend riders estimated to be one-third of weekdays riders, similar to today's ratio.
Source: SPUR Analysis

Highway Tolls were estimated based on annual net revenue (after operating costs) per lane mile of $290,000, based on comparable projects. (see Figure 16 of the vision plan for more detail). Over 17 years and across 49 lane miles (including both directions), this accrues to approximately $241,570,000.

3.3 Countywide Sales Taxes ($2 Billion)

Arguably the hardest tax to approve through referendum, sales tax provides a stable funding stream that can grow as the economy grows. It can also fluctuate during an economic downturn. Unlike parcel taxes that remain more static over time in built-out environments, sales taxes provide a relatively stable funding source that can also be the basis of bonding mechanisms to support project delivery or pay for operating programs such as bus or rail service. Actual sales tax revenue fluctuates with the amount of sales (which includes business-to-business sales).

Sales taxes are currently limited to 2.0% above the statewide tax rate of 7.5%. However, local sales taxes can push the total to as high as 10.0%. Currently, all three Caltrain corridor counties have transportation sales tax measures in place. However, because the statewide Proposition 30 ¼ cent sales tax expired on December 30, 2016, the existing sales tax rate was reduced. An additional ¼ cent sales tax in the three counties would render approximately $7.4 billion over 30 years. Figure 24 presents several sales tax scenarios.

At a rate of a half-cent per dollar spent, sales taxes across the three corridor counties would generate approximately $352,000,000 annually. This study assumed that one-third of sales tax funding would be used for vision plan projects (rail, stations, highway, first- and last-mile connections, seamless transit). A time period of 17 years was chosen to overlap with the years during which vision plan projects should be implemented. Typically, sales taxes are in place for 20, 30 or more years.

Santa Clara County Measure B, which passed on the November 2016 Ballot, raises between $6 billion and $6.5 billion, including $700 million of program tax revenues for grade separations and $314 million for Caltrain Corridor Capacity Improvements.[8]

Figure 24. Sales Tax Revenue Scenarios

		Additional 1/4 c		Additional 1/2 c		Additional 1/8 c	
Existing Measure	Annual Estimate	Annual Estimate	30 Year Est. (millions)	Annual Estimate	30 year Est. (millions)	Annual Estimate	30 year Est. (millions)
San Francisco Prop K (1/2 Cent)	$80 million	$40 million	$ 1,674.54	$80 million	3,349.08	$20 million	837.27
Rate: 8.75%		9.00%		9.25%		8.875%	
San Mateo Measure A (1/2 c)	$72 million	$36 million	$ 1,507.09	$72 million	3,022.81	$18 million	753.54
Rate: 9.0% (9.5%: SSF)		9.25%		9.5000%		9.125%	
Santa Clara Measure A (1/2 c)	$200 million	$100 million	$ 4,186.35	$200 million	8,372.71	$50 million	2,093.18
Rate: 8.75% (9.0%Campbell)		9.00%		9.25%		8.875%	
	$352 millon		$ 7,367.98		14,744.60		3,683.99

Annual Estimate References
Prop K: Adoption of Draft 2014 Prop K Strategic Plan
SM Measure A: SMCTA Strategic Plan
SC Measure A: 2nd Quarter 2016 estimates (www.www.vta.org/about-us/2000-measure-a-sales-tax-revenue

Source: NWC Partners Inc. analysis

3.4 Corridor Parcel Tax ($2.5 Billion)

Parcel taxes can provide a stable revenue stream. Additionally, because these taxes are levied on a parcel basis, and are not indexed to inflation, it is easy to estimate their worth over time and bond against them to assist project delivery. Additionally, Parcel taxes can be used to fund both capital and operating expenses, if needed. Figure 25 presents an estimate for several parcel taxes scenarios.

[8] https://www.sccgov.org/sites/rov/Info/Nov2016Info/Documents/E110%20-%20Measure%20B.pdf

Figure 25. Parcel Tax Revenue Estimates

	2015 Total Parcels	Total (Assumes 10% Exempt)	$25 per parcel	30 Year Estimate	$50 per parcel	30 Year Estimate	$100 per parcel	30 Year Estimate
Santa Clara	474,789	427,310	$ 10,682,753	$ 320,482,575	$ 21,365,505	$ 640,965,150	$ 42,731,010	$ 1,281,930,300
San Mateo	220,642	198,578	$ 4,964,445	$ 148,933,350	$ 9,928,890	$ 297,866,700	$ 19,857,780	$ 595,733,400
San Francisco	206,953	186,258	$ 4,656,443	$ 139,693,275	$ 9,312,885	$ 279,386,550	$ 18,625,770	$ 558,773,100
3 County Total	902,384	812,146	$ 20,303,640	$ 609,109,200	$ 40,607,280	$ 1,218,218,400	$ 81,214,560	$ 2,436,436,800

Notes

Exemption rate not known.

Sources

Santa Clara County Assessor Annual Report FY 2015-16

San Mateo County Assessors Annual Report 2015

San Francisco County Assessor Annual Report FY 2015

Source: NWC Partners Inc. Analysis

3.5 Local Property-Based and Business-Based Funding ($3 Billion)

There are a multitude of local property-based and business-based funding options, which would be additive to anticipated transportation funding. These strategies could bring in significant revenue and be easily implemented. A few of the more promising types of local funding are described here.

Property Based Business Improvement Districts (PBID) or Business Based Business Improvement District (BBID)

A PBID or a BBID is a self-imposed and self-governed property tax assessment that enhances the base level of services within a business district. Property owners can form the PBID or BBID and develop the methodology for assessment and management of the funds. Uses of the funds are limited to those developed during the formation of the BID. The benefits of BIDs are that they provide stable funding for the term of the agreement. However, their term must go through a renewable process after five years. Unlike Business Improvement Area funds that are generated by business license fees, BIDS must engage all property owners, who tend to have long term investments in the area and may share community improvement goals. Because BIDs are based upon an agreed upon universe of projects or services, then an assessment is formed to address those services, estimating how much funding could be available from the formation of a BID would require more careful scrutiny.

Enhanced Infrastructure Financing District (EIFD)

An EIFD can be created within a city or county and used to finance the construction or rehabilitation of public infrastructure. Based on a SB 628, which sought to provide a value capture mechanism after the repeal of redevelopment in California, EIFDs may fund facilities and development with the property tax increment taxing agencies (cities, counties, special districts, but not schools) that consent. The city or county must adopt an Infrastructure Financing Plan that describes the type of public facilities, infrastructure or development that will be financed by the EIFD. Certain restrictions apply regarding the dissolution of former redevelopment areas.

A variety of funding sources may be available to fund the plan; most likely property tax increment generated within the EIFD area. However, the Infrastructure Financing Plan must include consultation with the taxing entities to determine their concurrence on transferring their share of the property tax increment or other eligible revenue. Bonds can be issued payable from funds or properties within the EIFD with a 55% voter approval of either voters or landowners. Public notice during the development of the plan is required so that landowners, taxing agencies and the public will have an opportunity to provide input.

Gross Receipt Taxes

Gross receipts tax or gross excise tax is a tax on the funds received from the sale of goods or services, regardless of their source. A gross receipts tax is similar to a sales tax, but it is levied on the seller of goods or service consumers. These are the most common business tax bases among the state's largest cities. Tax rates of businesses vary by industry because some sectors, like wholesale trade, have a very low profit margin. While a vote of the electorate is required for these taxes, they traditionally have a greater success than sales tax, as the taxes are levied against employers and businesses. The benefits of these taxes are similar to sales taxes, in that they provide a stable, if fluctuating, revenue stream. Based on the gross sales figures for the three counties, a fairly small percentage tax (0.25%) can generate fairly significant annual revenues. Figure 26 provides an estimate for several countywide tax scenarios:

Figure 26. Gross Receipts Tax Estimates

County	Estimated Gross Receipts*	Annual Generated at 0.25%	Annual Generated at 0.5%	Annual Generated at 0.10%
San Francisco County	$175.9	$439,694,518	$879,389,035	$ 175,877,807
San Mateo County	$148.4	$370,875,083	$741,750,165	$ 148,350,033
Santa Clara County	$351.4	$878,392,833	$1,756,785,665	$ 351,357,133
		$1,688,962,433	$3,377,924,865	$ 675,584,973
	At 30 years	70,705,942,407	$ 141,411,884,813	$ 28,282,376,963

*2012 Census Survey

Source: NWC Partners Inc.

3.6 New Regional and State Funding ($3 Billion)

The vision plan recommends pursuing entirely new funding streams to grow funding for the Caltrain Corridor. The options are:

1. Pass a new regional transportation revenue measure: $2 billion. This could be based on a tax or fee and could include major regional transportation investments, similar to Los Angeles County Measure M (2016) or Seattle's Sound Transit series of parcel taxes. In 2016, almost 70 percent of Los Angeles voters passed Measure M, a one-cent sales tax that would raise $860 million per year to fund a $120 billion mix of capital and operating funding for transit, highway and local transportation projects over the next 40 years. The Measure M package includes doubling the size of LA Metro's rail system (100 new miles). The same year, Seattle voters approved Sound Transit 3, $54 billion capital and operating program which funds doubling the length of the light rail system (nearly 62 new miles and 80 new stations) over 25 years.

2. Expand regional and state proposals to price driving and carbon: $500 million. Key state opportunities are a carbon tax and a vehicle-miles-traveled tax. Adding to the cost of driving has an additional benefit of creating new demand for transit.

3. Work at the state level to create a new or augmented revenue source similar to cap-and-trade: $500 million.

3.7 Public-Private Partnerships (To Be Determined)

Opportunities for private investment such as concessions and public private partnerships need to be identified and pursued in the Caltrain Corridor. Project sponsors such as PCJPB or the Countywide Agencies should develop a concerted action plan to identify and carve out portions of the vision plan that could be turned over to the private sector for investment, project delivery, operations or all three. Selected elements of the vision could be accomplished via a public-private partnership (P3), an agreement between a government agency and a private sector entity that participates in delivering a public sector project. Contrasted with traditional models, the private sector assumes a greater role in the planning, financing, design, construction, operation and maintenance of public facilities. P3s transfer risks to the private sector, reduce costs, increase certainty of execution, accelerate funding and accelerate project completion.

While P3s are still emerging in California and the United States, they are increasingly common around the world. A local example is San Francisco's project to replace Doyle Drive with the Presidio Parkway, where a concessionaire was brought on to design, build, finance, operate and maintain the project for 30 years. Some P3s could be strictly concessions. For example, WETA could build a series of ferry terminals with public funding and invite the private sector to submit proposals to provide the ferries and operate the service. Other options could include concessions to operate bus lines, shuttles, ferries, rail lines or toll lanes. The possibilities are many and should be explored. This effort would include private sector outreach by agencies and civic leaders to help identify which portions of the vision could be delivered with private participation and investment, as well as the type of arrangement that would be the most appropriate in each case.

Private grants, or cost-sharing agreements, are another way that private funds could help pay for vision plan elements. A potential upside of private funding is that it can be less restrictive than public funding.