

# Caltrain Extension to Monterey County Alternatives Analysis

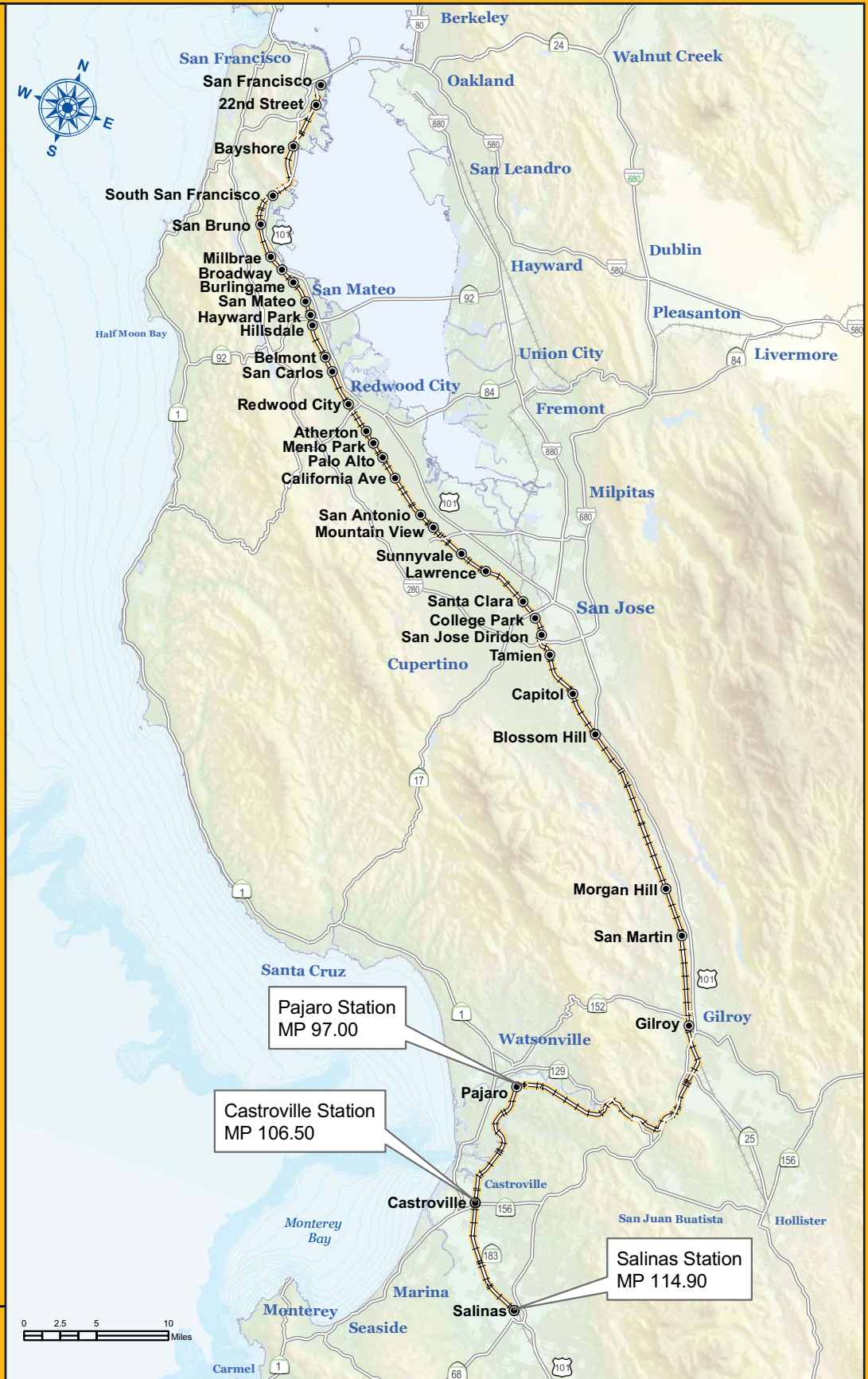
Prepared for



## Ridership Validation Report

January 2009

# PARSONS



**CALTRAIN EXTENSION  
TO MONTEREY COUNTY**

# Alternatives Analysis

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by

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## SUMMARY

The Draft *Caltrain Extension to Monterey County Alternatives Analysis* was published in September 2006. Following a review by the Peninsula Corridor Joint Powers Board and Federal Transit Administration staff, additional information was added, and the draft report was republished in April 2007. Further review by the Federal Transit Administration staff recommended use of a traditional regional travel demand model for the development of the ridership forecasts, plus consideration of a reduced scope/cost baseline alternative.

A suitable, regional travel demand and mode choice model, calibrated by the Santa Clara Valley Transportation Authority, became available for use in 2008. This model, which includes both commuter rail and express bus modes as well as other modes, was used to produce the ridership forecasts which are listed in this report. Additional validation efforts were performed to verify the accuracy of the model calibration parameters, both for Caltrain service between Gilroy and San Francisco, and Altamont Commuter Express service between Stockton and San Jose.

The results of the VTA model application indicate ridership potentials for the Caltrain extension which are higher than the previously reported estimates which were based on sketch planning methods. No alteration or adjustment was made to the VTA model, demographic data set, or highway and transit networks other than to extend commuter rail or express bus service between Santa Clara and Monterey/Santa Cruz counties. More conservative maximum wait time penalties were assumed compared with VTA ridership validation checks. Ridership results were also adjusted downward to reflect county to county observed peak period traffic flows.

Assuming Year 2005 baseline demographic conditions and 2006 service levels, the Caltrain extension to Salinas would be sufficient to warrant three-train service in each direction in the near-term based on the VTA model results (2,712 riders per day). This forecast is higher than the sketch planning estimate of 2,056 riders based on pre-recession Year 2010 expected conditions.

This ridership validation effort also tested an Enhanced Shuttle Bus to Gilroy option, operating between park-and-ride lots constructed in Salinas, Castroville and Pajaro/Watsonville. This test assumed the express bus mode, and attracted 1,386 daily riders based on the VTA model results. Given the equipment recycle time of over two hours per round trip, this service would be only marginally less expensive to operate compared with the express bus service alternative documented in the Draft *Caltrain Extension to Monterey County Alternatives Analysis* report.

While not a consideration for Small Starts funding requests, this ridership validation effort also prepared a long-range, Year 2035 forecast. This long-range forecast assumed electrified passenger rail service north of San Jose, and shuttle diesel powered rail service between San Jose and Salinas. The ridership potential indicated by this test scenario was 7,300 to 7,500 riders per day. This forecast was higher than the sketch plan estimate of 3,926 riders per day by Year 2030.

By way of reference, ridership on the Altamont Commuter Express, a line and service similar to that proposed, during the first quarter of fiscal year 2009 (July 1, 2008 through September 30, 2008) averaged 3,697 riders per weekday.

## 1. OVERVIEW

The Transportation Agency for Monterey County proposes to extend existing Caltrain commuter rail service, which currently runs between San Francisco and Gilroy, California, 38 miles south to Salinas, with intermediate stops in Pajaro/Watsonville and Castroville, serving the Monterey Peninsula.

The existing Caltrain commuter rail service is administered and operated by the Peninsula Corridor Joint Powers Board—a three-member agency comprising the City and County of San Francisco, the San Mateo County Transit District, and the Santa Clara Valley Transportation Authority (VTA).

Caltrain is the commuter rail system that has linked San Francisco Bay Area peninsula communities with one another for more than 130 years. The service currently spans 77 miles and includes 30 stations.

Figure 1 illustrates the existing and proposed regional passenger rail network, which includes Caltrain service between San Francisco and Gilroy, Amtrak's Capitol Corridor service between Sacramento and San Jose, and the Altamont Commuter Express, which operates between Stockton and San Jose. The graphic also illustrates the proposed service extension from Gilroy to Salinas, and an inactive proposal for a service extension from Gilroy to Hollister in San Benito County.

## 2. PROJECT HISTORY

The proposed Caltrain commuter rail extension project has evolved over a 16-year timeframe. System level planning conducted from 1992 to 2000 led to a commitment of state and local funding in 2000. This funding commitment was contingent upon the approval of a project initiation document by the California Transportation Commission, suitable cost benefit findings, and state environmental document findings.

Between 2002 and 2006, the Transportation Agency for Monterey County, the local sponsor of the proposed project, undertook corridor level studies and site specific analysis to meet state planning, environmental, and cost effectiveness requirements, and to meet Federal Transit Administration guidance regarding planning-level Alternatives Analysis required for federal Small Starts funding. The Transportation Agency for Monterey County followed these requirements and guidance by undertaking three planning/environmental processes in parallel—a Project Study Report, an Environmental Assessment/Environmental Impact Report, and an Alternatives Analysis.

To meet State of California requirements for a Project Initiation Document, a Project Study Report (PSR) was begun in 2002 and completed in 2006. The lengthy timeframe required to prepare this document resulted from extensive public involvement regarding the definition and design of project components and their physical locations.

In parallel with the PSR, environmental studies were begun in 2002. The State of California Department of Transportation (Caltrans), joint local sponsor of the proposed project, notified the Federal Department of Transportation about the project on June 12, 2002. An Initial Study was subsequently prepared pursuant to Section 15063 of the California Environmental Quality Act (CEQA) guidelines, and was published in July 2003. A Notice of Preparation for the *Caltrain Extension to Monterey County Project Draft Environmental Impact Report* was subsequently issued on September 2, 2003 to notify the public and interested agencies of the proposed project. The intent of the Notice of Preparation and Initial Study was to solicit comments about the environmental impacts of the project and to request assistance from stakeholders in identifying key issues that the

**Figure 1**  
**Existing and Proposed Regional Passenger Rail Network**



Environmental Assessment/Environmental Impact Report should address and evaluate. As the definition of the build alternative was being finalized in 2005, a joint CEQA/National Environmental Policy Act (NEPA) document was prepared. To meet state funding schedules, this document was circulated as a Draft Environmental Impact Report on April 26, 2006. The CEQA document was finalized as a Final Environmental Impact Report on August 23, 2006, following receipt and response to public and agency comment. The California Transportation Commission certified this Environmental Impact Report on September 7, 2006 and programmed \$22 million in state funding to the project on that date.

In conjunction with the State Project Initiation document and CEQA process, a corridor level Alternatives Analysis planning process was undertaken, extending from 2002 to 2006/2007. The Alternatives Analysis process narrowed modal and alignment alternatives from eight conceptual options to three detailed alternatives: a no-build, transportation system management, and build alternative for the project corridor.

A NEPA document was originally prepared in 2006. This document was subsequently expanded to address FTA comments, and published as an Administrative Draft Environmental Assessment on February 12, 2007. This document has not been formally reviewed by the Federal Transit Administration with such review awaiting the Federal Transit Administration's concurrence with this ridership validation effort.

### **3. FEDERAL TRANSIT ADMINISTRATION CONCERNS**

The Federal Transit Administration reviewed the Caltrain Extension to Monterey County Alternatives Analysis report in 2007 and expressed concern that the capital cost of the baseline (Express Bus) alternative was too high relative to the Build (Commuter Rail) Alternative. The Federal Transit Administration also questioned the magnitude of the Build Alternative ridership forecasts, given their reliance on sketch planning methods as well as falling ridership trends at the south Santa Clara County Caltrain stations.

Table 1 lists Caltrain weekday passenger boardings by station, with year-by-year detail provided for 1992 through 2008. The table shows that boardings at the Gilroy station grew by 408 percent between 1992 and 2001, more than at any other station. Total Caltrain boardings grew 81 percent during this 10-year period.

During 2002 through 2005, boardings at almost every station declined as overall Caltrain ridership fell. (Stations served by "Baby Bullet" trains, i.e., Diridon, Mountain View, Palo Alto, Hillsdale, Millbrae, experienced increased ridership.) This diminished ridership can be attributed to the concurrent regional economic downturn and was therefore projected to be short-lived. Table 1 indicates that 2008 ridership has recovered to 2001 levels, in part due to increased service. The Peninsula Corridor Joint Powers Board (JPB) now operates 98 weekday trains between San Jose Diridon Station and downtown San Francisco.

As indicated in Table 1, Caltrain ridership has been rising since 2004. Ridership counts collected in February 2008 indicate that system ridership has surpassed the previous peak ridership recorded in February 2001. Rising gasoline fuel prices have contributed to push Caltrain ridership even higher since February 2008. During the first quarter of fiscal year 2009 (July 1, 2008 through September 30, 2008), Caltrain carried an average of 44,916 riders per weekday. This ridership trend is illustrated on Figure 2.

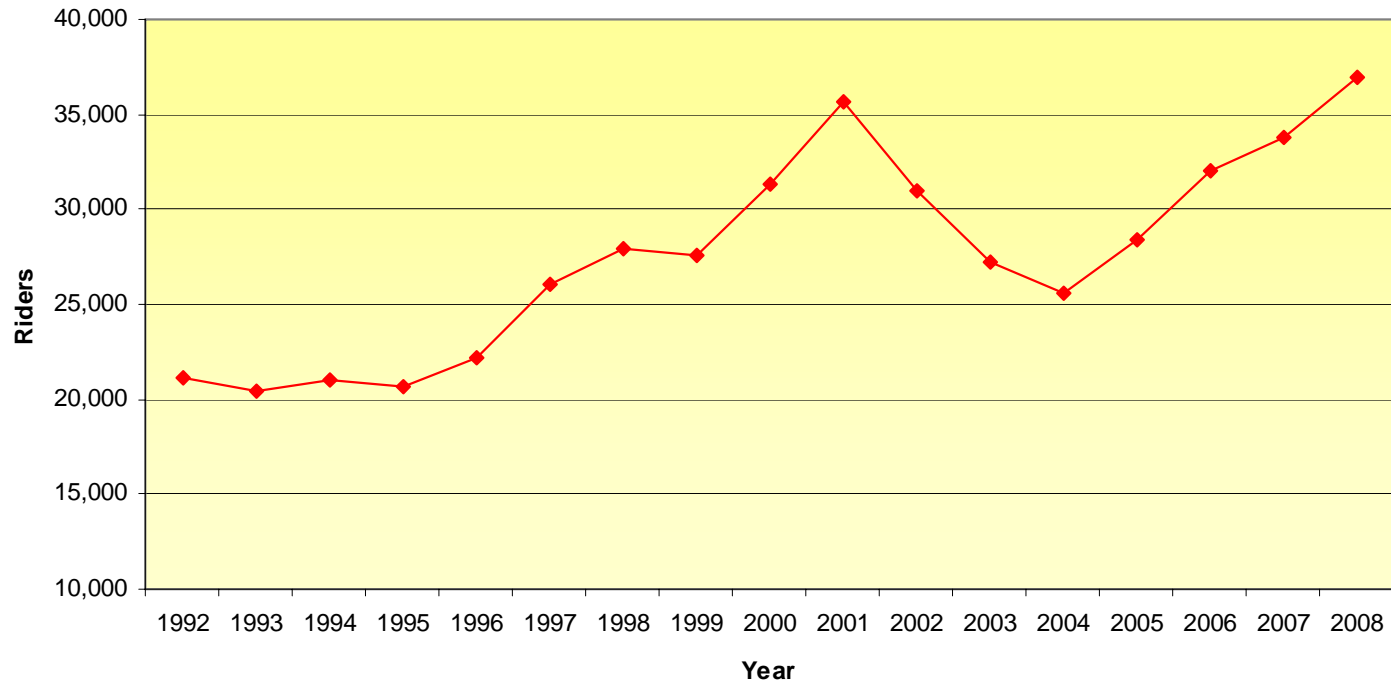
**Table 1**  
**Caltrain Weekday Passenger Boardings**

Station	Oct '92	Apr '93	Mar '94	Feb '95	Mar '96	Feb '97	Feb '98	Feb '99	Feb '00	Feb '01	Feb '02	Feb '03	Feb '04	Feb '05	Feb '06	Feb '07	Feb '08	Station
San Francisco	6,280	5,680	5,795	5,303	5,536	6,126	6,302	5,898	6,602	6,807	6,180	5,846	5,065	5,910	7,155	7,672	8,306	San Francisco
22nd Street	208	206	242	235	297	397	517	510	574	673	524	456	382	545	797	836	872	22nd Street
Paul Avenue	52	50	35	37	37	17	20	6	11	10	25	9	6	1	—	—	—	Paul Avenue
Bayshore	169	215	194	170	241	316	402	403	458	513	463	403	344	247	166	171	166	Bayshore
South San Francisco	418	412	397	392	398	521	509	517	549	621	597	510	472	487	521	548	373	South San Francisco
San Bruno	454	500	529	529	578	650	694	704	723	844	762	659	505	488	412	414	450	San Bruno
Millbrae	501	550	558	549	543	618	698	655	782	870	776	657	1,148	1,507	1,816	1,917	2,425	Millbrae
Broadway	336	377	378	392	377	430	464	423	495	567	492	433	333	205	—	—	—	Broadway
Burlingame	546	581	566	618	638	674	686	755	842	985	884	726	645	604	588	610	646	Burlingame
San Mateo	589	623	648	633	719	845	905	957	1,105	1,389	1,302	1,084	1,004	1,062	1,238	1,300	1,441	San Mateo
Hayward Park	211	210	203	198	216	299	275	320	381	607	565	447	417	347	244	231	210	Hayward Park
Bay Meadows	127	129	70	2	134	180	167	154	62	67	70	57	65	71	10	—	—	Bay Meadows
Hillsdale	920	917	918	961	1,038	1,156	1,193	1,163	1,278	1,318	1,193	1,065	1,080	1,487	1,815	1,850	1,957	Hillsdale
Belmont	554	519	566	529	554	506	548	590	648	892	770	629	568	518	435	412	426	Belmont
San Carlos	620	638	703	749	716	835	878	865	1,028	1,216	987	848	816	836	867	860	928	San Carlos
Redwood City	764	725	807	778	874	1,142	1,286	1,331	1,597	1,804	1,597	1,356	1,360	1,423	1,870	1,934	2,154	Redwood City
Atherton	299	275	243	240	230	250	206	225	266	260	246	198	182	122	—	—	—	Atherton
Menlo Park	859	815	796	863	847	1,017	1,133	1,104	1,174	1,321	1,194	1,034	1,055	1,009	1,171	1,224	1,393	Menlo Park
Palo Alto	1,020	991	1,075	1,162	1,242	1,610	1,706	1,693	1,960	2,249	2,016	1,880	1,849	2,425	3,054	3,307	3,672	Palo Alto
Stanford	—	—	3	0	0	0	18	14	12	11	—	—	—	—	—	—	—	Stanford
California Avenue	881	929	922	974	950	1,125	1,163	1,211	1,280	1,376	1,225	1,026	976	839	822	825	917	California Avenue
San Antonio	—	—	—	—	—	—	—	—	550	841	694	644	697	610	488	525	551	San Antonio
Castro	276	268	263	263	236	246	281	271	111	—	—	—	—	—	—	—	—	Castro
Mountain View	962	887	980	1,023	1,162	1,369	1,477	1,478	1,640	2,200	1,854	1,644	1,519	2,423	2,764	2,999	3,137	Mountain View
Sunnyvale	814	816	872	828	1,001	1,204	1,214	1,230	1,363	1,427	1,222	1,020	1,149	970	1,342	1,508	1,825	Sunnyvale
Lawrence	601	522	575	558	687	822	965	981	1,124	1,309	956	773	593	534	514	544	565	Lawrence
Santa Clara	558	587	570	579	554	770	809	863	1,031	1,124	991	853	798	706	657	663	673	Santa Clara
College Park	161	132	169	150	154	167	197	178	206	185	180	184	192	133	97	98	97	College Park
San Jose Diridon	1,352	1,317	1,118	1,092	1,197	1,486	1,616	1,492	1,454	1,747	1,421	1,244	1,183	1,906	2,270	2,422	2,750	San Jose Diridon
Tamien	287	332	359	382	468	492	531	526	676	821	634	520	480	343	446	532	610	Tamien
Capitol	—	—	25	33	39	54	76	63	95	121	82	67	56	57	29	36	34	Capitol
Blossom Hill	52	54	85	84	91	128	148	119	161	177	136	130	101	99	77	69	67	Blossom Hill
Morgan Hill	138	88	124	128	151	195	318	297	387	437	340	276	194	191	151	129	143	Morgan Hill
San Martin	—	46	51	63	51	95	170	175	200	252	164	158	91	78	72	63	57	San Martin
Gilroy	112	90	143	198	182	300	394	420	468	569	421	357	226	210	141	144	149	Gilroy
<b>TOTAL</b>	<b>21,121</b>	<b>20,481</b>	<b>20,982</b>	<b>20,695</b>	<b>22,138</b>	<b>26,042</b>	<b>27,966</b>	<b>27,591</b>	<b>31,293</b>	<b>35,610</b>	<b>30,963</b>	<b>27,193</b>	<b>25,551</b>	<b>28,393</b>	<b>32,029</b>	<b>33,843</b>	<b>36,994</b>	

Source: Peninsula Corridor Joint Powers Board



**Figure 2**  
**Caltrain Annual Weekday Ridership Trend**



While overall Caltrain ridership declined from 2001 to 2005 and has since recovered to Year 2001 levels, ridership boarding at stations in southern Santa Clara County continued to lose ridership. Figure 3 illustrates the sharp rise and fall of the number of passengers boarding at the five southernmost stations, i.e., Capitol to Gilroy. The reasons for this ridership decline are well known, as follows.

1. Overall Caltrain ridership declined from 2000 to 2004 in direct proportion to total industry employment in Santa Clara, San Mateo and San Francisco counties.
2. Caltrain ridership boarding at south Santa Clara County stations declined from 2000 to 2003 in slightly greater than direct proportion to the decline in total industry employment in Santa Clara County.
3. U.S. 101 was widened from four lanes to eight lanes between Morgan Hill and South San Jose for a distance of 11 miles. The widening alleviated northbound AM and southbound PM congestion and raised average speeds on U.S. 101. The project was completed in June 2003 and resulted in the 33 percent loss of Caltrain ridership boarding at south county stations between 2003 and 2004.
4. Caltrain service to south Santa Clara County stations was reduced in August 2005 from four weekday round trips to three weekday round trips. In addition, the schedule of one of the remaining trains in each direction was revised to skip one-half of the station stops in northern Santa Clara County. For south Santa Clara County residents, Caltrain service was effectively reduced by one-third. South Santa Clara County ridership fell by 26 percent following the service reduction.

The ridership estimates contained in the Alternatives Analysis report were based on Year 2000 commute conditions, when employment was higher in San Jose, congestion was more severe on Highway 101 and Caltrain service was better insofar as south Santa Clara County commuter needs. As the baseline (Express Bus) ridership was set equal to the build (Commuter Rail) alternative ridership, for capital and operating and maintenance costing purposes, Federal Transit Administration staff questioned the reliability of the forecasts and the resulting cost effectiveness comparison.

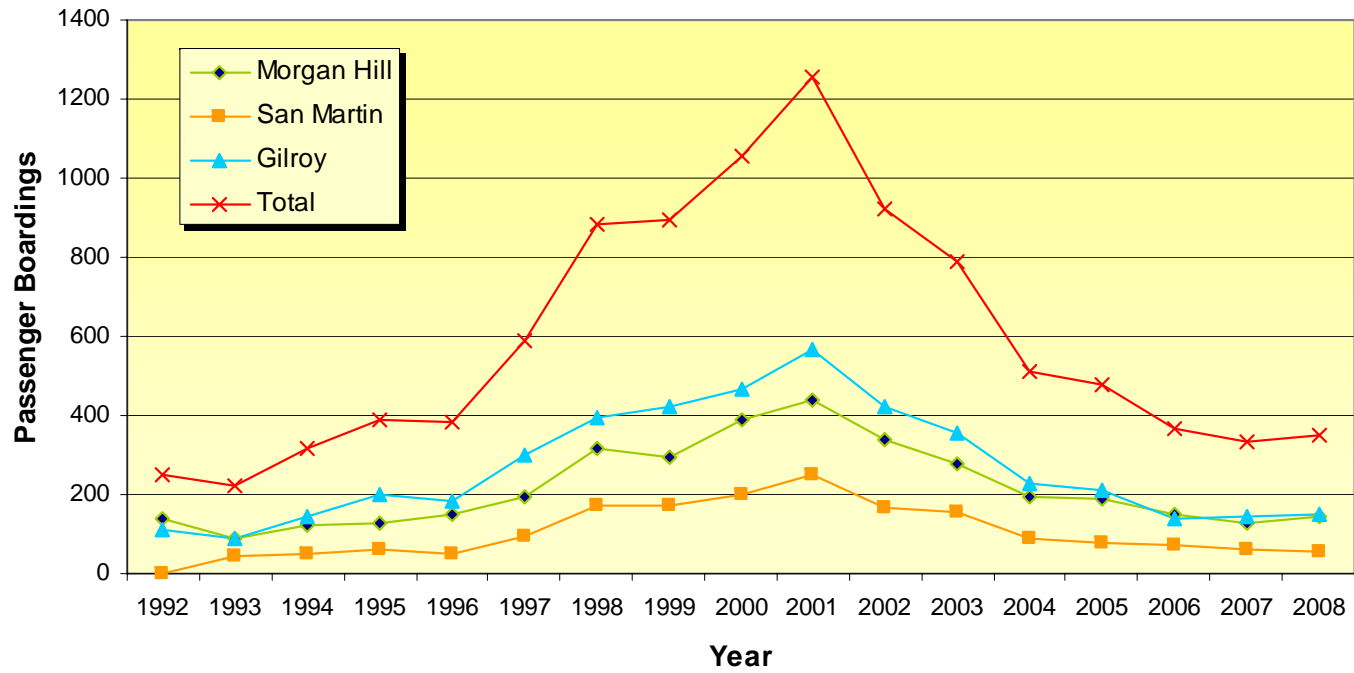
The purpose of this report is to address these concerns insofar as the ridership forecasts.

#### **4. RIDERSHIP VALIDATION METHODOLOGY**

At the time the Project Study Report and the Alternatives Analysis reports were prepared, no reasonably calibrated four-step travel demand model was available for application on this project, nor did the Small Starts level of funding warrant the development and calibration of a mode choice model specifically for this project.

Subsequent to the Federal Transit Administration's 2007 review of the Alternatives Analysis report, the Santa Clara Valley Transportation Authority (VTA) made sufficient progress with their own model calibration, that it could be applied to this commuter rail extension project. This model was initially obtained from the VTA in October 2007, but continued model enhancements and refinements delayed its application until summer and fall 2008.

**Figure 3**  
**Caltrain Weekday Passenger Boardings for South Santa Clara County**



Documentation of the VTA model used for this application is appended to this document. Along with the model, VTA furnished the results of a model validation check reflecting 2006 Caltrain service levels compared to 2006 and 2007 observed results. These results are reported in Table 2 and Table 3. The check indicates that overall, the VTA model slightly overestimated 2006 ridership counts, but was very close to system-wide 2007 counts.

**Table 2**  
**2006 Caltrain Daily Ons and Offs Summary**

Station	Ons Model	Offs Model	2006 Modeled Ons and Offs	2006 Observed Ons and Offs	Est 2006/ Obs 2006	2007 Observed Ons and Offs	Est 2006/ Obs 2007
San Francisco	3,808	10,602	14,410	14,216	1.01	15,456	0.93
22nd Street	1,024	179	1,203	1,595	0.75	1,697	0.71
Bayshore	908	101	1,009	342	2.95	337	3.00
South San Francisco	424	1,026	1,450	1,056	1.37	1,147	1.26
San Bruno	818	233	1,051	814	1.29	800	1.31
Millbrae	2,070	1,084	3,154	3,675	0.86	3,938	0.80
Burlingame	713	594	1,307	1,163	1.12	1,195	1.09
San Mateo	1,466	864	2,331	2,441	0.95	2,551	0.91
Hayward Park	292	390	682	492	1.39	464	1.47
Hillsdale	2,602	1,046	3,648	3,548	1.03	3,625	1.01
Belmont	453	475	928	843	1.10	800	1.16
San Carlos	797	1,066	1,862	1,749	1.06	1,781	1.05
Redwood City	2,342	1,472	3,813	3,630	1.05	3,798	1.00
Menlo Park	1,117	872	1,989	2,438	0.82	2,469	0.81
Palo Alto	2,135	4,245	6,379	6,242	1.02	6,711	0.95
California Avenue	425	1,213	1,638	1,617	1.01	1,623	1.01
San Antonio	765	362	1,127	975	1.16	1,030	1.09
Mountain View	2,110	2,887	4,997	5,519	0.91	5,933	0.84
Sunnyvale	2,371	510	2,881	2,675	1.08	2,974	0.97
Lawrence	464	1,051	1,515	1,049	1.44	1,097	1.38
Santa Clara	700	883	1,583	1,380	1.15	1,319	1.20
College Park	4	83	87	244	0.36	252	0.35
Diridon	3,193	1,928	5,121	4,568	1.12	4,837	1.06
Tamien	1,258	210	1,468	889	1.65	1,006	1.46
Capitol	176	4	179	56	3.20	68	2.65
Blossom Hill	185	82	267	146	1.83	134	1.99
Morgan Hill	299	27	326	283	1.15	244	1.33
San Martin	196	33	229	121	1.89	110	2.08
Gilroy	402	0	402	276	1.46	286	1.41
	<b>33,517</b>	<b>33,517</b>	<b>67,035</b>	<b>64,042</b>	<b>1.05</b>	<b>67,681</b>	<b>1.55</b>
<b>By Segments</b>							
San Francisco to Burlingame	9,052	13,224	22,276	21,698	1.03	23,375	0.95
Burlingame to Menlo Park	9,782	6,778	16,560	16,304	1.02	16,683	0.99
Palo Alto to Mountain View	5,435	9,577	14,141	14,353	0.99	15,297	0.92
Sunnyvale to Diridon	6,733	4,455	11,187	9,916	1.13	10,479	1.07
Tamien to Gilroy	2,516	355	2,870	1,771	1.62	1,847	0.96
<b>By County</b>							
San Francisco	5,739	10,882	16,621	16,153	1.03	17,489	0.95
San Mateo	13,095	9,120	22,215	21,849	1.02	22,568	0.98
Santa Clara	14,684	13,515	28,199	26,040	1.08	27,624	1.02
All	<b>33,517</b>	<b>33,517</b>	<b>67,035</b>	<b>64,042</b>	<b>1.05</b>	<b>67,681</b>	<b>0.99</b>

Source: Santa Clara Valley Transportation Authority, February 2008

**Table 3**  
**2006 Caltrain Daily Park-and-Ride Spaces**

Station	Estimated Park-and-Ride Spaces	Observed Park-and-Ride Spaces Used
Diridon	320	597
Tamien	202	232
Capitol	64	24
Blossom Hill	50	46
Morgan Hill	102	105
San Martin	70	55
Gilroy	123	144
<b>Total</b>	<b>931</b>	<b>1,203</b>

Source: Santa Clara Valley Transportation Authority

The demographic projections used in the model were for 2005 baseline conditions; hence, the system-wide forecasts, based on 2006 service levels, were higher compared to published 2005 boarding counts collected in February 2005. Also, the modeled volumes were high for the three stations representing south Santa Clara County.

To address these issues, Parsons conducted further validation checks. Table 4 presents the results of various model runs performed by Parsons.

Run 3 used the VTA model “out of the box” with no adjustment. This forecast of 38,857 riders (38,857 boardings + 38,857 alightings divided by 2) was similar, but higher compared to that furnished by VTA (33,517). Model enhancements, refinements, and/or different computers may have produced the difference in forecasts. (The 38,857 rider forecast was very similar to observed ridership counts collected in 2008.)

A check of headways on the service extended to Salinas was conducted to determine if a change in frequency of service would affect the ridership insofar as south Santa Clara County boardings. These findings (runs 2 and 4 discussed later) indicated no change in ridership between a three-train scenario, operating northbound from Gilroy during the AM commute period, and a four-train scenario.

Follow-up discussions with VTA staff uncovered that the baseline model assumed maximum wait times on the commuter rail mode as 10 minutes. This limit on wait time was the controlling factor affecting ridership on the service south of the Tamien station, which was atypical for the remainder of the line.

Parsons subsequently increased the maximum wait time parameter from 10 minutes to 30 minutes (Run 5), and thereafter to 20 minutes (Run 7). The table indicates that the 20-minute maximum wait time assumption most closely approximates Caltrain system-wide ridership for 2005 and 2006. Table 5 compares the results of the 20-minute maximum wait time test to station boarding counts collected in February 2005 and February 2006. The results indicate that the maximum wait time assumption of 20 minutes closely approximates south county station boarding activity, in addition to system-wide totals.

In addition to comparing VTA model results with Caltrain ridership counts, a similar comparison was conducted for the Altamont Commuter Express commuter rail service.

**Table 4  
Parsons Model Run Results**

Station	Name	Run #1		Run #2		Run #3		Run #4		Run #5		Run #6		Run #7		Run #8	
		Boardings	Alightings	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings
32433	SF Transbay Terminal																
32435	Fourth/Townsend Caltrain	3,730	14,166	3,780	14,413	3,780	14,010	3,780	14,448	3,442	10,988	3,437	9,875	3,430	11,261	3,430	11,574
32436	23rd Street Caltrain	950	198	970	198	970	197	970	198	787	84	788	84	788	95	788	95
32437	Paul Avenue Caltrain																
32438	Bayshore Caltrain	842	110	1,002	109	1,002	107	1,002	109	526	41	526	42	567	49	567	49
32439	South San Francisco	376	1,015	406	1,099	406	1,075	406	1,099	173	667	173	651	185	712	185	730
32440	San Bruno Caltrain	790	236	830	235	830	234	830	235	454	170	453	170	465	177	465	177
32441	Millbrae Caltrain	1,956	1,252	1,986	1,240	1,986	1,202	1,986	1,241	1,315	819	1,231	793	1,319	885	1,319	912
34323	Millbrae Caltrain																
32442	Broadway Caltrain																
32443	Burlingame Caltrain	773	601	793	619	793	611	793	618	395	401	423	401	460	421	460	421
32444	San Mateo Caltrain	1,505	902	1,555	920	1,555	908	1,555	920	865	671	858	662	1,008	705	1,008	713
32445	Hayward Park Caltrain	315	404	315	403	315	400	315	403	104	183	103	180	115	195	115	195
32446	Bay Meadows Caltrain																
32447	Hillsdale Caltrain	2,764	1,157	2,954	1,149	2,954	1,122	2,954	1,151	2,225	718	2,139	671	2,359	744	2,359	770
32448	Belmont Caltrain	458	465	458	474	458	470	458	474	253	261	251	261	303	286	303	286
32449	San Carlos Caltrain	827	1,145	837	1,137	837	1,113	837	1,137	494	574	493	573	580	688	580	688
32450	Redwood City Caltrain	2,511	1,608	2,511	1,599	2,511	1,567	2,511	1,599	1,682	1,048	1,682	1,020	1,842	1,160	1,842	1,202
32451	Atherton Caltrain																
32452	Menlo Park Caltrain	1,132	994	1,132	985	1,132	948	1,132	985	702	556	736	538	828	592	828	618
32453	Palo Alto Caltrain	2,521	5,170	2,531	5,216	2,531	5,074	2,531	5,218	1,649	3,699	1,480	3,525	1,855	3,830	1,855	3,934
32454	Stanford Stadium Caltrain																
32455	California Avenue	495	1,299	495	1,278	495	1,192	495	1,278	252	662	252	596	316	721	316	784
32456	San Antonio Caltrain	910	422	910	417	910	397	910	417	440	255	467	246	511	263	511	276
32457	Mountain View Caltrain	2,728	3,192	2,728	3,148	2,728	2,959	2,728	3,148	1,764	1,878	1,365	1,773	1,928	2,026	1,928	2,156
32469	San Antonio Caltrain																
32458	Sunnyvale Caltrain	3,094	607	3,094	585	3,094	526	3,094	584	1,937	328	1,968	305	2,371	332	2,371	371
32459	Lawrence Caltrain	587	1,334	587	1,288	587	1,068	587	1,289	225	691	225	590	323	678	323	833
32460	Santa Clara Caltrain	918	1,474	918	1,340	918	939	919	1,340	635	666	638	483	697	552	697	831
32461	College Park Caltrain	6	95	6	95	6	95	6	95	5	35	5	35	4	44	4	44
32462	San Jose Caltrain	4,578	3,119	4,577	2,966	4,577	2,250	4,613	2,966	4,369	1,840	3,801	1,502	3,978	1,648	3,978	2,152
32530	San Jose Caltrain																
32463	Tamien Caltrain	1,827	978	1,827	813	1,827	244	1,827	813	828	330	956	74	1,036	113	1,036	504
32464	Capitol Caltrain	202	20	202	18	202	4	202	18	5	9	5	1	61	2	61	13
32465	Blossom Hill Caltrain	246	769	246	684	246	98	246	684	146	296	147	22	149	43	149	453
32466	Morgan Hill Caltrain	383	141	383	135	383	21	383	135	158	55	158	4	244	8	244	85
32467	San Martin Caltrain	262	336	262	306	262	28	262	306	108	129	108	2	173	6	173	198
32468	Gilroy Caltrain	558	775	558	829	558		558	829	212	373	212		338		338	567
32429	Watsonville Caltrain	2,556		2,171				2,171		1,003						1,510	
32430	Castroville Caltrain	1,500		1,194				1,194		576						846	
32431	Salinas Caltrain	1,679		1,475				1,475		699						1,038	
<b>Total</b>		<b>43,983</b>	<b>43,983</b>	<b>43,697</b>	<b>43,697</b>	<b>38,857</b>	<b>38,857</b>	<b>43,733</b>	<b>43,733</b>	<b>28,428</b>	<b>28,428</b>	<b>25,079</b>	<b>25,079</b>	<b>28,235</b>	<b>28,235</b>	<b>31,629</b>	<b>31,629</b>

Run #1 Service to Salinas  
 Run #2 Service to Salinas with revised distances and travel times, 3 trains  
 Run #3 Service to Gilroy only  
 Run #4 Service to Salinas with revised distances and travel times, 4 trains  
 Run #5 Service to Salinas with the initial maximum wait time increased to 30 minutes for Caltrain and ACE

Run #6 Service to Gilroy with the initial maximum wait time increased to 30 minutes for Caltrain and ACE  
 Run #7 Service to Gilroy with the initial maximum wait time increased to 20 minutes for Caltrain and ACE  
 Run #8 Service to Salinas with the initial maximum wait time increased to 20 minutes for Caltrain and ACE

**Table 5**  
**Caltrain Ridership Validation Check** (20-minute maximum wait time)

Station	ID No.	Boardings	Alightings	Ons and Offs/2	Feb 2005	Feb 2006
Fourth/Townsend	35	3,430	11,261	7,345.5	5,910	7,155
23rd Street	36	788	95	441.5	545	797
Bayshore	38	567	49	308	247	166
South San Francisco	39	185	712	448.5	487	521
San Bruno	40	465	177	321	488	412
Millbrae	41	1,319	885	1,102	1,507	1,816
Broadway	42	—	—	—	205	—
Burlingame	43	460	421	440.5	604	588
San Mateo	44	1,008	705	856.5	1,062	1,009
Hayward Park	45	115	195	155	347	244
Bay Meadows	46	—	—	—	71	10
Hillsdale	47	2,359	744	1,551.5	1,487	1,815
Belmont	48	303	286	294.5	518	435
San Carlos	49	580	688	634	836	867
Redwood City	50	1,842	1,160	1,501	1,423	1,870
Atherton	51	—	—	—	122	0
Menlo Park	52	828	592	710	1,009	1,171
Palo Alto	53	1,855	3,830	2,842.5	2,425	3,054
California	55	316	721	518.5	839	822
San Antonio	56	511	263	387	610	488
Mountain View	57	1,928	2,026	1,977	2,423	2,764
Sunnyvale	58	2,371	332	1,351.5	970	1,342
Lawrence	59	323	678	500.5	534	514
Santa Clara	60	697	552	624.5	706	657
College Park	61	4	44	24	133	97
San Jose	62	3,978	1,648	2,813	1,906	2,270
Tamien	63	1,036	113	574.5	343	466
Capitol	64	61	2	31.5	57	29
Blossom Hill	65	149	43	96	99	77
Morgan Hill	66	244	8	126	191	151
San Martin	67	173	6	89.5	78	72
Gilroy	68	338	0	169	210	141
<b>Summary by County</b>						
San Francisco	35–38	4,785	11,405	8,095	6,702	8,118
San Mateo	39–52	9,464	6,565	8,014.5	10,166	10,758
Santa Clara						
North	53–57	4,610	6,840	5,725	6,297	7,128
Mid	58–63	8,409	3,367	5,888	4,592	5,346
South	64–68	965	59	512	635	470
<b>Total</b>		<b>28,233</b>	<b>28,236</b>	<b>28,234.5</b>	<b>28,392</b>	<b>31,820</b>

Source: Parsons

Note: Forecast assumes 3 round trip trains south of Tamien.

- February 2005 Count reflects 4 round trip trains south of Tamien.
- February 2006 Count reflects 3 round trip trains south of Tamien.

The Altamont Commuter Express (ACE) is a commuter rail line operating between Stockton and San Jose. Overall, the line, service area and operations are very similar to the Caltrain line operating between San Jose and Gilroy plus the proposed extension of service to Monterey County. ACE

serves as an additional comparison or benchmark for Caltrain extension ridership forecasts. ACE trains operate on an 82-mile route between Stockton and San Jose through the San Joaquin, Central, and Silicon Valleys. ACE trains use a combination of Caltrain and Union Pacific Railroad (UPRR) tracks (including the former Western Pacific line over Altamont Pass), serving nine stations.

ACE commuter service is governed by the Altamont Commuter Express Joint Powers Authority, formed in 1997 by Alameda, San Joaquin, and Santa Clara counties to coordinate management and funding. The service is managed by the Joint Powers Authority member agency San Joaquin Regional Rail Commission, and trains are operated under contract by Herzog Transit Services. UPRR owns the tracks.

Service began on October 19, 1998. Initial operations consisted of two round trips, with a morning turn-back train between San Jose and Fremont added in February 2000.

On March 5, 2001, the turn-back train was dropped and a third round trip was added departing Lathrop–Manteca later in the morning and returning in the evening. Concurrent with the March schedule change, ACE trains added a stop at Caltrain’s station in Santa Clara.

In late evening, passengers can also board an ACE bus from San Jose to Stockton.

At the San Jose Diridon station, passengers can connect to Amtrak and Caltrain commuter trains. Local bus operators provide free connections between ACE rail stations and employment sites.

As noted in Figure 3, ACE now operates four round-trip trains per day (effective August 28, 2006). Station stops are indicated on the following ACE train schedule. One-way travel time between Stockton and San Jose Diridon is 2 hours 10 minutes. Within Santa Clara County, only two stops occur.

**Figure 3**  
**Altamont Commuter Express Timetable**

<b>AM - WESTBOUND</b>				
<b>Stockton To San Jose (Read Down)</b>	<b>#01</b>	<b>#03</b>	<b>#05</b>	<b>#07</b>
Stockton	4:20 AM	5:35 AM	6:40 AM	9:30 AM
Lathrop/Manteca	4:38 AM	5:53 AM	6:58 AM	9:48 AM
Tracy	4:52 AM	6:07 AM	7:12 AM	10:02 AM
Vasco	5:22 AM	6:37 AM	7:42 AM	10:32 AM
Livermore	5:27 AM	6:42 AM	7:47 AM	10:37 AM
Pleasanton	5:35 AM	6:50 AM	7:55 AM	10:45 AM
Fremont	5:57 AM	7:12 AM	8:17 AM	11:07 AM
Great America	L6:16 AM	L7:31 AM	L8:36 AM	11:26 AM
Santa Clara	suspended	suspended	suspended	suspended
San Jose	6:30 AM	7:50 AM	8:50 AM	11:40 AM
<b>PM - EASTBOUND</b>				
<b>San Jose To Stockton (Read From Bottom Up)</b>	<b>#02</b>	<b>#04</b>	<b>#06</b>	<b>#08</b>
Stockton	2:15 PM	5:45 PM	6:45 PM	7:45 PM
Lathrop/Manteca	1:53 PM	L5:23 PM	L6:23 PM	7:23 PM
Tracy	1:39 PM	L5:09 PM	L6:09 PM	L7:09 PM
Vasco	1:09 PM	4:39 PM	5:39 PM	6:39 PM
Livermore	1:04 PM	4:34 PM	5:34 PM	6:34 PM
Pleasanton	12:56 PM	4:26 PM	5:26 PM	6:26 PM
Fremont	12:34 PM	4:04 PM	5:04 PM	6:04 PM
Great America	12:16 PM	3:46 PM	4:46 PM	5:46 PM
Santa Clara	suspended	suspended	suspended	suspended
San Jose	12:05 PM	3:35 PM	4:35 PM	5:35 PM

L = Train may leave ahead of schedule after discharging passengers

Trains #07 westbound and #02 eastbound added beginning August 28, 2006.



As of March 2006, ACE carried approximately 2,500 riders per day, or approximately 1,250 in each direction. Like Caltrain, ACE has seen its ridership increase rapidly during the dot-com boom years, to be followed by declining and then stabilized ridership patterns. Figure 4 illustrates the average weekday daily ridership experienced by ACE from its inception in 1998 through March 2006. Since 2006, ridership has increased to 3,073 during the first quarter of fiscal year 2008, and 3,697 during the first quarter of fiscal year 2009. Table 6 indicates the distribution of boarding activity based on rider surveys conducted by ACE.

ACE recently expanded its commuter rail service between the San Joaquin Valley and the Santa Clara Valley. Beginning on Monday, August 28, 2006, a fourth train was added which departs Stockton Monday through Friday at 9:30 a.m. making all stops en route to San Jose and arriving there at 11:40 a.m. Returning, this new train departs San Jose at 12:05 p.m. and arrives back in Stockton at 2:15 p.m.

Table 7 compares the VTA model results with the observed ridership counts for April 2005, with the distribution of boardings based on a rider survey conducted by ACE on April 24, 2006. On a system-wide basis, the VTA model forecasts are two percent higher than counted, when a 20-minute maximum wait time is assumed.

Insofar as trips originating by county, the VTA model with the 20-minute maximum wait time forecast 92 percent of the 2005 observed ridership for San Joaquin County, 148 percent for Alameda County, and 64 percent of the observed activity for Santa Clara County. The “observed” data is based on a 2006 rider survey, so the distribution may reflect inconsistent survey participation rates by county. (On board rider surveys conducted in 2000, 2001, 2006 and 2007 indicate highly fluid boarding patterns.)

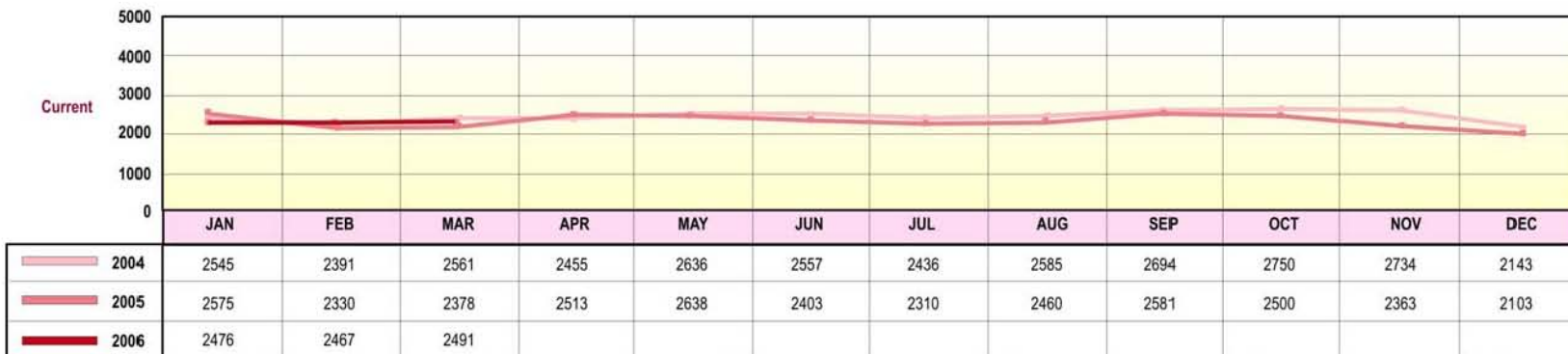
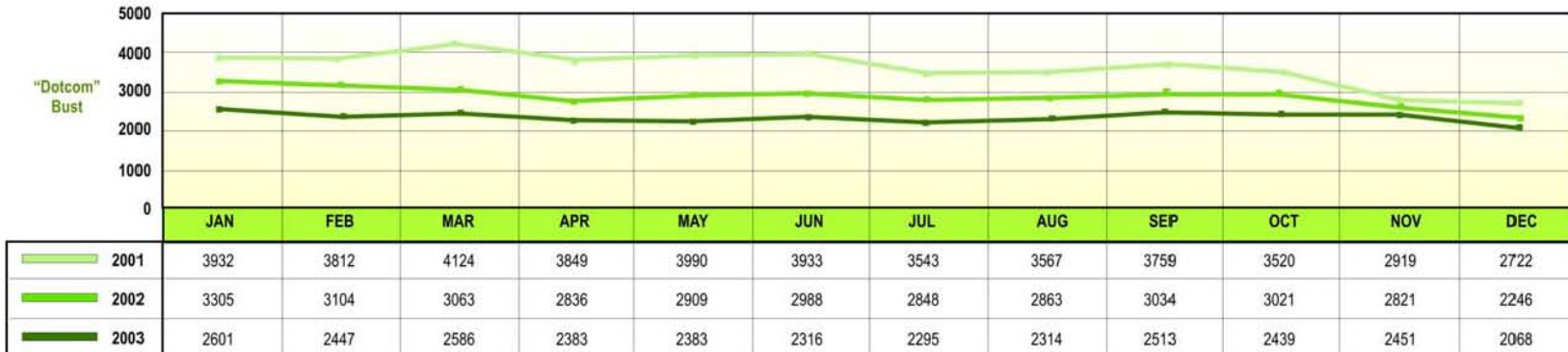
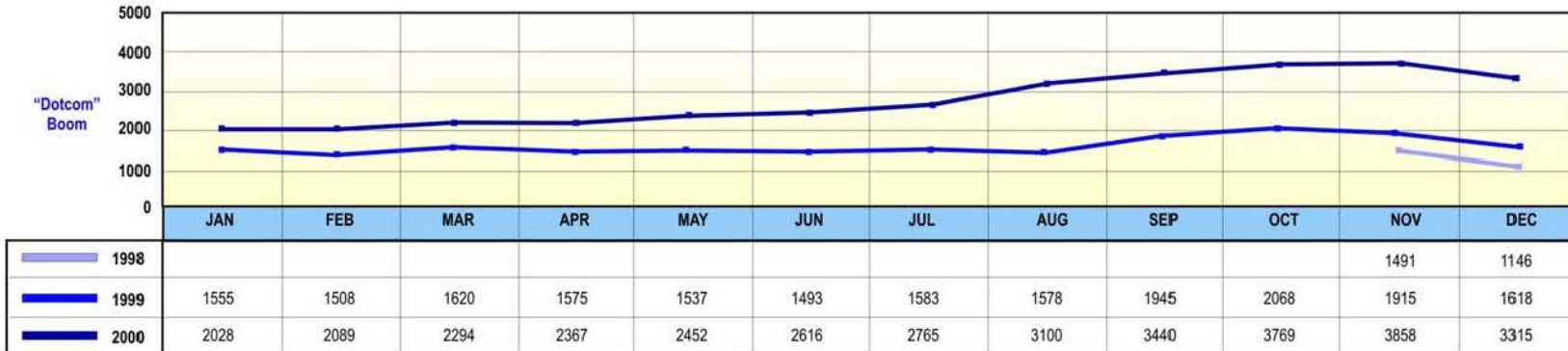
## **5. U.S. 101 TRAFFIC VOLUME FORECAST VALIDATION**

In addition to commuter rail ridership validation checks, the VTA model was checked insofar as peak period traffic assignment results compared with ground traffic counts.

Caltrans maintains a permanent traffic count station at a location on U.S. 101 just north of the Monterey–San Benito county line (San Benito County post mile 2.0), located approximately 1 mile south of the junction of SR 156 (E). For the purpose of this ridership validation check, daily, hour-by-hour, and day-by-day traffic counts were obtained from Caltrans covering an eight year period from 1998 through 2005. From this universe of traffic count data, counts were extracted and averaged for midweek conditions (Tuesdays, Wednesdays and Thursdays).

Exhibit 1 illustrates and provides a tabulation of weekday northbound traffic volumes on U.S. 101 by hour and year. Exhibit 2 provides the same information for southbound traffic flows. These exhibits portray 12-month averages of traffic volumes by hour for midweek conditions. The hour-by-hour averages do not account for the one-hour shift in clock time which occurs from April through October to reflect daylight saving time. Exhibit 3 illustrates the seasonal variation in daily traffic flows for each month of the year. The one-hour shift in the diurnal distribution of traffic resulting from daylight saving time can be observed in this graphic as the clock was not reset at the count station.

**Figure 4**  
**Altamont Commuter Express Average Daily Ridership Trends**



**Table 6**  
**Altamont Commuter Express Rider Boarding Patterns**

Station	4/4/2000		7/25/2001		4/24/2006		9/25/2007	
	AM	PM	AM	PM	AM	PM	AM	PM
	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound
Stockton	7%	—	9%	—	14%	—	8.5%	—
Lathrop	18%	—	28%	—	31%	—	22.3%	—
Tracy	19%	—	23%	—	25%	—	34.0%	—
Vasco	9%	—	7%	2%	6%	2%	6.4%	5.3%
Livermore	10%	1%	8%	1%	7%	1%	10.6%	5.3%
Pleasanton	29%	3%	16%	6%	13%	17%	17.0%	28.7%
Fremont	8%	8%	9%	8%	5%	18%	1.1%	5.3%
Great America	—	72%	—	52%	—	52%	—	47.9%
Santa Clara	—	—	—	17%	—	—	—	—
San Jose Diridon	—	14%	—	14%	—	10%	—	7.4%
Not returning by ACE	—	2%	—	—	—	—	—	—

**Table 7**  
**ACE Ridership Validation Check**

By Station	10 Minutes			20 Minutes			30 Minutes			April 2005 Count/ 2006 Survey	September 2007 Count and Survey	
	Ons	Offs	Ons+Offs	Ons	Offs	Ons+Offs	Ons	Offs	Ons+Offs			
			2			2			2			
Stockton	501	0	250.5	392	0	196	241	0	120.5	Stockton	176	131
Manteca	344	0	172	263	0	131.5	128	0	64	Manteca	390	343
Tracy	1,236	0	618	957	0	478.5	499	0	249.5	Tracy	313	522
Vasco	159	0	79.5	45	0	72.5	293	0	146.5	Vasco	101	180
Livermore	273	833	553	173	662	417.5	107	416	261.5	Livermore	100	244
Pleasanton	411	1,149	780	293	867	580	211	580	395.5	Pleasanton	377	702
Fremont	598	68	333	345	50	197.5	347	35	191	Fremont	277	98
Great America	32	266	149	2	231	116.5	2	167	84.5	Great America	654	736
Santa Clara	0	0	0	0	0	0	0	0	0	Santa Clara	0	0
Diridon	0	1,237	618.5	0	760	380	0	631	315.5	Diridon	126	114
<b>Total</b>			<b>3,553</b>			<b>2,570</b>			<b>1,829</b>		<b>2,514</b>	<b>3,070</b>
<b>By County</b>												
San Joaquin			1,040.5			806			434	San Joaquin	879	996
Alameda			1,745.5			1,267.5			994.5	Alameda	855	1,224
Santa Clara			767.5			496.5			400	Santa Clara	780	850

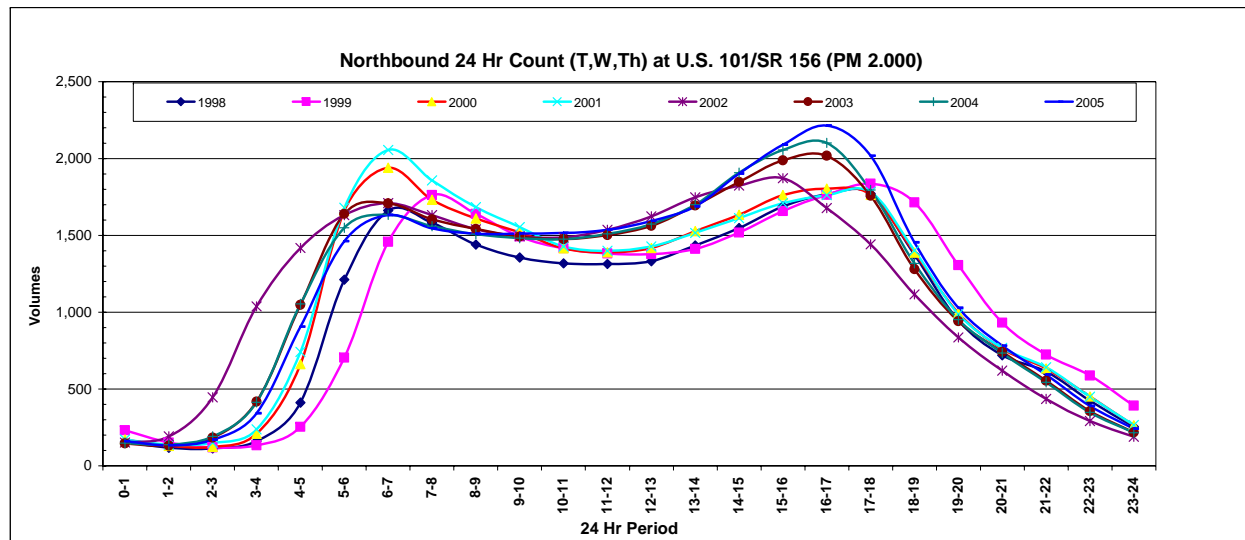
The VTA regional travel model covers the entire nine-county San Francisco Bay Area, three counties to the south (San Benito, Monterey, and Santa Cruz), and two counties to the east (San Joaquin and Merced). Three-hour peak period and peak hour traffic assignments are captured by the model on a highway network which is progressively less detailed as the focus of the investigation moves further away from Santa Clara County. Figure 5 illustrates a portion of this highway network covering Gilroy, northern San Benito County, and northern Monterey County. The location of the Caltrans permanent count station is indicated on the graphic.

### Exhibit 1 Northbound Hourly Traffic Volumes on U.S. 101 at SR 156 (E)

24 Hour Count (Tuesday, Wednesday and Thursday)

Northbound

Year	24 Hr Period																								24 Hr Count Total
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	
1998	158	119	113	162	412	1,213	1,662	1,583	1,440	1,357	1,317	1,315	1,333	1,433	1,547	1,687	1,769	1,771	1,373	947	721	613	423	254	24,723
1999	232	152	121	135	255	704	1,458	1,763	1,639	1,493	1,416	1,383	1,378	1,413	1,518	1,658	1,763	1,837	1,714	1,305	931	724	587	392	25,972
2000	172	129	125	209	661	1,660	1,941	1,732	1,610	1,520	1,416	1,391	1,418	1,529	1,633	1,761	1,804	1,764	1,387	993	762	633	452	264	26,966
2001	172	139	150	238	742	1,681	2,056	1,859	1,684	1,554	1,428	1,400	1,429	1,515	1,611	1,711	1,762	1,781	1,403	987	767	643	450	265	27,426
2002	152	192	446	1,039	1,418	1,631	1,710	1,632	1,541	1,493	1,486	1,536	1,623	1,749	1,824	1,872	1,678	1,442	1,116	837	620	436	293	189	27,952
2003	146	132	183	417	1,048	1,639	1,707	1,603	1,542	1,491	1,477	1,503	1,563	1,693	1,848	1,988	2,018	1,757	1,281	942	742	554	357	219	27,828
2004	148	139	192	415	1,054	1,551	1,634	1,560	1,508	1,482	1,476	1,510	1,574	1,700	1,908	2,057	2,102	1,797	1,319	952	735	543	348	217	27,920
2005	161	134	171	342	905	1,461	1,632	1,546	1,511	1,511	1,516	1,536	1,594	1,689	1,902	2,090	2,214	2,018	1,454	1,029	783	595	390	243	28,426
<b>Average</b>	168	142	187	370	812	1,442	1,725	1,660	1,559	1,488	1,442	1,447	1,489	1,590	1,724	1,853	1,889	1,771	1,381	999	758	593	413	255	27,151
<b>Minium</b>	146	119	113	135	255	704	1,458	1,546	1,440	1,357	1,317	1,315	1,333	1,413	1,518	1,658	1,678	1,442	1,116	837	620	436	293	189	24,723
<b>Maximum</b>	232	192	446	1,039	1,418	1,681	2,056	1,859	1,684	1,554	1,516	1,536	1,623	1,749	1,908	2,090	2,214	2,018	1,714	1,305	931	724	587	392	28,426

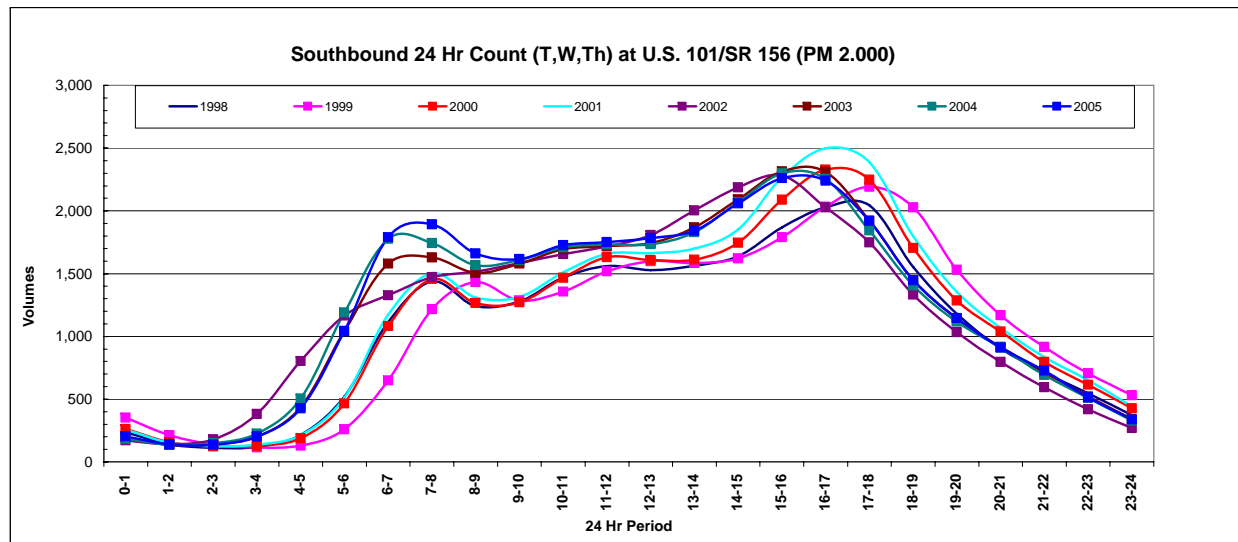


## Exhibit 2 Southbound Hourly Traffic Volumes on U.S. 101 at SR 156 (E)

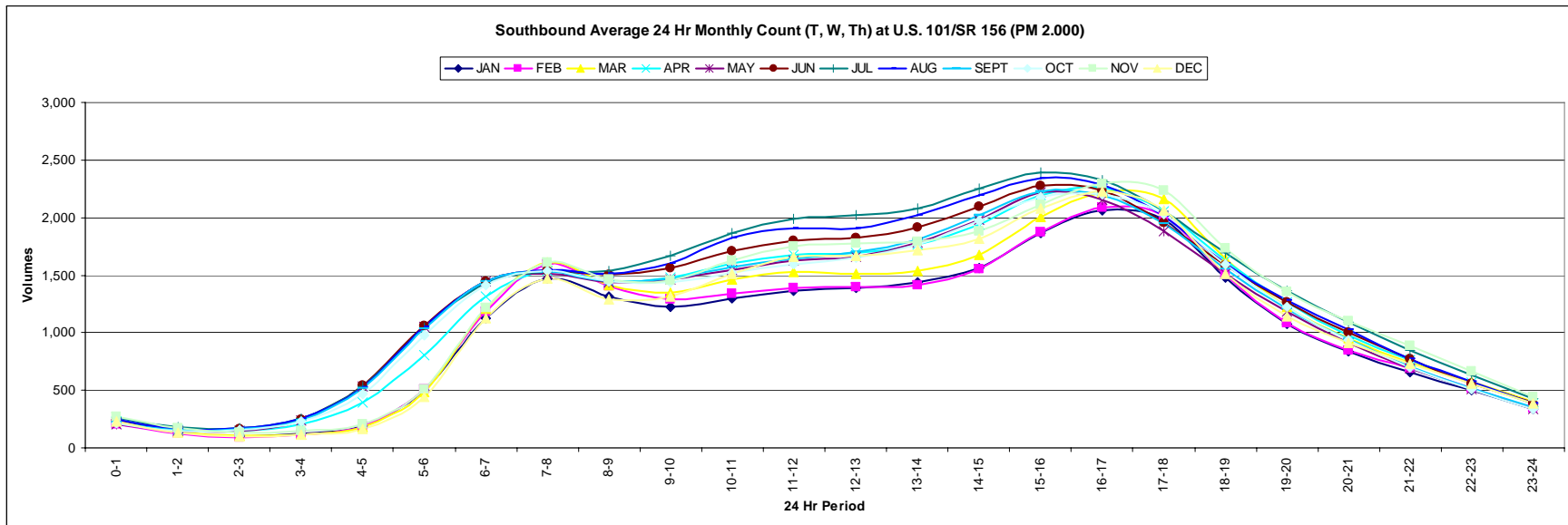
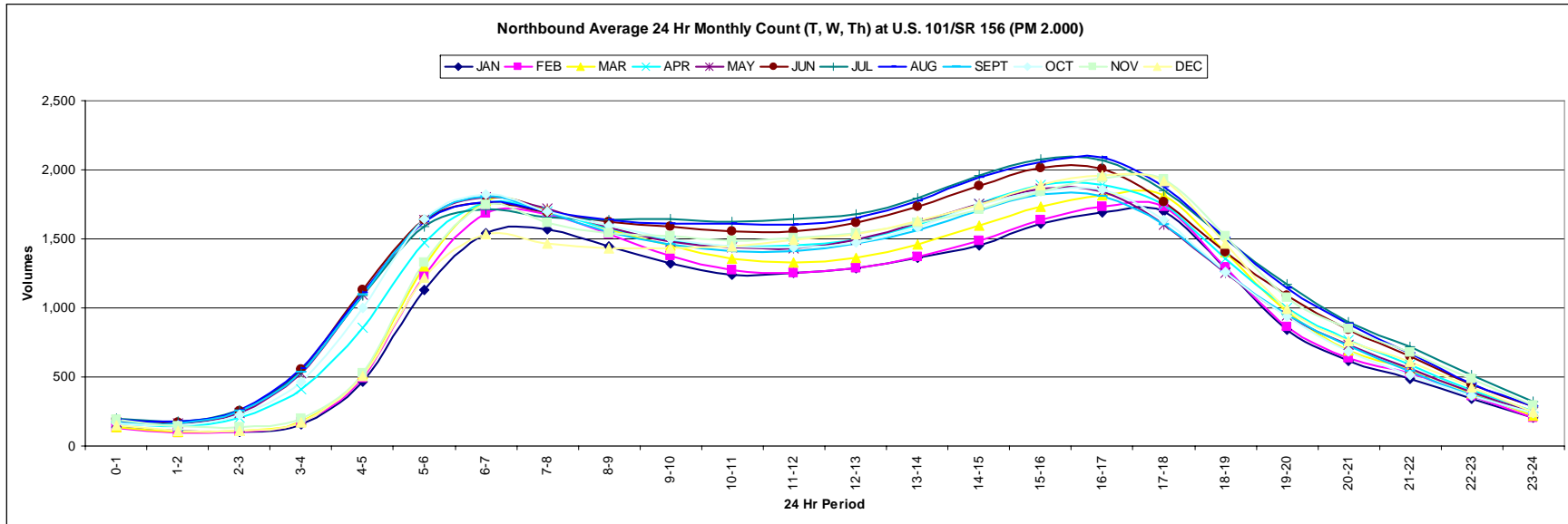
24 Hour Count (Tuesday, Wednesday and Thursday)

Southbound

Year	24 Hr Period																							24 Hr Count Total	
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23		23-24
1998	234	139	112	119	216	519	1,114	1,438	1,241	1,279	1,469	1,561	1,527	1,564	1,638	1,869	2,028	2,046	1,553	1,180	903	711	545	372	25,378
1999	352	214	136	116	130	259	650	1,216	1,432	1,286	1,358	1,518	1,599	1,586	1,620	1,790	2,034	2,193	2,027	1,531	1,169	915	705	530	26,366
2000	262	157	121	128	189	466	1,084	1,457	1,265	1,272	1,468	1,632	1,610	1,612	1,747	2,088	2,328	2,248	1,705	1,285	1,038	797	616	427	27,001
2001	258	152	124	137	213	512	1,173	1,503	1,309	1,315	1,510	1,659	1,663	1,699	1,851	2,268	2,497	2,389	1,798	1,354	1,068	834	651	442	28,359
2002	172	143	179	381	803	1,165	1,328	1,472	1,515	1,586	1,655	1,717	1,806	2,003	2,186	2,282	2,028	1,748	1,331	1,034	796	596	420	269	28,616
2003	197	134	140	200	435	1,043	1,579	1,630	1,507	1,579	1,695	1,719	1,743	1,870	2,092	2,314	2,312	1,922	1,449	1,142	915	716	522	340	29,183
2004	185	136	150	224	505	1,190	1,778	1,745	1,566	1,609	1,710	1,731	1,733	1,829	2,070	2,299	2,255	1,845	1,407	1,116	911	693	508	327	29,524
2005	203	140	138	203	425	1,041	1,790	1,894	1,660	1,615	1,727	1,750	1,782	1,842	2,060	2,261	2,241	1,921	1,447	1,146	910	727	513	337	29,774
Average	233	152	137	189	365	774	1,312	1,544	1,437	1,443	1,574	1,661	1,683	1,751	1,908	2,146	2,215	2,039	1,590	1,223	964	749	560	381	28,025
Minium	172	134	112	116	130	259	650	1,216	1,241	1,272	1,358	1,518	1,527	1,564	1,620	1,790	2,028	1,748	1,331	1,034	796	596	420	269	25,378
Maximum	352	214	179	381	803	1,190	1,790	1,894	1,660	1,615	1,727	1,750	1,806	2,003	2,186	2,314	2,497	2,389	2,027	1,531	1,169	915	705	530	29,774



### Exhibit 3 Seasonal Fluctuations in Hourly Traffic Volumes on U.S. 101 at SR 156 (E)



**Figure 5**  
**VTA Highway Network Detail** (South Santa Clara County, Northern San Benito and Monterey Counties)

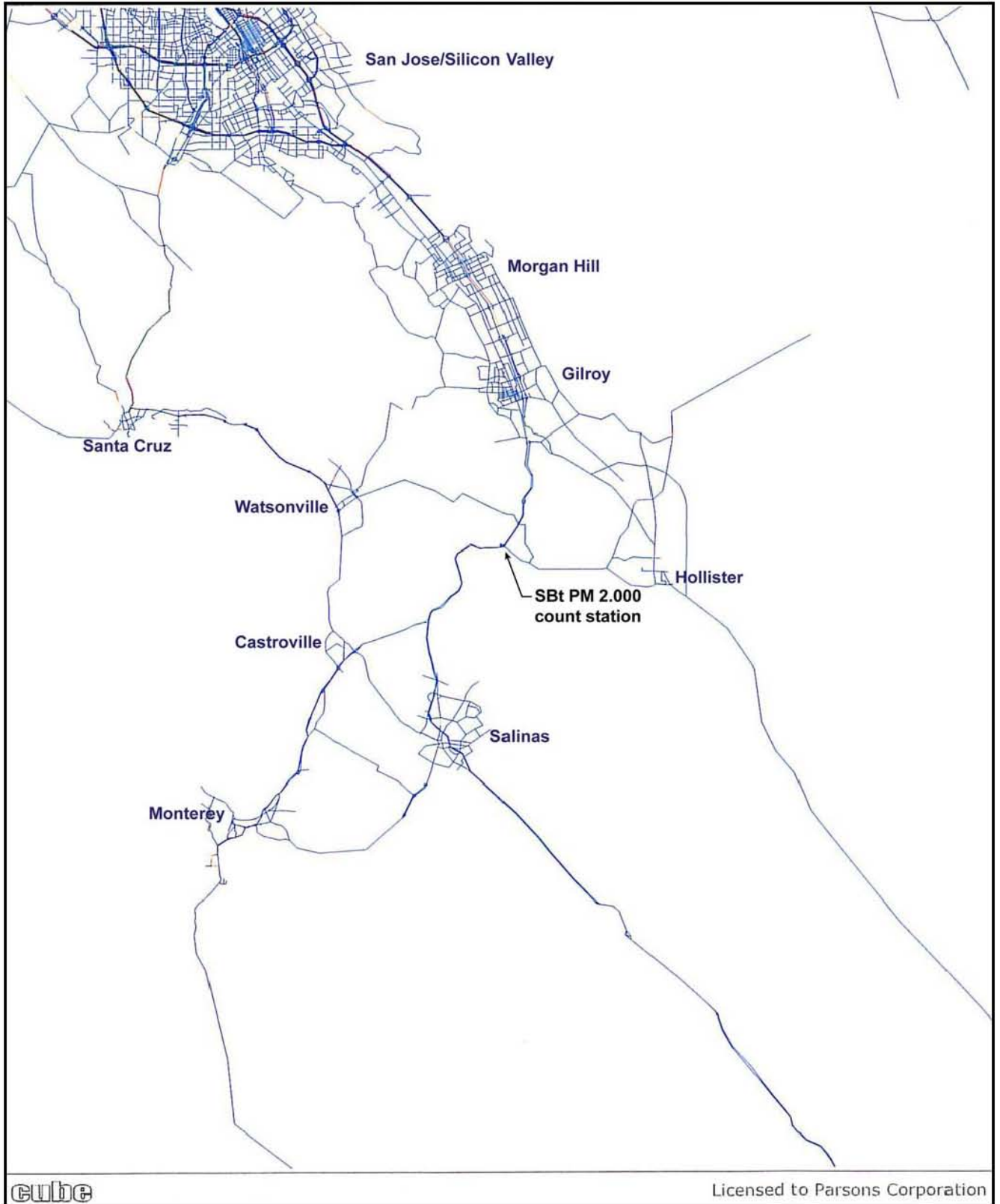


Table 8 compares the peak period, three-hour traffic volumes assigned by the traffic model to the counts collected from the Caltrans count station for midweek conditions during 2005. Peak period rather than peak hour volumes are reported as the peak 60-minute time slice varies significantly by location. Midweek traffic count volume averages, obtained from April, May, September and October, corrected to account for daylight saving time shifted clock times are used for the comparison.

**Table 8**  
**VTA Model Peak Period Validation Check at U.S. 101/SR 156 (SB<sub>t</sub> PM 2.000)**

Direction	Peak Period	2005 Traffic Counts (Midweek)	2005 Traffic Model Forecast	Observed/Forecast
Northbound	6:00–9:00 a.m.	5,150	7,356	0.70
Southbound	3:00–6:00 p.m.	6,791	7,623	0.89
<b>Totals</b>		<b>11,941</b>	<b>14,979</b>	<b>0.80</b>

Source: Parsons

The results of this highway traffic validation check indicate that the VTA regional travel forecast model overpredicts (or assigns) peak period traffic volumes in the U.S. 101 corridor traveling northbound from Monterey County in the morning and southbound during the afternoon. As the mode choice model transit ridership forecasts are based on daily trip tables rather than peak hour or peak period flows, the average of the two “correction factors” (0.80) will be used to adjust transit ridership forecasts between Monterey County and the San Francisco Bay Area.

The appropriateness of the 0.80 correction factor was further validated by comparing observed versus modeled home based work trips between counties, as documented in the VTA Model Methodology Report. A trip table correction factor based on data presented in the VTA report, weighted to reflect Caltrain extension origin-destination patterns, would be 0.76.

## 6. OPERATING PLAN FOR CALTRAIN EXTENSION ALTERNATIVE

The Caltrain Extension to Monterey County Alternative would extend existing and programmed Caltrain commuter rail service from Gilroy to Salinas with intermediate stops at Pajaro/Watsonville and Castroville. The Peninsula Corridor Joint Powers Board (JPB) currently operates 98 daily trains between San Jose and San Francisco. Six of these trains operate between Gilroy and San Francisco. Prior to 2006, eight trains operated between Gilroy and San Francisco on weekdays.

The Santa Clara Valley Transportation Authority (VTA) is the lead agency for Caltrain program development between San Jose and Gilroy. As part of its long-term Transit Capital Investment Program, VTA has negotiated an agreement with UPRR which grants VTA/JPB rights to operate up to 20 trains (10 round trips) between Gilroy and San Jose upon completion of \$35 million (2004 dollars) of capacity improvements. These improvements include construction of 8.3 miles of double track (addition of a second track) between San Jose and Gilroy on UPRR property. VTA also plans to construct a Gilroy yard facility, estimated to cost \$10 million (2004 dollars) to accommodate storage of 10 commuter rail train sets.

Extension of the Caltrain service to Salinas would reduce or completely remove the need for expansion of the Caltrain layover yard in Gilroy.



Table 9 displays an illustrative timetable for 10 round trip trains operating between San Jose and Gilroy<sup>1</sup>. For planning purposes, the schedules have been extended north to Mountain View and south to Salinas to indicate potential departure/arrival times. Trains indicated as “proposed service” would best meet the needs of Monterey County commuters.

**Table 9  
Commuter Service between Salinas and Mountain View—Depart Times**

Schedule ID Train #	10 215	1 121	6 New	2 227	5 New	3 231	4 235	7 New	8 239	9 141
<b>Northbound, a.m.</b>										
Lv Salinas	3:54	4:21	4:44	5:07	5:30	5:50	6:07	6:30	6:54	7:21
Lv Gilroy	4:49	5:16	5:39	6:02	6:25	6:45	7:02	7:25	7:49	8:16
Lv San Jose	5:39	6:06	6:29	6:52	7:15	7:37	7:52	8:15	8:39	9:06
Ar Mountain View	6:03	6:25	6:48	7:11	7:37	8:03	8:13	8:34	8:58	9:25
Schedule ID Train #	8 258	7 New	1 160	6 262	5 New	2 164	3 270	4 172	9 278	10 284
<b>Southbound, p.m.</b>										
Lv Mountain View	3:39	4:00	4:21	4:44	5:04	5:27	5:50	6:27	6:50	7:39
Lv San Jose	4:01	4:23	4:45	5:06	5:28	5:51	6:16	6:49	7:16	8:01
Lv Gilroy	4:52	5:15	5:36	5:57	6:20	6:42	7:07	7:41	8:08	8:53
Ar Salinas	5:47	6:10	6:31	6:52	7:15	7:37	8:02	8:36	9:03	9:48

Proposed service

645188AA-081

Other possible services

To illustrate a more complete operating schedule, Table 10 reproduces a portion of the Caltrain public timetable, effective January 1, 2006. This table highlights the extension of three existing “Gilroy” round trip trains to/from Salinas. A fourth round trip train is also extended from San Jose to Gilroy and Salinas for planning purposes.

These schedules are preliminary and are based on train simulation/capacity modeling undertaken for UPRR. Factors which might affect scheduling include electrification of the Caltrain line north of San Jose; upgrades to the UPRR coast line track between Salinas and Gilroy; Caltrain/Amtrak schedule coordination south of Gilroy; and schedule recovery “padding” to ensure reliability of Caltrain service north of Gilroy. These schedule refinements would be expected to have minor impact on the Caltrain Extension Alternative ridership estimate.

<sup>1</sup>The San Jose–Gilroy portion of the schedule was developed in October 2004 and served as the basis of the agreement between UPRR and VTA.

**Table 10**  
**Caltrain Public Timetable**

**Gilroy/San Jose to San Francisco—Northbound**

Train #	101	103	305	207	309	211	313	215	217	319	221	323	225	227	329	231	233	135
Salinas									5:12		5:35			6:10		6:37		
Castroville									5:22		5:45			6:20		6:47		
Pajaro									5:36		5:59			6:34		7:01		
Gilroy									6:07		6:30			7:05		7:32		
San Martin									6:16		6:39			7:14		7:41		
Morgan Hill									6:22		6:45			7:20		7:47		
Blossom Hill									6:35		6:58			7:33		8:00		
Capitol									6:41		7:04			7:39		8:06		
Tamien		4:58		5:50	5:56	—	—	—	6:49	6:56	7:12	—	—	7:47	7:56	8:14	8:33	—
San Jose Diridon	4:30	5:05	5:45	5:57	6:03	6:22	6:45	6:50	6:57	7:03	7:20	7:45	7:50	7:55	8:03	8:22	8:40	9:10
College Park	—	—	—	—	—	—	—	—	—	—	—	—	—	7:58	—	—	—	—
Santa Clara	4:35	5:10	—	6:02	—	6:27	—	—	7:02	—	7:25	—	—	8:02	—	8:27	8:45	9:15
Lawrence	4:40	5:15	—	6:12	—	—	—	—	7:12	—	7:30	—	—	8:12	—	—	8:50	9:20
Sunnyvale	4:44	5:19	—	6:18	6:13	—	—	7:00	7:18	7:13	—	—	8:00	8:18	8:13	—	8:54	9:24
Mountain View	4:49	5:24	5:57	6:23	—	6:37	6:57	7:05	7:23	—	7:37	7:57	8:05	8:23	—	8:37	8:59	9:29
San Antonio	4:53	5:28	—	6:27	—	—	—	—	7:27	—	—	—	—	8:27	—	—	9:03	9:33
California Avenue	4:57	5:32	—	6:31	—	—	—	7:11	7:31	—	—	—	8:11	8:31	—	—	9:07	9:37
Palo Alto	5:01	5:36	6:05	6:36	6:23	—	7:05	7:16	7:36	7:23	—	8:05	8:16	8:36	8:23	—	9:11	9:41
Menlo Park	5:04	5:39	—	6:39	—	6:45	—	—	7:39	—	7:45	—	—	8:39	—	8:45	9:14	9:44
Redwood City	5:09	5:44	—	6:45	6:30	6:51	—	—	7:45	7:30	7:51	—	—	8:45	8:30	8:51	9:19	9:49
San Carlos	5:13	5:48	—	—	—	6:55	—	7:24	—	—	7:55	—	8:24	—	—	8:55	9:23	9:53
Belmont	5:16	5:51	—	—	—	6:58	—	—	—	—	7:58	—	—	—	—	8:58	9:26	9:56
Hillsdale	5:19	5:54	6:16	6:51	—	7:02	7:16	7:28	7:51	—	8:02	8:16	8:28	8:51	—	9:02	9:29	9:59
Hayward Park	5:22	5:57	—	—	—	7:05	—	—	—	—	8:05	—	—	—	—	9:05	—	10:02
San Mateo	5:25	6:00	—	—	6:39	7:08	—	7:32	—	7:39	8:08	—	8:32	—	8:39	9:08	9:33	10:05
Burlingame	5:28	6:03	—	—	—	7:11	—	7:35	—	—	8:11	—	8:35	—	—	9:11	9:36	10:08
Millbrae	5:33	6:08	6:24	6:59	6:45	7:17	7:24	—	7:59	7:45	8:17	8:24	—	8:59	8:45	9:17	9:41	10:13
San Bruno	5:37	6:12	—	—	—	7:21	—	7:42	—	—	8:21	—	8:42	—	—	9:21	9:45	10:17
So. San Francisco	5:41	6:16	—	7:05	—	7:25	—	—	8:05	—	8:25	—	—	9:05	—	9:25	—	10:21
Bayshore	5:47	6:22	—	—	—	7:33	—	—	—	—	8:33	—	—	—	—	9:31	—	10:27
22nd Street	5:52	6:27	—	—	—	7:40	—	—	—	—	8:40	—	—	—	—	9:37	—	10:32
San Francisco	6:01	6:36	6:42	7:19	7:02	7:48	7:42	7:57	8:19	8:02	8:48	8:42	8:57	9:19	9:02	9:45	10:02	10:41

**San Francisco to San Jose/Gilroy—Southbound**

Train #	154	256	158	260	362	264	266	368	270	372	274	276	378	280	382	284	386	288
San Francisco	2:07	2:37	3:07	3:37	4:09	4:19	4:27	4:33	4:56	5:14	5:20	5:27	5:33	5:56	6:14	6:27	6:33	6:56
22nd Street	2:12	—	3:12	—	—	—	4:32	—	—	—	—	5:32	—	—	—	6:32	—	—
Bayshore	2:17	—	3:17	—	—	—	4:40	—	—	—	—	5:40	—	—	—	6:40	—	—
So. San Francisco	2:23	—	3:23	—	—	—	4:48	—	5:08	—	—	5:48	—	6:08	—	6:48	—	7:08
San Bruno	2:27	2:51	3:27	3:51	—	4:33	4:52	—	—	—	5:34	5:52	—	—	—	6:52	—	—
Millbrae	2:31	2:55	3:31	3:55	4:25	—	4:56	4:49	5:14	5:30	—	5:56	5:49	6:14	6:30	6:56	6:49	7:14
Burlingame	2:35	2:59	3:35	3:59	—	4:38	5:00	—	—	—	5:39	6:00	—	—	—	7:00	—	—
San Mateo	2:38	3:02	3:38	4:02	—	4:42	5:04	4:57	—	—	5:43	6:04	5:57	—	—	7:04	6:57	—
Hayward Park	2:41	—	3:41	—	—	—	5:07	—	—	—	—	6:07	—	—	—	7:07	—	—
Hillsdale	2:44	3:06	3:44	4:06	4:33	4:47	5:11	—	5:22	5:38	5:48	6:11	—	6:22	6:38	7:11	—	7:22
Belmont	2:47	3:09	3:47	4:09	—	—	5:14	—	—	—	—	6:14	—	—	—	7:14	—	—
San Carlos	2:50	3:12	3:50	4:12	—	4:51	5:18	—	—	—	5:52	6:18	—	—	—	7:18	—	—
Redwood City	2:55	3:17	3:55	4:17	—	—	5:22	5:06	5:28	—	—	6:22	6:06	6:28	—	7:22	7:06	7:28
Menlo Park	3:00	3:22	4:00	4:22	—	—	5:28	—	5:34	—	—	6:28	—	6:34	—	7:28	—	7:34
Palo Alto	3:03	3:25	4:03	4:25	4:44	5:01	—	5:12	5:38	5:49	6:02	—	6:12	6:38	6:49	—	7:12	7:38
California Avenue	3:07	3:29	4:07	4:29	—	5:05	—	—	5:42	—	6:06	—	—	6:42	—	—	—	7:42
San Antonio	3:11	3:33	4:11	4:33	—	—	—	—	5:46	—	—	—	—	6:46	—	—	—	7:46
Mountain View	3:15	3:37	4:15	4:37	4:51	5:11	5:36	—	5:50	5:56	6:12	6:36	—	6:50	6:56	7:36	—	7:50
Sunnyvale	3:20	3:42	4:20	4:42	—	5:16	—	5:21	5:55	—	6:17	—	—	6:21	6:55	—	7:21	7:55
Lawrence	3:24	3:46	4:24	4:46	—	—	—	—	6:01	—	—	6:43	—	7:01	—	—	—	7:59
Santa Clara	3:29	3:51	4:29	4:51	—	—	5:47	—	6:08	—	—	6:48	—	7:08	—	7:47	—	8:04
College Park	—	—	4:32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
San Jose Diridon	3:38	4:00	4:39	5:00	5:06	5:27	5:55	5:32	6:16	6:11	6:28	6:56	6:32	7:16	7:11	7:55	7:32	8:12
Tamien	—	4:07	4:45	5:07	—	5:33	—	5:39	6:22	—	—	7:02	6:39	7:23	—	—	7:39	8:19
Capitol	—	—	4:52	—	—	5:40	—	—	6:29	—	—	7:09	—	—	—	—	—	—
Blossom Hill	—	—	4:58	—	—	5:46	—	—	6:35	—	—	7:15	—	—	—	—	—	—
Morgan Hill	—	—	5:11	—	—	5:59	—	—	6:48	—	—	7:28	—	—	—	—	—	—
San Martin	—	—	5:17	—	—	6:05	—	—	6:54	—	—	7:34	—	—	—	—	—	—
Gilroy	—	—	5:30	—	—	6:18	—	—	7:07	—	—	7:47	—	—	—	—	—	—
Pajaro	—	—	6:01	—	—	6:49	—	—	7:38	—	—	8:18	—	—	—	—	—	—
Castroville	—	—	6:15	—	—	7:03	—	—	7:52	—	—	8:32	—	—	—	—	—	—
Salinas	—	—	6:25	—	—	7:13	—	—	8:02	—	—	8:42	—	—	—	—	—	—

Gilroy/Salinas service

## 7. RIDERSHIP FORECASTS FOR THE CALTRAIN EXTENSION ALTERNATIVE

Table 4 listed the boarding and alighting forecasts for the Caltrain Extension (Build) alternative and the existing (No Build) service. These forecasts were prepared based on Year 2006 service schedules and the Year 2005 demographic data set prepared by VTA, with no adjustment or revision to any aspect of the model. The ridership validation check indicated that an assumption of 20 minutes as the maximum wait time most closely corresponded to observed rider counts on the Caltrain system and at south Santa Clara stations during the model calibration/ validation year (2005). This same maximum wait time assumption of 20 minutes also most closely forecast the observed rider counts on the Altamont Commuter Express service, connecting San Joaquin and Alameda counties with “Silicon Valley.” Both Caltrain and ACE operate three trains toward downtown San Jose in the morning and three trains away from San Jose in the afternoon/evening. These trains are spaced 30 minutes apart for Caltrain service to Gilroy, and 60 minutes apart for ACE service to Stockton.

Table 11 lists the ridership forecast results for the three test scenarios, assuming maximum wait times of 10 minutes, 20 minutes, and 30 minutes. With 20-minute maximum wait times, which yields the closest fit to 2005 Caltrain and ACE observed counts, the ridership on the extension to Salinas, adjusted downward to reflect the Highway 101 traffic volume validation comparison, would be 1,358 riders boarding in the morning and riding north, and the same number boarding at points north, and riding south in the evening, deboarding at the Monterey County stations. Total daily ridership on the extension would thus be 2,712, assuming that adequate parking supplies were provided.<sup>2</sup> This forecast is based on 2005 demographic conditions and a three train schedule.

**Caltrain and ACE passenger counts collected during the first quarter of fiscal year 2008 (July 1, 2007 to September 30, 2008) and the first quarter of fiscal year 2009 indicate that ridership has risen dramatically on both lines since 2005 and 2006. The rising cost of gasoline has most likely contributed to this increase in ridership. Be that as it may, no change in automobile operating costs, relative to transit fares, has been assumed for the commuter rail extension to Monterey County.**

**Table 11  
Caltrain Extension to Monterey County Ridership Forecast (2005)**

	Maximum Wait Time Assumptions								
	10 Minutes			20 Minutes			30 Minutes		
	Ons	Offs	On+Offs/2	Ons	Offs	On+Offs/2	Ons	Offs	On+Offs/2
Watsonville/Pajaro	2,171	0	1,085.5	1,510	0	755	1,003	0	501.5
Castroville	1,194	0	597	846	0	423	576	0	288
Salinas	1,475	0	737.5	1,038	0	519	699	0	349.5
<b>Total Northbound Boardings</b>			<b>2,420</b>			<b>1,697</b>			<b>1,139</b>
Trip table correction factor		0.80			0.80			0.80	
Adjusted northbound boardings		1,936			1,358			911	
Daily ridership		<b>3,872</b>			<b>2,712</b>			<b>1,822</b>	

Source: Parsons, based on VTA Regional Travel Model

<sup>2</sup>Conceptual design drawings, produced for the Project Study Report in 2005, indicate the following parking lot capacities: Pajaro/Watsonville—409 spaces, Castroville—364 spaces, Salinas—662 spaces.

## 8. COMPARISON WITH SKETCH PLANNING RIDERSHIP FORECASTS

Table 12 is reproduced from the *Caltrain Extension to Monterey County Alternatives Analysis*, dated April 2007 (page 114). This table indicates boardings in Monterey County, with an opening year forecast of between 1,028 and 1,390 commuters riding northbound in the morning and an equal number riding southbound in the evening. These sketch planning level estimates are very similar to the forecasts produced using the VTA four-step regional travel forecast and mode choice models.

**Table 12**  
**Future Ridership Forecasts from Monterey County (Sketch Planning Methods)**

Egress	Transit Commuters	Access Station		
		Pajaro	Castroville	Salinas
<b>2000: Percent Share<sup>1</sup></b>	100%	33%	7%	60%
Santa Clara—Mid	291	96	20	175
Santa Clara—North	632	209	44	379
San Mateo	72	24	5	43
San Francisco	33	11	2	20
<b>Total</b>	<b>1,028</b>	<b>340</b>	<b>71</b>	<b>617</b>
<b>2006: Percent Share</b>	100%	33%	7%	60%
Santa Clara—Mid	395	130	28	237
Santa Clara—North	854	282	60	512
San Mateo	97	32	7	58
San Francisco	44	15	3	26
<b>Total</b>	<b>1,390</b>	<b>459</b>	<b>98</b>	<b>833</b>
<b>2010: Percent Share</b>	100%	31%	8%	60%
Santa Clara—Mid	492	154	40	298
Santa Clara—North	1,064	333	86	645
San Mateo	121	38	10	73
San Francisco	54	17	4	33
<b>Total</b>	<b>1,731</b>	<b>542</b>	<b>140</b>	<b>1,049</b>
<b>2020: Percent Share<sup>2</sup></b>	100%	30%	9%	61%
Santa Clara—Mid	557	167	50	340
Santa Clara—North	1,206	362	109	735
San Mateo	137	41	12	84
San Francisco	63	19	6	38
<b>Total</b>	<b>1,963</b>	<b>589</b>	<b>177</b>	<b>1,197</b>
<b>2025: Percent Share</b>	100%	30%	9%	61%
Santa Clara—Mid	579	174	52	353
Santa Clara—North	1,253	376	113	764
San Mateo	143	43	13	87
San Francisco	64	19	6	39
<b>Total</b>	<b>2,039</b>	<b>612</b>	<b>184</b>	<b>1,243</b>
<b>2030: Percent Share</b>	100%	30%	9%	61%
Santa Clara—Mid	600	180	54	366
Santa Clara—North	1,300	390	117	793
San Mateo	147	44	13	90
San Francisco	67	20	6	41
<b>Total</b>	<b>2,114</b>	<b>634</b>	<b>190</b>	<b>1,290</b>

Source: Parsons, *Caltrain Extension to Monterey County Alternatives Analysis*, April 2007

<sup>1</sup>2000 forecast applies to Year 2010 planning horizon.

<sup>2</sup>2020 forecast applies to Year 2030 planning horizon.

Side by side comparisons of the ridership estimates are provided in Tables 13 and 14. The comparison shown in Table 13 indicates that the VTA model forecasts greater use from the two most northerly stations (Pajaro and Salinas) resulting from greater drawing power for park-and-ride commuters from Watsonville and the Monterey Peninsula, respectively. The comparison shown in Table 14 indicates that the VTA model forecasts shorter trips made by commuter rail compared with the sketch planning estimates. The VTA model was similarly skewed toward forecasting shorter trips by commuter rail as observed in the Altamont Commuter Express ridership validation check (Table 7). This situation arises due to the model's weighted reliance on Caltrain ridership patterns, whose trip lengths are significantly shorter as indicated in Table 15.

**Table 13**  
**Comparison of Caltrain Extension Ridership Boarding in Monterey County**

Station	VTA Model Forecast (2005) <sup>1</sup>	Sketch Plan Estimate (2010) <sup>2</sup>	Sketch Plan Estimate (2016) <sup>3</sup>
Pajaro/Watsonville	604	340	459
Castroville	338	71	98
Salinas	415	617	833
<b>Total</b>	<b>1,357</b>	<b>1,028</b>	<b>1,390</b>

Source: Parsons

1. Year 2005 demographic data file boardings adjusted downward to reflect trip table adjustment factor of 0.80.
2. Year 2000 forecast applies to Year 2010 planning horizon.
3. Year 2006 forecast applies to Year 2016 planning horizon.

**Table 14**  
**Comparison of Caltrain Extension Ridership from Monterey County**

Egress	VTA Model Forecast (2005) <sup>1</sup>	Sketch Plan Estimate (2010) <sup>2</sup>	Sketch Plan Estimate (2016) <sup>3</sup>
Santa Clara—South	334	—	—
Santa Clara—Mid	715	291	395
Santa Clara—North	124	632	854
San Mateo	59	72	97
San Francisco	125	33	44
<b>Total</b>	<b>1,357</b>	<b>1,028</b>	<b>1,390</b>

Source: Parsons

1. Year 2005 demographic data file boardings adjusted downward to reflect trip table adjustment factor of 0.80.
2. Year 2000 forecast applies to Year 2010 planning horizon.
3. Year 2006 forecast applies to Year 2016 planning horizon.

**Table 15**  
**Average Trip Length for Caltrain Riders by Train Type**

Train Type	Average Trip Length (miles)	
	February 2008	February 2007
Weekday	24.5	22.3
Baby Bullet	31.7	28.4
Peak non-Baby Bullet	21.1	19.5
Off peak	21.8	20.1
All locals	21.0	19.6

Source: Key Findings Caltrain Annual Passenger Counts, PCJPB, 2007 and 2008

## 9. EXPRESS BUS (TSM) ALTERNATIVE

The *Caltrain Extension to Monterey County Alternatives Analysis* proposed express bus service from Monterey County to the San Francisco Bay Area as a “baseline” for comparison with the commuter rail extension build alternative. For ease of reference, a description of the Express Bus Alternative is provided as Appendix A of this document. The objective of the build and baseline alternatives is to provide additional transportation capacity in the U.S. 101, State Route (SR) 1 and SR 156 corridors, as capacity problems exist along all of these roadways; and funding, environmental, and topographic constraints, plus the cost of major road construction, all limit options for non-transit solutions. Therefore, to consider express bus or baseline proposals as a viable alternative to “build” transit guideway options, the definition of this alternative needed to deliver equivalent travel time savings, comfort and convenience for transit users.

As a simplifying assumption, the *Caltrain Extension to Monterey County Alternatives Analysis* assumed that the express bus alternative could provide comparable service quality and quantity to therefore attract and transport an equal number of Monterey County boarding riders northbound to the San Francisco Bay Area in the morning, and return the same number in the afternoon/evening. FTA staff expressed concern that the capital and O&M cost of the Express Bus Alternative would thus be too expensive, given the need for buses to deliver a one-seat ride from Monterey County park-and-ride lots to San Francisco Bay Area destinations/stations along the Caltrain commuter rail line.

## 10. REDUCED SCOPE BASELINE ALTERNATIVES

The *Caltrain Extension to Monterey County Alternatives Analysis* included the following discussion of non-guideway bus alternatives that were considered, but rejected (pages 87–88).

### ***Shuttle Bus Service to Gilroy***

This alternative would operate regularly scheduled, fixed route bus service between concentrations of population in northern Monterey County and the Gilroy Caltrain station. Schedules would be devised to meet Caltrain trips, allowing for cross platform transfers at the existing Gilroy station. Route origins in Monterey County would include Salinas, the Monterey Peninsula, Castroville and Pajaro/Watsonville. Park-and-ride lots could also be constructed as part of this service definition.

A service virtually identical to that outlined was operated by MST for three years between September 9, 2002 and July 29, 2005. Known as the “Caltrain Fastrack,” the service failed to attract sufficient ridership to warrant its continuance following a three-year demonstration period. Long travel times by bus to Gilroy, the need to transfer in Gilroy, and missed connections were cited as reasons for discontinuing the service.

Exhibit 4 depicts the public timetable and route map for the Caltrain Fastrack service. The routes served all of the proposed Express Bus Alternative park-and-ride sites or their equivalent bus stops, with the exception of Pajaro/Watsonville. Travel time to Gilroy was comparable to the proposed Caltrain extension service; however, these shuttle bus passengers encountered additional time penalties for transfers. The timetables indicate 18 minutes of delay for northbound, AM riders assuming on time arrival of Route 25/26 vehicles.

Exhibit 4 indicates the ridership experienced on lines 25/26 during January and February 2005. Ridership averaged 28 patrons in each direction or 56 riders per day. Operating costs were approximately \$300,000 per year.

**Exhibit 4  
MST Route 25/26 Public Timetable and Boarding Statistics**

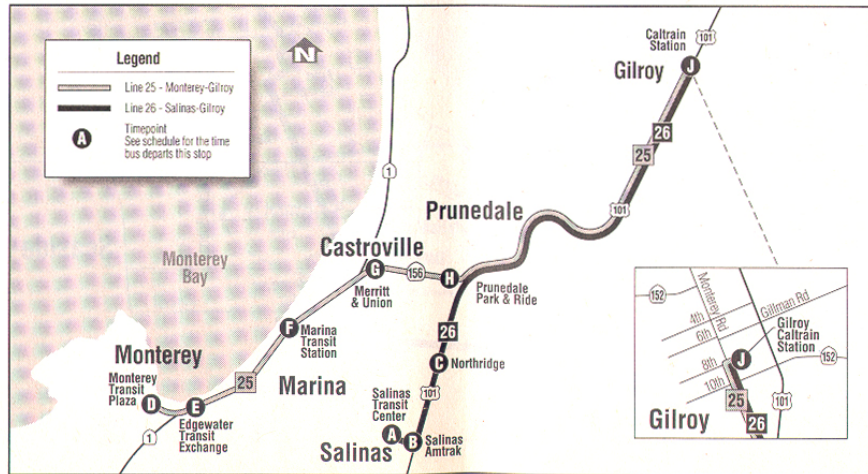
25 Gilroy						
Weekdays						
Monterey Transit Plaza <b>D</b>	Edgewater Transit Exchange <b>E</b>	Marina Transit Station <b>F</b>	Castroville <b>G</b>	Prunedale Park & Ride <b>H</b>	Gilroy Caltrain Station <b>J</b>	Caltrain Departs
5:20	5:27	5:37	5:48	5:57	6:27	6:45
9:50	10:02	10:14	10:28	10:38	11:14	--
<b>4:05</b>	--	<b>4:29</b>	<b>4:43</b>	<b>4:53</b>	<b>5:29</b>	--

25 Monterey							
Weekdays							
Notes	Caltrain Arrives	Gilroy Caltrain Station <b>J</b>	Prunedale Park & Ride <b>H</b>	Castroville <b>G</b>	Marina Transit Station <b>F</b>	Edgewater Transit Exchange <b>E</b>	Monterey Transit Plaza <b>D</b>
--	--	6:35	6:56	7:06	7:15	7:26	7:41
--	--	11:20	11:46	11:56	<b>12:07</b>	--	<b>12:25</b>
<b>5:36</b>	<b>5:42</b>	<b>6:08</b>	<b>6:18</b>	<b>6:18</b>	<b>6:29</b>	<b>6:39</b>	<b>6:50</b>
<b>A 7:41</b>	<b>7:47</b>	<b>8:15</b>	<i>Via Salinas</i>	<b>8:55</b>	<b>9:05</b>	<b>9:15</b>	

26 Gilroy					
Weekdays					
Salinas Transit Center <b>A</b>	Salinas Amtrak <b>B</b>	Northridge Center <b>C</b>	Prunedale Park & Ride <b>H</b>	Gilroy Caltrain Station <b>J</b>	Caltrain Departs
4:50	4:53	4:59	5:11	5:44	6:02
5:50	5:53	5:59	6:11	6:44	7:02
11:22	11:25	11:39	11:51	<b>12:21</b>	--
<b>4:35</b>	--	<b>4:50</b>	<b>5:02</b>	<b>5:30</b>	--
<b>5:35</b>	--	<b>5:50</b>	<b>6:02</b>	<b>6:30</b>	--
<b>6:35</b>	--	<b>6:50</b>	<b>7:02</b>	<b>7:30</b>	--

26 Salinas						
Weekdays						
Notes	Caltrain Arrives	Gilroy Caltrain Station <b>J</b>	Prunedale Park & Ride <b>H</b>	Northridge Center <b>C</b>	Salinas Amtrak <b>B</b>	Salinas Transit Center <b>A</b>
--	--	5:45	6:13	6:25	--	6:35
--	--	6:55	7:23	7:35	--	7:45
--	--	<b>12:30</b>	<b>12:58</b>	<b>1:10</b>	<b>1:22</b>	<b>1:25</b>
<b>5:36</b>	<b>5:42</b>	<b>6:10</b>	<b>6:22</b>	<b>6:32</b>	<b>6:32</b>	<b>6:34</b>
<b>6:42</b>	<b>6:48</b>	<b>7:16</b>	<b>7:28</b>	<b>7:38</b>	<b>7:38</b>	<b>7:40</b>
<b>B 7:41</b>	<b>7:47</b>	<b>8:15</b>	<b>8:27</b>	<b>8:37</b>	<b>8:37</b>	<b>8:39</b>

Notes: A Departs Gilroy for Salinas as line 26 then continues to Marina & Monterey. Partirá de Gilroy a Salinas como línea 26 y continúa a Marina y Monterey.  
B 7:47 pm trip travels to Salinas then continues to Monterey. El viaje continúa a Salinas y después a Monterey a las 7:47 pm.



**Caltrain Fastrack Boarding Statistics (January–February 2005)**

Month	Line 25	Line 26	Total
<b>January 2005</b> • 20 weekdays • 402.67 hours of operation	• 379 total boardings • 19/day • 9 passenger round trips	• 759 total boardings • 38/day • 19 passenger round trips	• 1,138 total boardings • 57/day • 28 passenger round trips
<b>February 2005</b> • 20 weekdays • 402.67 hours of operation	• 374 total boardings • 19/day • 9 passenger round trips	• 754 total boardings • 38/day • 19 passenger round trips	• 1,128 total boardings • 57/day • 28 passenger round trips
<b>All of fiscal year 2004</b>			<b>1,070 average monthly total boardings</b>

### ***Limited Stop Bus Service to San Jose***

This alternative would operate regularly scheduled, limited stop, fixed route bus service between concentrations of population in northern Monterey County and selected stops in Santa Clara County, including the Diridon Caltrain Station adjacent to downtown San Jose.

Beginning in the summer of 2006, MST initiated a limited stop service (Line 55) from Monterey to San Jose Diridon Station, with intermediate stops in Edgewater/Sand City, Prunedale, Gilroy, and Morgan Hill. The route is similar to Route 25 as discussed above, but this service extends to San Jose. Travel time between Monterey and San Jose is 2 hours 13 minutes during the morning commute trip and 2 hours during the evening commute trip. The public timetable and route map for this service is shown as Exhibit 5.

This Limited Stop Bus Alternative is similar to the proposed Express Bus Alternative. The Express Bus Alternative will, however, additionally serve sets of stations north of downtown San Jose which attract the vast majority of trips originating within Monterey County, based on Caltrain boarding and deboarding counts.”

The public timetable for MST Line 55 indicates that service during commute hours is limited to one northbound a.m. peak period trip and one southbound trip during the afternoon. First quarter fiscal year 2008 ridership averaged 74 passengers per day. First quarter fiscal year 2009 ridership increased to 114 riders per day.

Since the publication of the *Caltrain Extension to Monterey County Alternatives Analysis* report in April 2007, VTA has initiated express bus service between Gilroy and downtown San Jose to complement the Caltrain service to Gilroy. This service, Route 168, was initiated on January 14, 2008 and operates every 20 to 30 minutes in the peak direction only, during commute hours.

Buses stop at the Gilroy, San Martin and Morgan Hill Caltrain stations before running non-stop to downtown San Jose, with the route ending at the Diridon Station. Running time for the 34.18 mile route is 60 to 64 minutes northbound, and 63 to 67 minutes southbound (please see Table 16).

As of September 2008, Route 168 carried 302 riders per day.

## **11. RIDERSHIP FORECAST FOR ENHANCED SHUTTLE BUS SERVICE TO GILROY ALTERNATIVE**

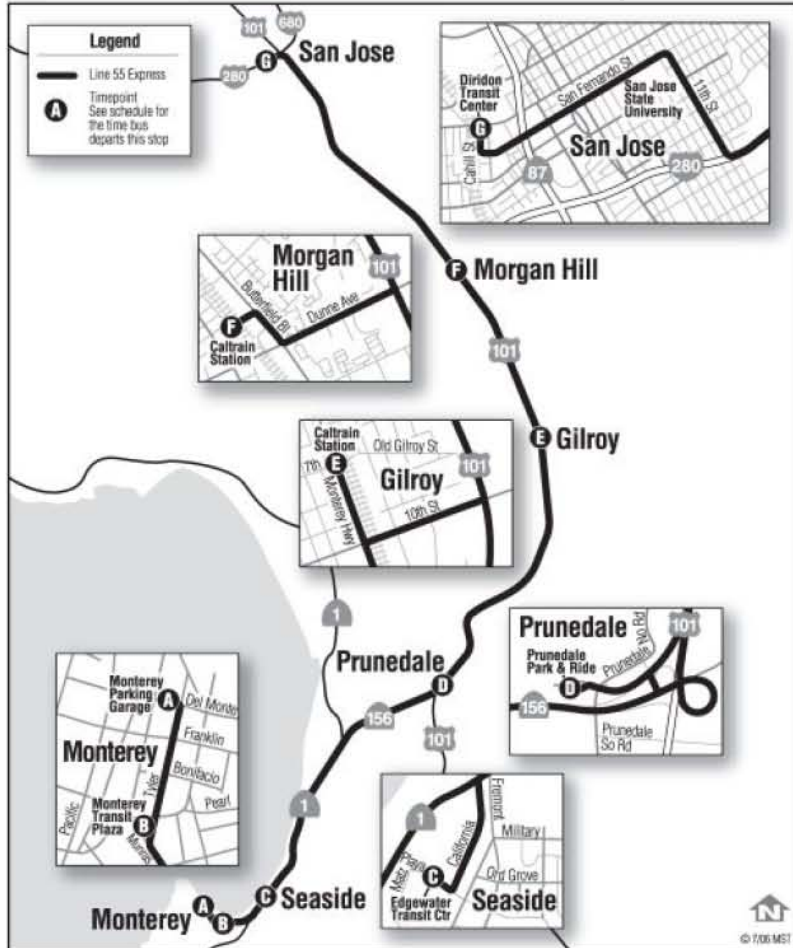
The *Caltrain Extension to Monterey County Alternatives Analysis* considered, but rejected two limited scope alternatives as discussed above. Both the “Shuttle Bus to Gilroy” and “Limited Stop Bus Service to San Jose” offered infrequent service with marginally attractive vehicles; and both attracted very little ridership.

To address FTA staff requests for consideration of a less expensive baseline alternative, ridership forecasts were prepared using the VTA model for an enhanced shuttle bus service, assuming frequent service and higher quality vehicles.

Ridership forecasts were prepared for the enhanced shuttle bus to Gilroy alternative, assuming shuttle bus departures from the Salinas, Castroville, and Pajaro/Watsonville park-and-ride lots that would be constructed under the commuter rail service extension alternative. For this forecast, no park-and-ride lot was assumed for the Monterey Peninsula (Fort Ord) area, for ease of comparison with the Caltrain Extension Alternative. The results of this forecasting effort, using the VTA model and Year 2005 demographic data set prepared by VTA, with no adjustment or revision to any aspect of the model, are presented in Table 17.



**Exhibit 5**  
**MST Line 55 Public Timetable and Route Map**



55 San Jose Express									
Weekdays									
Monterey Transit Plaza <b>A</b>	Edgewater Transit Exchange <b>B</b>	Prunedale Park & Ride <b>C</b>	Gilroy Caltrain Station <b>D</b>	Morgan Hill Caltrain Station <b>E</b>	San Jose Diridon Station <b>F</b>	Amtrak Capitol Corridor		Caltrain	
						Layover Time	Departs San Jose Diridon Station	Layover Time	Departs San Jose Diridon Station
5:10	5:22	5:44	6:11	6:38	7:23	1:42	9:05	0:17	7:45*
9:50	10:02	10:24	10:51	11:18	<b>12:03</b>	0:17	<b>12:20</b>	0:07	<b>12:10</b>
3:18	3:30	3:52	4:19	4:46	5:31	0:19	5:50	0:14	5:45*

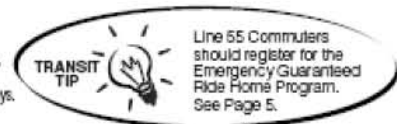


Although MST tries to ensure reliable wireless internet service, circumstances beyond our control may limit availability.

55 Monterey Express									
Weekdays									
Amtrak Capitol Corridor		Caltrain		San Jose Diridon Station <b>F</b>	Morgan Hill Caltrain Station <b>E</b>	Gilroy Caltrain Station <b>D</b>	Prunedale Park & Ride <b>C</b>	Edgewater Transit Exchange <b>B</b>	Monterey Transit Plaza <b>A</b>
Arrives San Jose Diridon Station	Layover Time	Arrives San Jose Diridon Station	Layover Time						
7:35	0:20	7:24	0:31	7:55	8:40	8:57	9:22	9:42	9:55
1:15	0:20	1:00	0:35	1:35	2:15	2:32	3:02	3:22	3:35
3:15	2:38	5:27*	0:26	5:53	6:38	6:55	7:20	7:40	7:53
Saturday & Sunday**									
8:45	0:20	—	—	9:05	9:50	10:07	10:37	10:57	11:10
1:45	0:20	1:36	0:29	2:05	2:50	3:07	3:37	3:57	4:10
5:20	0:25	5:36	0:09	5:45	6:30	6:47	7:17	7:37	7:50

Notes:

Light Type - AM, Bold Type - PM. Schedules subject to traffic delays.  
 \*Denotes connections to/from Caltrain Baby Bullet or limited stop trains.  
 \*\*Holiday schedule: Line 55 operates a Sunday schedule on Thanksgiving, the day after Thanksgiving, Christmas Day, Memorial Day, Independence Day, Labor Day, New Year's Day, and a regular schedule on all other holidays.  
 Amtrak Thruway buses to Salinas and San Jose depart from Pearl St. Please contact Amtrak & Caltrain regarding their holiday service.



**Table 16**  
**Express Bus Route 168 Weekday Schedule**

**Northbound Route 168**

	<b>Gilroy Transit Center</b>	<b>Monterey &amp; San Martin</b>	<b>Morgan Hill Caltrain Station</b>	<b>San Jose Convention Center</b>	<b>1st &amp; Santa Clara</b>	<b>San Jose Diridon Station</b>
Trip 1	5:30a	5:42a	5:53a	6:21a	6:25a	6:30a
Trip 2	5:50a	6:02a	6:13a	6:41a	6:45a	6:50a
Trip 3	6:05a	6:17a	6:28a	6:56a	7:00a	7:05a
<b>Caltrain 217</b>	<b>6:07a</b>	<b>6:16a</b>	<b>6:22a</b>	—	—	<b>6:57a</b>
Trip 4	6:24a	6:36a	6:47a	7:15a	7:19a	7:25a
<b>Caltrain 221</b>	<b>6:30a</b>	<b>6:39a</b>	<b>6:45a</b>	—	—	<b>7:20a</b>
Trip 5	6:46a	7:00a	7:11a	7:40a	7:44a	7:50a
<b>Caltrain 227</b>	<b>7:05a</b>	<b>7:14a</b>	<b>7:20a</b>	—	—	<b>7:55a</b>
Trip 6	7:16a	7:30a	7:41a	8:10a	8:14a	8:20a
Trip 7	7:47a	8:01a	8:12a	8:41a	8:45a	8:50a

**Southbound Route 168**

	<b>Diridon Station</b>	<b>2nd &amp; Santa Clara</b>	<b>San Jose Convention Center</b>	<b>Morgan Hill Caltrain Station</b>	<b>Monterey &amp; San Martin</b>	<b>Gilroy Transit Center</b>
Trip 1	3:34p	3:40p	3:45p	4:14p	4:24p	4:37p
Trip 2	4:04p	4:10p	4:15p	4:44p	4:54p	5:07p
Trip 3	4:24p	4:31p	4:36p	5:05p	5:16p	5:29p
<b>Caltrain 158</b>	<b>4:39p</b>	—	—	<b>5:11p</b>	<b>5:17p</b>	<b>5:30p</b>
Trip 4	4:44p	4:51p	4:56p	5:25p	5:36p	5:49p
Trip 5	5:09p	5:16p	5:21p	5:52p	6:03p	6:16p
Trip 6	5:39p	5:46p	5:51p	6:23p	6:33p	6:46p
Trip 7	6:09p	6:16p	6:21p	6:51p	7:01p	7:13p
<b>Caltrain 270</b>	<b>6:16p</b>	—	—	<b>6:48p</b>	<b>6:54p</b>	<b>7:07p</b>
<b>Caltrain 276</b>	<b>6:56p</b>	—	—	<b>7:28p</b>	<b>7:34p</b>	<b>7:47p</b>

**Table 17**  
**Enhanced Shuttle Bus to Gilroy Ridership Forecast (2005)**

	<b>Service Headway</b>	
	<b>20 Minutes<sup>1</sup></b>	<b>30 Minutes<sup>2</sup></b>
	<b>Ons + Offs</b>	<b>Ons + Offs</b>
Watsonville/Pajaro	1,153	898
Castroville	451	343
Salinas	651	492
<b>Total Boardings and Alightings</b>	<b>2,255</b>	<b>1,733</b>
Trip table correction factor	0.80	0.80
Daily ridership	<b>1,804</b>	<b>1,386</b>

<sup>1</sup>Assumes Express Bus mode. Assumes five minute transfer penalty with no allowance for congestion delay.

<sup>2</sup>Assumes Express Bus Mode. MST Caltrain fastrack service included 18 minutes of “slack time” to address potential congestion delays. This run assumes five minute transfer penalty with 13 minutes of additional “slack time” for Salinas and Castroville routes to address potential congestion delays. Assumes 8 minutes of slack time for Watsonville/Pajaro route.

The table indicates that the Enhanced Shuttle Bus to Gilroy Alternative, operating with 30-minute headways from three park-and-ride lots, would attract approximately 1,386 riders per day, assuming Year 2005 demographic conditions. This level of ridership is approximately one-half of the ridership forecast for the Caltrain extension to Salinas, assuming a 20-minute maximum wait time as discussed in Section 7 of this document (please see Table 11).

## **12. ALTERNATIVE OPERATING PLANS FOR CALTRAIN EXTENSION ALTERNATIVE**

The *Caltrain Extension to Monterey County Alternatives Analysis* included the following discussion of commuter rail service options that were considered, but rejected (pages 89 and 91).

### ***Shuttle Train Service to Gilroy***

This alternative would operate regularly scheduled shuttle train service between three stations located in Monterey County (Pajaro, Castroville and Salinas) and the Gilroy Caltrain station. Schedules would be devised to meet Caltrain trips, allowing for cross track transfers at the existing Gilroy station.

Physical improvements to stations, platforms, park-and-ride facilities, main line track, and layover facilities, defined for the Caltrain Extension Alternative, would be assumed for this Shuttle Train Service Alternative. Additionally, this alternative would require purchase of locomotives and passenger coaches for the shuttle trainsets running between Salinas and Gilroy.

To minimize impacts to UPRR freight operations, and therefore minimize the need for offsetting mainline capacity improvements; this alternative would store the shuttle trains in Gilroy during the midday on VTA's existing layover tracks.

Compared with the Caltrain Extension Alternative, the Shuttle Train Alternative would be more expensive, both from a capital and operating perspective. Insofar as capital costs, the Shuttle Train Alternative would require the purchase of FRA-compliant rolling stock that would stand idle for all but two hours, 255 weekdays per year. From an operating cost perspective, a shuttle train service would be cost prohibitive as train crew productivity (vehicle hours of revenue service) would be less than 15 percent of crew paid time.

### ***Independent Train Service to San Francisco***

This alternative would operate regularly scheduled, independent, commuter rail service between three stations located in Monterey County (Pajaro, Castroville and Salinas) and the San Francisco Caltrain station. Schedules would be devised to interlace with Caltrain trips, thereby supplementing or replacing existing Caltrain service. Similar to Altamont Commuter Express (ACE) service, trains would originate in Salinas and make one northbound trip in the morning to San Francisco. During the midday, trains would layover in San Francisco before returning to Salinas in the evening.

Monterey County based trains would make selected stops at stations between Gilroy and San Francisco. To minimize disruptions to existing Caltrain operating schedules, Monterey County based trains could piggyback behind Caltrain Baby Bullet trains, or replace selected trips (such as trains 215, 319, 323, 329, 362, 368, 372 and 378) altogether.

Physical improvements to stations, platforms, park-and-ride facilities, main line track, and layover facilities, defined for the Caltrain Extension Alternative, would be assumed for this Independent Train Service Alternative. Additionally, this alternative would require purchase of locomotives and passenger coaches for the trainsets running between Salinas and San Francisco.

To minimize impacts to Union Pacific Railroad freight operations, and therefore minimize the need for additional offsetting mainline capacity improvements, the Transportation Agency for Monterey County would assume the responsibility for its proportional share of track improvements and slot fees negotiated by the Santa Clara Valley Transportation Authority with Union Pacific for increased service between Gilroy and San Jose.

Compared with the Caltrain Extension Alternative, the Independent Train Service Alternative would be more expensive, both from a capital and operating perspective. Insofar as capital costs, the Independent Train Service Alternative would require the purchase of FRA-compliant rolling stock that would stand idle for all but five or six hours, 255 weekdays per year. From an operating cost perspective, an independent train service would be more costly than the Caltrain Extension Alternative, as train crew productivity (vehicle hours of revenue service) would be approximately 50 percent of crew paid time. To improve this productivity, Monterey County based trains could replace or supplement Baby Bullet service throughout the midday.

Tables 3-7 and 3-8 list the comparative capital and operating costs for independent train service to San Francisco versus the extension of existing Caltrain service to Salinas.

**Table 3-7  
Capital Costs of Independent Train Service to San Francisco Alternative versus Caltrain Extension (\$1,000 Fiscal Year 2007)**

	Independent Train Service	Caltrain Extension Alternative
UPRR main line	\$35,000	\$ 5,000
Gilroy yard	4,124	4,124
Pajaro station	17,030	17,030
Castroville station	16,443	16,443
Salinas station	19,856	19,856
Salinas bus	9,827	9,827
Salinas yard	11,742	11,742
Rolling stock	48,000	8,800
	<u>\$162,022</u>	<u>\$92,822</u>

Source: Parsons

Note: Capital costs exclude unallocated contingencies

**Table 3-8  
Operating and Maintenance Costs of Independent Train Service to San Francisco Alternative versus Caltrain Extension (\$ Fiscal Year 2007)\***

	Independent Train Service	Caltrain Extension Alternative
Rail operator	\$ 9,870,000	\$3,270,000
Fuel	1,796,000	583,000
Timetables and tickets	35,000	35,000
Insurance	655,000	219,000
Facilities and equipment	200,000	160,000
Utilities	97,000	97,000
UPRR track use charge	1,915,000	1,058,000
UPRR slot fees	1,915,000	2,196,000
JPB administrative expense	—	1,097,000
	<u>\$19,071,000</u>	<u>\$8,715,000</u>

Source: Parsons

\* Altamont Commuter Express fiscal year 2006–2007 budget is \$14 million.

### ***Shuttle Train Service to San Jose***

Since publication of the Caltrain Extension to Monterey County Alternatives Analysis report in April 2007, the Metropolitan Transportation Commission, Peninsula Corridor Joint Powers Board, Santa Clara Valley Transportation Authority, and the Transportation Agency for Monterey County have been working to devise a long-range regional passenger rail service plan which would reflect the:

- Peninsula Corridor Joint Powers Board's goal of electrifying passenger rail service between San Francisco and San Jose
- Metropolitan Transportation Commission's goal of establishing high speed rail service between San Francisco and Los Angeles via San Jose and Gilroy
- Santa Clara Valley Transportation Authority's goals of extending BART service to downtown San Jose, and maintaining and enhancing commuter rail service between San Jose and Gilroy
- Transportation Agency for Monterey County's goals of providing convenient and attractive public transportation service between Monterey and the San Francisco Bay Area, to include a connection to high speed rail.

Ridership forecasts were prepared for these options using the Santa Clara Valley Transportation Authority model and Year 2035 demographic data set and highway/transit networks prepared by VTA, with no adjustment or revision to any aspect of the model, assuming 20-minute maximum wait times. Two scenarios were tested. A base case option would operate shuttle train service between Gilroy and San Jose on 45-minute headways. This service would be bi-directional to recycle trainset equipment. A Caltrain Extension to Monterey County option would originate trainsets in Salinas, operating northbound in the morning and southbound in the evening, with trains laying over in Salinas during the evening, and in San Jose during the midday.

Table 18 reports the ridership forecasts for these two options. The table indicates that the shuttle service to Salinas option would attract an additional 9,134 system-wide boardings per weekday, over and above the base option of shuttle service to Gilroy. Assuming the Year 2005 trip table correction factor of 0.80 applies to Year 2035 conditions, ridership potential for the Caltrain Extension to Monterey County would be approximately 7,300 to 7,500 riders per day, based on Parsons' application of the VTA Regional Travel Forecast Model.

**Table 18**  
**Caltrain Ridership Forecast with Shuttle Service South of San Jose (2035)**

Station	Name	Shuttle to Gilroy		Shuttle to Salinas	
		Boardings	Alightings	Boardings	Alightings
32433	SF Transbay Terminal				
32435	Fourth/Townsend Caltrain	10,679	23,004	10,677	23,352
32436	23rd Street Caltrain	1,351	1,087	1,351	1,092
32437	Paul Avenue Caltrain				
32438	Bayshore Caltrain	1,395	435	1,395	444
32439	South San Francisco	1,562	2,811	1,562	2,841
32440	San Bruno Caltrain	1,698	507	1,698	513
32441	Millbrae Caltrain	6,526	3,268	6,526	3,349
34323	Millbrae Caltrain				
32442	Broadway Caltrain				
32443	Burlingame Caltrain	1,087	1,474	1,087	1,484
32444	San Mateo Caltrain	3,662	2,210	3,662	2,230
32445	Hayward Park Caltrain	800	1,189	800	1,196
32446	Bay Meadows Caltrain				
32447	Hillsdale Caltrain	7,382	4,260	7,382	4,308
32448	Belmont Caltrain	881	1,306	881	1,314
32449	San Carlos Caltrain	2,470	3,163	2,470	3,198
32450	Redwood City Caltrain	6,290	5,149	6,290	5,200
32451	Atherton Caltrain	783	254	783	261
32452	Menlo Park Caltrain	2,159	2,715	2,159	2,742
32453	Palo Alto Caltrain	4,172	12,204	4,172	12,377
32454	Stanford Stadium Caltrain				
32455	California Avenue	1,211	2,371	1,211	2,458
32456	San Antonio Caltrain	2,353	2,373	2,353	2,436
32457	Mountain View Caltrain	5,037	6,800	5,030	6,934
32469	San Antonio Caltrain				
32458	Sunnyvale Caltrain	4,543	7,163	4,543	7,346
32459	Lawrence Caltrain	924	3,563	924	3,695
32460	Santa Clara Caltrain	14,377	2,886	14,119	2,971
32461	College Park Caltrain				
32462	San Jose Caltrain	10,788	3,345	10,774	6,522
32530	San Jose Caltrain				
32463	Tamien Caltrain	425	256	422	1,223
32464	Capitol Caltrain	31	94	31	139
32465	Blossom Hill Caltrain	104	257	104	1,424
32466	Morgan Hill Caltrain	775	137	775	347
32467	San Martin Caltrain	463	131	463	1,018
32468	Gilroy Caltrain	612	126	612	1,259
32429	Watsonville Caltrain			2,378	
32430	Castroville Caltrain			2,803	
32431	Salinas Caltrain			4,237	
<b>Total</b>		<b>94,539</b>	<b>94,539</b>	<b>103,673</b>	<b>103,673</b>

### 13. SUMMARY

The Draft *Caltrain Extension to Monterey County Alternatives Analysis* was published in September 2006. Following a review by the Peninsula Corridor Joint Powers Board and Federal Transit Administration staff, additional information was added, and the draft report was republished in April 2007. Further review by the Federal Transit Administration staff recommended use of a traditional regional travel demand model for the development of the ridership forecasts, plus consideration of a reduced scope/cost baseline alternative.

A suitable, regional travel demand and mode choice model, calibrated by the Santa Clara Valley Transportation Authority, became available for use in 2008. This model, which includes both commuter rail and express bus modes as well as other modes, was used to produce the ridership forecasts which are listed in this report. Additional validation efforts were performed to verify the accuracy of the model calibration parameters, both for Caltrain service between Gilroy and San Francisco, and Altamont Commuter Express service between Stockton and San Jose.

The results of the VTA model application indicate ridership potentials for the Caltrain extension which are higher than the previously reported estimates which were based on sketch planning methods. No alteration or adjustment was made to the VTA model, demographic data set, or highway and transit networks other than to extend commuter rail or express bus service between Santa Clara and Monterey/Santa Cruz counties. More conservative maximum wait time penalties were assumed compared with VTA ridership validation checks. Ridership results were also adjusted downward to reflect county to county observed peak period traffic flows.

Assuming Year 2005 baseline demographic conditions and 2006 service levels, the Caltrain extension to Salinas would be sufficient to warrant three-train service in each direction in the near-term based on the VTA model results (2,712 riders per day). This forecast is higher than the sketch planning estimate of 2,056 riders based on pre-recession Year 2010 expected conditions.

This ridership validation effort also tested an Enhanced Shuttle Bus to Gilroy option, operating between park-and-ride lots constructed in Salinas, Castroville and Pajaro/Watsonville. This test assumed the express bus mode, and attracted 1,386 daily riders based on the VTA model results. Given the equipment recycle time of over two hours per round trip, this service would be only marginally less expensive to operate compared with the express bus service alternative documented in the Draft *Caltrain Extension to Monterey County Alternatives Analysis* report.

While not a consideration for Small Starts funding requests, this ridership validation effort also prepared a long-range, Year 2035 forecast. This long-range forecast assumed electrified passenger rail service north of San Jose, and shuttle diesel powered rail service between San Jose and Salinas. The ridership potential indicated by this test scenario was 7,300 to 7,500 riders per day. This forecast was higher than the sketch plan estimate of 3,926 riders per day by Year 2030.

By way of reference, ridership on the Altamont Commuter Express, a line and service similar to that proposed, during the first quarter of fiscal year 2009 (July 1, 2008 through September 30, 2008) averaged 3,697 riders per weekday.

# APPENDIX A

## VTA Model Methodology Report



# **Silicon Valley Rapid Transit Corridor**

**DRAFT**

## **Travel Demand Modeling Methodology Report**

### **1.0 Introduction**

The purpose of this working paper is to present the travel demand modeling methodology and year 2000 base validation results of the models used for the Silicon Valley Rapid Transit Corridor Study. The model chosen for the project is an enhanced version of the Metropolitan Transportation Commission (MTC) regional model. The MTC Regional model, called BAYCAST-90, encompasses the nine-county San Francisco bay area and is the model used to develop the Regional Transportation Plan and prepare travel forecasts for major regional corridor studies. The MTC model was recently calibrated to the 1990 regional household survey and was recently re-validated by MTC to 1998 traffic counts and transit operator boardings as part of the year 2001 update of the Regional Transportation Plan. The MTC Regional model was chosen as the basis to prepare ridership for this study primarily because it models the full nine-county region. This was an important consideration as one of the primary travel markets in the corridor consist of the long-distance inter-county commuter trips. In addition, due to the regional nature of travel in the corridor, it was important to be able to predict and analyze systemwide impacts to transit services located outside the immediate project corridor. The strategy for the travel demand modeling for this project was to add incremental improvements to the MTC regional models to refine the model performance in the project corridor and to model special travel markets not well addressed in the regional model framework.

### **1.1 Model Enhancements**

The model enhancements applied for this project have evolved as the project as progressed from feasibility, alternatives analysis (MIS) and the current DEIS phase. One of the first considerations in the recommended model enhancements to the regional model was that the MTC model did not explicitly consider the different transit submodes within the mode choice model structures. Ridership on competing transit modes is a function of the all-or-nothing minimum path transit assignment instead of as a behavioral issue in the mode choice models considering the total time and cost of the trip on each competing mode. As part of the previous BART Extension Study to Milpitas, San Jose and Santa Clara, the MTC mode choice model was revised to enhance the ability of the models to prepare forecasts that could explicitly consider the differences between different transit technologies that would exist within the project corridor. This enhancement was preserved and enhanced during the DEIS project phases.

In summary, the model enhancements implemented in the MTC Regional Model for the Silicon Valley Corridor study DEIS included the following:

- Addition of a lower-level nest to the MTC home-based work mode choice models to model transit submode choice (heavy rail, commuter rail, light rail, express bus and local bus) for walk-access to transit and park-and-ride/kiss-and-ride choice for drive-access to transit,
- Addition of a procedure designed to model the auto and transit choices of commuters residing east of the Bay Area in the Central Valley who work within the nine-county Bay Area,
- Addition of traffic analysis zones (TAZ) in Santa Clara County to allow detailed estimation of station ridership by mode-of-access,
- Addition of a transit station park-and-ride constraint in the mode choice models,
- Estimation of air-passenger trips to the San Jose International Airport, and
- Recalibration and validation of the models to base year 2000 observed travel conditions in the project corridor.

The new countywide models were developed to be consistent with the Metropolitan Transportation Commission (MTC) regional model methodologies, and were also expanded to include Santa Cruz, Monterey, San Benito and San Joaquin Counties, all important commuter markets into employment rich Santa Clara County. The countywide model update included recalibration of all aspects of the models, including auto ownership, trip generation, trip distribution and the mode choice models. A new base year 2000 peak hour highway and daily transit validation was also implemented for model validation.

FTA specifically requested that VTA address the following elements in the model recalibration efforts for purposes of the New Starts submittal, consisting of the following:

- Continue to calibrate the mode choice models using regional constants, not constants stratified by subregion (i.e., counties or districts),
- Analyze and correct possible errors in the underlying person trip tables to improve the results of the mode choice and transit assignments, and
- Incorporate recent transit on-board survey data into the calibration of the mode choice models

## 2.0 Workers and Vehicles by Household Submodel

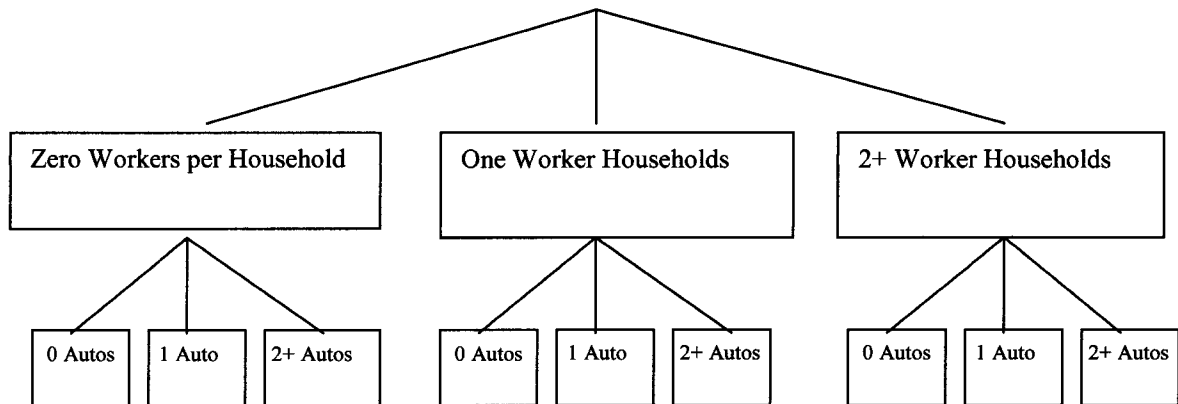
The workers and vehicles per household model is a nested logit choice model applied at the zone-of-residence level. The input to the WHHAO model application are number of households stratified by household income quartile level. Variables in this choice model include mean household income, mean household size, the share of households residing in multi-family dwelling units, the share of persons age 62-or-older, and gross population density. Coefficients for the final nested choice model are shown in Table 1. Detailed definition of variables in this and other models are included in Appendix Table A-1.

The nested structure for the WHHAO model is shown in Figure 1. The upper level nest of this model splits households into households by workers in household level (0, 1, 2+ workers per household). The lower nest further splits these households by auto ownership level (0, 1, 2+ vehicles per household).

The output from this WHHAO model is the number of households by household income quartile (4) by workers in household level (3) by auto ownership level (3) or 36 different market segments per travel analysis zone.

**Figure 1**

### Workers and Vehicles by Household Submodel Structure



WHH=0			WHH=1			WHH=2			Variable	Model #9W (Nested)	
AO=0	AO=1	AO=2	AO=0	AO=1	AO=2	AO=0	AO=1	AO=2		Beta	t-stat
X									Constant 1	1.615	(1.4)
	X								Constant 2	3.084	(2.6)
		X							Constant 3	1.679	(1.4)
			X						Constant 4	1.586	(1.2)
				X					Constant 5	3.284	(2.5)
					X				Constant 6	1.237	(0.9)
						X			Constant 7	-2.941	(2.8)
							X		Constant 8	-0.7834	(1.1)
	X								Income Leg1	3.956E-02	(2.1)
		X							Income Leg1	0.0888	(3.6)
			X						Income Leg1	0.2853	(2.4)
				X					Income Leg1	0.3433	(3.0)
					X				Income Leg1	0.3907	(3.3)
						X			Income Leg1	0.9325	(1.7)
							X		Income Leg1	0.9719	(1.8)
								X	Income Leg1	1.0320	(1.9)
	X								Income Leg2	9.989E-03	(0.6)
		X							Income Leg2	2.268E-02	(1.4)
			X						Income Leg2	4.776E-02	(1.4)
				X					Income Leg2	5.624E-02	(1.7)
					X				Income Leg2	7.682E-02	(2.4)
						X			Income Leg2	0.2699	(1.6)
							X		Income Leg2	0.2866	(1.7)
								X	Income Leg2	0.3048	(1.8)
		X							HH Size	0.3311	(3.8)
					X				HH Size	0.5986	(8.9)
						X	X	X	HH Size	1.3790	(2.4)
X			X			X			MFDU	0.5662	(3.0)
		X			X			X	MFDU	-1.0700	(8.8)
X	X	X							SHPOP 62+	4.5390	(2.9)
						X	X	X	SHPOP 62+	-12.1900	(1.7)
	X			X			X		GPOPD -Leg1	-0.05354	(1.6)
		X			X			X	GPOPD -Leg1	-0.07401	(2.2)
	X			X			X		GPOPD -Leg2	-0.04987	(3.6)
		X			X			X	GPOPD -Leg2	-0.11170	(6.9)
	X			X			X		GPOPD -Leg3	-2.506E-02	(4.1)
		X			X			X	GPOPD -Leg3	-2.724E-02	(2.9)
X	X	X							Theta-NWHH	0.7451	(3.0)
			X	X	X				Theta-SWHH	0.4477	(2.7)
						X	X	X	Theta-MWHH	0.1968	(1.8)
<b>Log Likelihood</b>										<b>-2780.50</b>	

Go to Appendix Table A.1 for detailed definition of variables.

### **3.0 Trip Generation Models**

Trip generation models include both trip production and trip attraction models. Production models are based on trips made by households, workers or students at the home end of home-based trips. Attraction models are based on trips made at the non-home end of home-based trips. Trips as defined in these trip generation models include non-motorized trips (bicycle, walk) as well as motorized modes (auto, transit). For non-home-based trips, the same production/attraction terminology can be applied, though non-home-based generation models are essentially trip origin (production) and trip destination (attraction) models. With the exception of the home-based school trip generation models, all of the new trip generation models are multiple regression in form. The home-based shop trip generation model, in particular, is a hybrid of a cross-classification model (stratified by workers in household level) and a multiple regression model.

Coefficients and definition of variables for all trip generation and attraction models are included in Table 2. The independent variable in these multiple regression trip generation models are either trip rates (e.g., work trips per employed person, home-based shop attractions per retail+service+other job) or trips (e.g., total home-based social/recreation attractions, total non-home-based productions).

The home-based work and home-based school trip generation (production) models are applied to persons who are eligible to take either work or school trips, namely, workers or students. Given difficulty in estimating home-based school trip generation models, the final models are simple trip rate models: 1.314 trips per K-12 student, and 1.157 trips per college student.

Results of the adjustment (calibration) of the trip generation models are summarized in Table 3 through 12. In terms of aggregate validation, trip generation results are compared, at the MTC county level, to 1998 MTC estimated trip generation productions and attractions.

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**Table 2**

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**Summary of BAYCAST Trip Generation Models****Home-Based Work Trip Generation**

Generation  $HBWG/EMPREA = 1.0525 + 1.632E-02 * HHINC - 2.190E-04 * HHINC^2 + 8.50E-07 * HHINC^3$

Attraction  $HBWA/TOTEMP = 0.7782 + 0.5661 * WRKR/JOB10 - 0.1289 * WRKR/JOB^2 + 0.00873 * WRKR/JOB10^3 - 0.03928 * GEMPG10 + 0.3369 * CORE$

Where:

HHINC = Household Income in Thousands of 1989 Constant Dollars

WRKR/JOB10 = Worker/Job Ratio Decile code

GEMPDG10 = Gross Employment Density, of Work, Decile Code

CORE = Regional Core Zones Dummy

Market Segmentation Household Income Quartile (Generation and Attraction)

**Home-Based Shop/Other Trip Generation**

Generation  $HBSHG/ZVHH = 0.3141 + 0.4709 * PHH + 0.4034 * VHH + 0.02052 * HHINC - 0.000131 * HHINC^2$

$HBSHG/SVHH = -0.4419 + 0.7299 * PHH + 0.2279 * VHH + 0.005123 * HHINC$

$HBSHG/MVHH = -0.4288 + 0.5921 * PHH + 0.09071 * VHH + 0.009143 * HHINC - 6.054E-5 * HHINC^2$

Attraction  $HBSHA/RSOEMP = 0.1363 - 0.04506 * \text{LogNEMPD} + 1.6169 * \text{TOTHHRT1} + 0.7365 * \text{TOTHHRT2} + 2.9835 * \text{RETEMPRT}$

Where:

PHH = Average Household Size (Person Per Household)

VHH = Average Vehicles per Household

HHINC = Household Income in Thousands of 1989 Constant Dollars

LogNEMPD = Natural Log of RSOEMP / Commercial/Industrial Acres

TOTHHRT1 = Ratio of Total Households to RSOEMP, where ratio is less than 1.0

TOTHHRT2 = Ratio of Total Households to RSOEMP, where ratio is greater than 1.0

RETEMPRT = Ratio of Retail to RSO Employment

RSOEMP = Retail + Service + Other Employment

Market Segmentation Workers in Household (3) by Household Income Quartile by Auto Ownership Level (3) (Generation Only)

**Non-Home-Based Trip Generation**

Generation  $NHBG = 0.798 * \text{OTHEMP} + 2.984 * \text{RETEMP} + 0.916 * \text{SEREMP} + 0.707 * \text{TOTHH}$

Attraction  $NHBA = 0.636 * \text{OTHEMP} + 3.194 * \text{RETEMP} + 0.730 * \text{SEREMP} + 0.803 * \text{TOTHH}$

Where:

OTHEMP = Other Employment

RETEMP = Retail Employment

SEREMP = Service Employment

TOTHH = Total Households

Market Segmentation None

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**Table 2 (cont.)**

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**Summary of BAYCAST Trip Generation Models**

**Home-Based Social/Recreation Trip Generation**

Generation  $HBSREG/HH = 0.4102 + 0.1176 * PHH + 0.002849 + HHINC - 0.4632 * WHHRATE + 0.1487 * VHH - 0.08118 * ZVHH - 0.1049 * ZWHH$

Attraction  $HBSRA = 0.8674 * RETEMP + 0.1616 * SEREMP + 0.5216 * TOTHH$

Where:

PHH = Average Household Size (Persons Per Household)

VHH = Average Vehicles per Household

HHINC = Household Income in Thousands of 1989 Constant Dollars

WHHRate = Share of Persons in Household who Work (EMPRES/HHPOP)

ZVHH = Zero Vehicle Household Dummy

ZWHH = Zero Worker Household Dummy

RETEMP = Retail Employment

SEREMP = Service Employment

TOTHH = Total Households

Market Segmentation Workers in Household (3) by Household Income Quartile by Auto Ownership Level (3) (Generation Only)

**Home-Based School Trip Generation**

Generation  $HBGSP = POP0513 * 0.923 * 1.314$

$HBHSP = POP1417 * 0.943 * 1.314$

$HBCoIP = POP1824 * <PCTENR -C> * 1.157$

$HBGSA = HBGSP$

$HBHSA = HSENROLL * 1.314$

$HBCoIA = COLL\_FTE * 1.157$

where:

HBGSP, HBGSA = Home-Based Grade School Productions and Attractions

HBHSP, HBHSA = Home-Based High School Productions and Attractions

HBCoIP, HBCoIA = Home-Based College Productions and Attractions

POP0513 = Number of Persons age 5-13

POP1417 = Number of Persons age 14-17

POP1824 = Number of Persons age 18-24

0.923, 0.943 = Percent of persons enrolled by age (1990 Census PUMS)

1.314, 1.157 = Trips per student (estimated from 1990 Survey)

PCTENR\_C = Percent of 18-24 year olds, enrolled in college, by County (PUMS)

HSENROLL = High School Enrollment

COLL\_FTE = College Full Time Equivalent Enrollment

Market Segmentation None

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**Table 3 Home-based Work Trip Production Comparison**

County	HBW Productions		Workers (Employed Residents)		Productions/Worker	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	586,992	616,588	405,177	422,100	1.45	1.46
San Mateo	583,528	612,913	376,900	393,703	1.55	1.56
Santa Clara	1,344,965	1,429,319	880,936	928,699	1.53	1.54
Alameda	976,945	1,033,856	662,557	694,602	1.47	1.49
Contra Costa	681,335	719,989	453,009	475,888	1.50	1.51
Solano	250,160	263,097	177,206	185,606	1.41	1.42
Napa	85,379	90,463	58,678	61,598	1.46	1.47
Sonoma	323,364	344,705	224,001	235,400	1.44	1.46
Marin	201,404	211,152	135,436	140,401	1.49	1.50
<b>ALL</b>	<b>5,034,072</b>	<b>5,322,082</b>	<b>3,373,900</b>	<b>3,537,997</b>	<b>1.49</b>	<b>1.50</b>

**Table 4 Home-based Work Trip Attraction Comparison**

County	HBW Attractions		Total Jobs		Attractions/Job	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	878,070	920,942	601,040	628,860	1.46	1.46
San Mateo	526,603	553,914	361,062	380,369	1.46	1.46
Santa Clara	1,460,606	1,571,357	1,010,107	1,077,227	1.45	1.46
Alameda	962,247	1,007,125	693,528	725,789	1.39	1.39
Contra Costa	510,730	542,719	339,312	360,090	1.51	1.51
Solano	169,414	171,662	127,166	129,510	1.33	1.33
Napa	80,771	85,016	57,426	59,710	1.41	1.42
Sonoma	274,704	289,093	195,455	203,530	1.41	1.42
Marin	170,927	180,256	119,022	123,510	1.44	1.46
<b>ALL</b>	<b>5,034,072</b>	<b>5,322,084</b>	<b>3,504,118</b>	<b>3,688,595</b>	<b>1.44</b>	<b>1.44</b>



*Table 5 Home-based Shop/Other Trip Production Comparison*

County	HBSHOP/OTHER Productions		Households		Productions/Household	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	542,581	564,929	313,212	315,594	1.73	1.79
San Mateo	639,629	657,918	251,192	254,342	2.55	2.59
Santa Clara	1,512,605	1,572,039	555,803	567,086	2.72	2.77
Alameda	1,032,649	1,077,127	505,006	516,102	2.04	2.09
Contra Costa	704,714	727,069	331,423	338,866	2.13	2.15
Solano	279,766	289,600	126,888	130,320	2.20	2.22
Napa	100,169	103,907	45,367	46,246	2.21	2.25
Sonoma	347,113	365,077	167,320	171,524	2.07	2.13
Marin	191,315	196,253	98,553	99,504	1.94	1.97
<b>ALL</b>	<b>5,350,541</b>	<b>5,553,919</b>	<b>2,394,764</b>	<b>2,439,584</b>	<b>2.23</b>	<b>2.28</b>

*Table 6 Home-based Shop/Other Trip Attraction Comparison*

County	HBSHOP/OTHER Attractions		Retail/Service/Other Employment		Attractions/RSO Employment	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	639,035	665,933	532,821	559,610	1.20	1.19
San Mateo	615,092	640,955	292,716	310,639	2.10	2.06
Santa Clara	1,550,506	1,624,819	668,735	721,118	2.32	2.25
Alameda	1,029,195	1,051,919	550,323	574,551	1.87	1.83
Contra Costa	621,485	645,483	287,422	304,080	2.16	2.12
Solano	265,983	273,118	109,140	110,660	2.44	2.47
Napa	101,916	110,072	44,019	45,460	2.32	2.42
Sonoma	345,636	356,228	150,563	155,530	2.30	2.29
Marin	181,693	185,392	106,413	110,770	1.71	1.67
<b>ALL</b>	<b>5,350,541</b>	<b>5,553,919</b>	<b>2,742,152</b>	<b>2,892,418</b>	<b>1.95</b>	<b>1.92</b>

**Table 7 Home-based Social-Recreational Trip Production Comparison**

County	HBSoc-Rec Productions		Households		Productions/Household	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	234,309	239,925	313,212	313,212	0.75	0.76
San Mateo	319,337	329,464	251,192	251,192	1.27	1.30
Santa Clara	728,490	756,826	555,803	555,803	1.31	1.33
Alameda	410,319	426,974	505,006	505,006	0.81	0.83
Contra Costa	323,842	335,052	331,423	331,423	0.98	0.99
Solano	122,183	126,563	126,888	126,888	0.96	0.97
Napa	42,845	44,267	45,367	45,367	0.94	0.96
Sonoma	156,722	161,752	167,320	167,320	0.94	0.94
Marin	93,201	95,805	98,553	98,553	0.95	0.96
<b>ALL</b>	<b>2,431,248</b>	<b>2,516,628</b>	<b>2,394,764</b>	<b>2,394,764</b>	<b>1.02</b>	<b>1.03</b>

**Table 8 Home-based Social-Recreational Trip Attraction Comparison**

County	HBSoc-Rec Attractions		Retail/Service Employment		Attractions/RSO Employment	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	639,035	665,933	532,821	559,610	1.20	1.19
San Mateo	615,092	640,955	292,716	310,639	2.10	2.06
Santa Clara	1,550,506	1,624,819	668,735	721,118	2.32	2.25
Alameda	1,029,195	1,051,919	550,323	574,551	1.87	1.83
Contra Costa	621,485	645,483	287,422	304,080	2.16	2.12
Solano	265,983	273,118	109,140	110,660	2.44	2.47
Napa	101,916	110,072	44,019	45,460	2.32	2.42
Sonoma	345,636	356,228	150,563	155,530	2.30	2.29
Marin	181,693	185,392	106,413	110,770	1.71	1.67
<b>ALL</b>	<b>5,350,541</b>	<b>5,553,919</b>	<b>2,742,152</b>	<b>2,892,418</b>	<b>1.95</b>	<b>1.92</b>

**Table 9 Non-home-based Trip Production Comparison**

County	Non-home-based Productions		Households		Productions/Household	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	836,789	866,303	313,212	313,212	1.57	1.55
San Mateo	683,935	714,840	251,192	251,192	2.34	2.30
Santa Clara	1,571,485	1,655,756	555,803	555,803	2.35	2.30
Alameda	1,043,164	1,081,125	505,006	505,006	1.90	1.88
Contra Costa	612,374	639,526	331,423	331,423	2.13	2.10
Solano	227,484	232,493	126,888	126,888	2.08	2.10
Napa	91,209	94,392	45,367	45,367	2.07	2.08
Sonoma	305,322	314,371	167,320	167,320	2.03	2.02
Marin	208,140	214,256	98,553	98,553	1.96	1.93
<b>ALL</b>	<b>5,579,902</b>	<b>5,813,062</b>	<b>2,394,764</b>	<b>2,394,764</b>	<b>2.03</b>	<b>2.01</b>

**Table 10 Non-home-based Trip Attraction Comparison**

County	Non-home-based Attractions		Retail/Service Employment		Attractions/RS Employment	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	809,162	837,078	532,821	559,610	1.52	1.50
San Mateo	684,289	715,158	292,716	310,639	2.34	2.30
Santa Clara	1,569,907	1,651,486	668,735	721,118	2.35	2.29
Alameda	1,045,297	1,084,363	550,323	574,551	1.90	1.89
Contra Costa	624,204	652,197	287,422	304,080	2.17	2.14
Solano	231,753	237,666	109,140	110,660	2.12	2.15
Napa	92,320	95,854	44,019	45,460	2.10	2.11
Sonoma	312,674	322,659	150,563	155,530	2.08	2.07
Marin	210,263	216,601	106,413	110,770	1.98	1.96
<b>ALL</b>	<b>5,579,869</b>	<b>5,813,062</b>	<b>2,742,152</b>	<b>2,892,418</b>	<b>2.03</b>	<b>2.01</b>

**Table 11 Home-based School Trip Production Comparison**

County	HB Grade School Productions		Home-based High School Productions		HB College Productions	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	83,158	89,803	38,725	315,594	58,288	58,861
San Mateo	104,826	112,000	42,263	254,342	44,415	45,151
Santa Clara	256,187	275,095	103,482	567,086	121,431	124,173
Alameda	223,114	238,317	87,366	516,102	95,275	96,424
Contra Costa	148,101	154,889	58,170	338,866	44,533	44,964
Solano	73,600	76,416	26,595	130,320	19,396	19,501
Napa	18,626	19,353	7,780	46,246	7,049	7,236
Sonoma	71,931	74,754	26,086	171,524	25,555	25,936
Marin	31,582	33,206	13,241	99,504	13,439	13,410
<b>ALL</b>	<b>1,011,125</b>	<b>1,073,833</b>	<b>403,708</b>	<b>428,147</b>	<b>429,381</b>	<b>435,656</b>

**Table 12 Home-based School Trip Attraction Comparison**

County	HB Grade School Attractions		HB High School Attractions		HB College Attractions	
	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000	MTC 1998	SVRTC 2000
San Francisco	82,920	89,803	37,927	39,449	75,656	77,894
San Mateo	104,720	112,000	42,234	43,861	24,012	24,096
Santa Clara	256,331	275,095	104,620	112,887	135,279	135,400
Alameda	223,254	238,317	86,957	91,016	108,442	108,782
Contra Costa	148,219	154,889	58,042	62,314	36,517	38,098
Solano	73,605	76,416	27,078	28,379	9,449	9,318
Napa	18,620	19,353	7,435	8,099	4,786	5,062
Sonoma	71,912	74,754	26,227	28,251	25,484	26,847
Marin	31,542	33,206	13,187	13,885	9,756	10,158
<b>ALL</b>	<b>1,011,123</b>	<b>1,073,833</b>	<b>403,707</b>	<b>428,141</b>	<b>429,381</b>	<b>435,655</b>

#### **4.0 Home-based Work Person Trip Distribution Estimation**

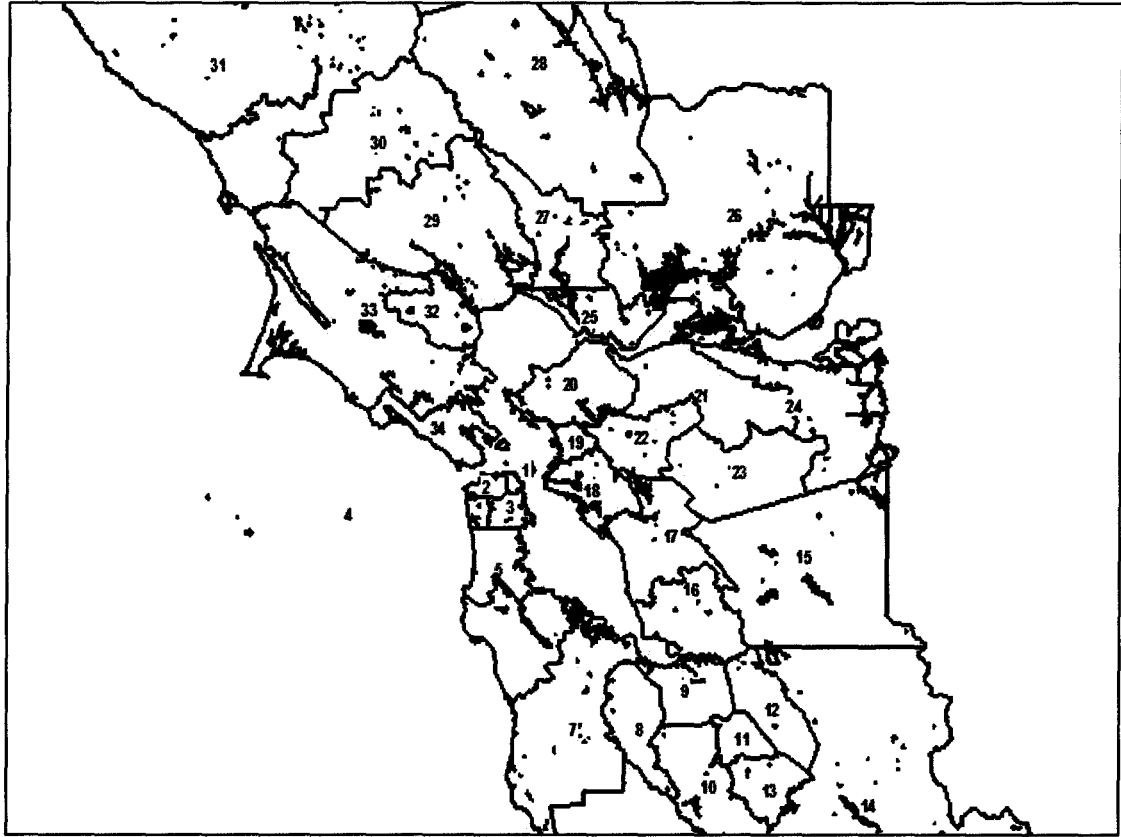
The home-based work trip distribution model person trip tables were calibrated using the year 2000 Public Use Micro-sample (PUMS) 5-percent sample and Journey to Work census data summaries of place of work/place of residence commuter statistics provided by MTC. These data sources presently represent the best available data for home-based work trip distribution calibration. San Francisco Bay county-to-county home to work person trip estimates were calibrated by four income quartiles to each of the county flows from the PUMS data. The results of the home-based work trip distribution for county-to-county flows for the 9-county regional model area and expanded counties are summarized in Table 13.

The trip distribution model calibration was initially performed by applying k-factor adjustments to match the observed county-to-county commuter flows. An important factor in transit calibration is the accuracy of the person trip table demand, and in order to ensure that the best possible conditions were available for regional constant calibration, finer adjustments were implemented to the trip distribution models during the course of transit validation once it was determined that the transit assignments were not validating. In order to more closely attempt to match regional transit trip patterns, particularly for BART, adjustments were implemented at the district-level within the Alameda/Santa Clara corridor and the Alameda/San Francisco Transbay corridor. Figure 2 shows the district boundaries used for k-factor adjustments. In particular, District 16, which includes Fremont, Newark and Union City, required k-factor adjustments to better match observed person trip flows between southern Alameda County and San Francisco County. Table 14 summarizes the more detailed District-level comparison between selected areas within San Francisco, Alameda and Santa Clara Counties. For both county-level and district-level distribution calibration, the model estimated values are relatively close to the observed trips.

Non-work trip distribution person trip calibration was based on the previous year 2000 estimated person county-to-county trip summaries from the MTC 2000 model estimates, since year 2000 data from the MTC regional travel surveys were not available. The results of the non-work trip distribution calibration for county-to-county flows are summarized in Table 15.

For both work and non-work trip purposes, there was relatively close agreement between the estimated and observed county-to-county flows, particularly for interchanges in the primary nine-county area between Santa Clara County and other counties. With the calibration of the distribution models, the next step involved calibration of the final mode choice constants, which will be described in the following sections.

**Figure 2**  
**Home-based Work Trip Distribution Calibration Districts**



**Table 13**  
**Home-based Work Distribution Calibration County-Level**  
**2000 Base Validation**

Production County	Attraction County													
Model Estimated	SF	SM	SCL	ALA	CC	SOL	NAPA	SON	MRN	SCZ	MON	SBEN	SJQ	ALL
San Francisco	520,689	70,052	24,816	32,894	7,308	641	452	1,363	9,619	211	94	4	18	668,162
San Mateo	112,647	330,447	88,007	25,131	2,955	505	123	757	1,335	316	74	7	38	562,342
Santa Clara	13,373	66,350	1,173,205	62,312	4,893	872	190	735	1,171	5,152	1,390	1,540	184	1,331,366
Alameda	114,181	55,953	112,473	728,979	58,224	3,315	637	1,683	6,445	724	221	16	1,030	1,083,881
Contra Costa	80,822	14,114	15,203	149,770	403,713	11,213	1,960	1,216	11,202	209	148	7	11,254	700,830
Solano	17,669	4,191	2,437	20,109	35,317	160,915	12,692	3,983	7,726	96	51	2	2,196	267,386
Napa	2,130	816	556	1,830	3,140	5,665	73,679	3,537	1,412	46	15	1	142	92,968
Sonoma	13,330	2,345	1,781	3,582	2,507	2,740	5,311	295,230	30,093	106	40	2	353	357,421
Marin	50,384	4,152	1,641	7,247	4,620	1,223	692	6,582	125,639	103	56	2	44	202,383
Santa Cruz	1,174	3,464	37,013	2,350	393	33	168	186	308	144,174	7,303	590	49	197,205
Monterey	489	955	15,687	1,289	266	228	182	434	606	12,951	218,262	4,046	1,649	257,044
San Benito	99	199	11,664	381	54	44	39	89	131	1,751	5,589	16,576	362	36,978
San Joaquin	1,929	2,933	10,555	35,861	6,528	2,988	277	268	2,002	48	7,878	505	244,206	315,979
ALL	928,916	555,970	1,495,038	1,071,735	529,917	190,385	96,402	316,062	197,689	165,887	241,122	23,297	261,526	6,073,945

2000 PUMS Observed	SF	SM	SCL	ALA	CC	SOL	NAPA	SON	MRN	SCZ	MON	SBEN	SJQ	ALL
San Francisco	517,829	70,600	25,367	33,510	7,257	630	543	1,373	9,841	331	127	16	48	667,474
San Mateo	111,202	330,600	89,466	24,353	2,905	500	121	744	1,347	344	77	24	82	561,766
Santa Clara	13,068	65,622	1,175,840	57,654	4,714	1,064	172	924	1,167	5,568	2,180	1,635	387	1,329,996
Alameda	116,861	54,956	110,605	728,972	56,339	3,188	608	1,608	6,304	743	227	56	2,275	1,082,741
Contra Costa	81,552	14,462	15,989	154,341	404,690	11,413	1,955	1,201	11,454	227	146	47	2,637	700,113
Solano	17,571	4,196	2,375	20,621	35,354	161,934	12,590	3,899	7,875	98	64	0	534	267,112
Napa	2,129	828	569	1,875	3,151	5,714	73,571	3,502	1,428	48	19	0	31	92,864
Sonoma	13,325	2,359	1,801	3,664	2,497	2,773	5,349	294,297	30,790	113	14	37	40	357,059
Marin	49,580	4,171	1,664	7,262	4,508	1,191	678	6,423	126,384	146	71	0	96	202,175
Santa Cruz	1,108	3,315	35,247	2,111	460	26	154	227	310	149,656	8,302	1,000	100	202,015
Monterey	354	608	9,323	857	249	47	10	82	47	12,221	235,445	1,908	19	261,169
San Benito	132	286	12,949	481	82	27	6	27	0	1,148	2,582	19,147	19	36,887
San Joaquin	1,487	2,574	10,632	31,977	5,891	929	217	312	84	63	98	8	262,795	317,066
ALL	926,196	554,576	1,491,827	1,067,677	528,098	189,438	95,975	314,619	197,030	170,705	249,354	23,878	269,063	6,078,435

**Table 13  
Continued**

Production County	Attraction County	Estimated/Observed													
		SF	SM	SCL	ALA	CC	SOL	NAPA	SON	MRN	SCZ	MON	SBEN	SJQ	ALL
San Francisco		1.01	0.99	0.98	0.98	1.01	1.02	0.83	0.99	0.98	0.64	0.74	0.27	0.38	1.00
San Mateo		1.01	1.00	0.98	1.03	1.02	1.01	1.02	1.02	0.99	0.92	0.96	0.30	0.46	1.00
Santa Clara		1.02	1.01	1.00	1.08	1.04	0.82	1.10	0.79	1.00	0.93	0.64	0.94	0.47	1.00
Alameda		0.98	1.02	1.02	1.00	1.03	1.04	1.05	1.05	1.02	0.98	0.97	0.29	0.45	1.00
Contra Costa		0.99	0.98	0.95	0.97	1.00	0.98	1.00	1.01	0.98	0.92	1.01	0.14	4.27	1.00
Solano		1.01	1.00	1.03	0.98	1.00	0.99	1.01	1.02	0.98	0.98	0.79	0.00	4.11	1.00
Napa		1.00	0.99	0.98	0.98	1.00	0.99	1.00	1.01	0.99	0.95	0.78	0.00	4.66	1.00
Sonoma		1.00	0.99	0.99	0.98	1.00	0.99	0.99	1.00	0.98	0.94	2.77	0.05	8.79	1.00
Marin		1.02	1.00	0.99	1.00	1.02	1.03	1.02	1.02	0.99	0.71	0.79	0.00	0.45	1.00
Santa Cruz		1.06	1.04	1.05	1.11	0.85	1.29	1.09	0.82	0.99	0.96	0.88	0.59	0.49	0.98
Monterey		1.38	1.57	1.68	1.50	1.07	4.90	18.91	5.29	12.99	1.06	0.93	2.12	85.46	0.98
San Benito		0.75	0.69	0.90	0.79	0.65	1.62	6.12	3.24	0.00	1.53	2.16	0.87	18.76	1.00
San Joaquin		1.30	1.14	0.99	1.12	1.11	3.22	1.28	0.86	23.95	0.76	80.33	62.76	0.93	1.00
ALL		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.98	0.97	1.00



**Table 14**  
**Home-based Work Distribution Calibration**  
**District-Level in the Corridor 2000 Base**  
**Calibration**

<b>Alameda County</b>							
<b>Model Estimated</b>	<b>Attraction To</b>						
<b>Production From</b>	<b>San Francisco</b>	<b>Santa Clara</b>	<b>Alameda District 15</b>	<b>Alameda District 16</b>	<b>Alameda District 17</b>	<b>Alameda District 18</b>	<b>Alameda District 19</b>
Alameda District 15	4,200	14,800	62,500	10,100	17,900	8,100	2,000
Alameda District 16	9,600	71,900	8,700	96,000	25,700	11,300	2,900
Alameda District 17	20,900	17,700	15,500	25,400	100,400	40,900	7,500
Alameda District 18	59,200	7,600	9,600	11,500	34,200	128,000	27,000
Alameda District 19	20,200	1,700	1,800	1,900	4,400	19,700	50,400
<b>ALL</b>	<b>114,100</b>	<b>113,700</b>	<b>98,100</b>	<b>144,900</b>	<b>182,600</b>	<b>208,000</b>	<b>89,800</b>

<b>2000 PUMS Observed</b>							
<b>FROM</b>	<b>TO</b>						
	<b>San Francisco</b>	<b>Santa Clara</b>	<b>Alameda District 15</b>	<b>Alameda District 16</b>	<b>Alameda District 17</b>	<b>Alameda District 18</b>	<b>Alameda District 19</b>
Alameda District 15	4,700	15,600	57,500	9,200	19,500	8,000	2,300
Alameda District 16	9,700	70,300	7,600	91,100	23,100	11,300	3,200
Alameda District 17	18,800	17,500	16,700	28,900	95,400	40,300	8,000
Alameda District 18	61,400	7,500	9,900	12,100	32,600	147,600	31,000
Alameda District 19	19,500	1,700	1,500	1,700	3,400	16,500	48,800
<b>ALL</b>	<b>114,100</b>	<b>112,600</b>	<b>92,900</b>	<b>142,600</b>	<b>173,800</b>	<b>223,700</b>	<b>93,200</b>

<b>Estimated/Observed</b>							
<b>FROM</b>	<b>TO</b>						
	<b>San Francisco</b>	<b>Santa Clara</b>	<b>Alameda District 15</b>	<b>Alameda District 16</b>	<b>Alameda District 17</b>	<b>Alameda District 18</b>	<b>Alameda District 19</b>
Alameda District 15	0.89	0.95	1.09	1.10	0.92	1.01	0.87
Alameda District 16	0.99	1.02	1.14	1.05	1.11	1.00	0.91
Alameda District 17	1.11	1.01	0.93	0.88	1.05	1.01	0.94
Alameda District 18	0.96	1.01	0.97	0.95	1.05	0.87	0.87
Alameda District 19	1.04	1.00	1.20	1.12	1.29	1.19	1.03
<b>ALL</b>	<b>1.00</b>	<b>1.01</b>	<b>1.06</b>	<b>1.02</b>	<b>1.05</b>	<b>0.93</b>	<b>0.96</b>

<b>Santa Clara County</b>							
<b>FROM Santa Clara</b>	<b>TO</b>						
	<b>Alameda District 15</b>	<b>Alameda District 16</b>	<b>Alameda District 17</b>	<b>Alameda District 18</b>	<b>Alameda District 19</b>	<b>ALL</b>	
Estimated	7,400	41,700	7,700	5,000	1,600	63,400	
Observed	7,300	40,500	7,500	5,100	1,700	62,100	
Estimated/Observed	1.01	1.03	1.03	.98	.94	1.02	

**Table 15  
Non-Work Distribution Calibration County-Level  
2000 Base Validation**

Estimated	SF	SM	SCL	ALA	CC	SOL	NAPA	SON	MRN	Grand Total
San Francisco	1,411,345	204,108	18,702	50,877	16,792	2,304	770	2,436	19,174	1,726,508
San Mateo	193,183	1,355,877	161,486	26,144	4,622	753	305	897	2,962	1,746,229
Santa Clara	18,787	118,940	3,776,407	53,952	6,316	912	388	89	1,138	3,976,928
Alameda	78,897	60,716	116,403	2,247,869	78,068	4,941	1,443	2,506	917	2,591,760
Contra Costa	57,646	14,165	16,991	139,710	1,461,819	22,620	4,055	2,465	1,191	1,720,660
Solano	14,386	3,587	776	17,061	41,061	542,449	5,473	2,404	4,393	631,590
Napa	2,135	526	5	1,958	2,726	2,155	223,745	9,565	923	243,738
Sonoma	10,728	965	0	4,302	2,790	1,447	16,481	788,682	11,473	836,868
Marin	35,391	4,681	1,469	944	677	1,371	667	6,072	459,562	510,835
ALL	1,822,498	1,763,565	4,092,239	2,542,816	1,614,870	578,950	253,327	815,116	501,734	13,985,116

Observed	SF	SM	SCL	ALA	CC	SOL	NAPA	SON	MRN	Grand Total
San Francisco	1,390,803	178,372	16,604	52,413	17,008	2,588	869	2,876	21,514	1,683,046
San Mateo	214,039	1,300,326	153,016	28,425	4,939	873	332	971	3,633	1,706,553
Santa Clara	21,434	119,727	3,778,756	62,694	7,109	1,083	404	1,318	1,385	3,993,910
Alameda	74,578	49,543	92,522	2,282,154	81,159	5,927	1,693	2,940	966	2,591,481
Contra Costa	49,168	10,265	12,258	129,702	1,461,785	29,961	4,952	3,078	1,274	1,702,443
Solano	7,932	1,814	726	10,779	30,125	586,250	4,884	2,619	3,294	648,425
Napa	1,404	200	192	1,399	2,144	2,227	224,323	10,210	728	242,827
Sonoma	5,643	606	527	2,675	1,954	1,433	15,393	805,505	7,767	841,504
Marin	29,279	3,458	1,221	834	692	1,602	762	7,469	462,359	507,676
ALL	1,794,281	1,664,311	4,055,822	2,571,074	1,606,916	631,942	253,614	836,987	502,919	13,917,866

Estimated/Observed	SF	SM	SCL	ALA	CC	SOL	NAPA	SON	MRN	Grand Total
San Francisco	1.01	1.14	1.13	0.97	0.99	0.89	0.89	0.85	0.89	1.03
San Mateo	0.90	1.04	1.06	0.92	0.94	0.86	0.92	0.92	0.82	1.02
Santa Clara	0.88	0.99	1.00	0.86	0.89	0.84	0.96	0.07	0.82	1.00
Alameda	1.06	1.23	1.26	0.98	0.96	0.83	0.85	0.85	0.95	1.00
Contra Costa	1.17	1.38	1.39	1.08	1.00	0.75	0.82	0.80	0.94	1.01
Solano	1.81	1.98	1.07	1.58	1.36	0.93	1.12	0.92	1.33	0.97
Napa	1.52	2.63	0.03	1.40	1.27	0.97	1.00	0.94	1.27	1.00
Sonoma	1.90	1.59	0.00	1.61	1.43	1.01	1.07	0.98	1.48	0.99
Marin	1.21	1.35	1.20	1.13	0.98	0.86	0.88	0.81	0.99	1.01
ALL	1.02	1.06	1.01	0.99	1.00	0.92	1.00	0.97	1.00	1.00

## 5.0 Mode Choice Model Structure and Model Coefficients

The standard form for mode choice models is the logit choice model. Six of the seven mode choice models included in the model set are nested logit choice model and one, the home-based grade school mode choice model, is multinomial logit. An important characteristic of most of the mode choice models (with the exception of the three home-based school mode choice models) is that both AM peak period and off-peak period travel times and trip costs are used in the model application. In previous versions of MTC model systems, home-based work trips were only sensitive to peak period travel times and costs; and non-work trips were only sensitive to off-peak times and costs. This improvement in the model system means that mode choice for these trip purposes is sensitive to changes in both the peak and off-peak period, as opposed to just one or the other.

All mode choice models incorporate non-motorized alternatives: bicycle and walk-only. Travel times for bicycle and walk are based on a "non-motorized network" based on the standard regional highway network, excluding freeway facilities where bicycles and pedestrians are not allowed. Uniform speeds of 3 miles per hour for pedestrians and 12 miles per hour for bicyclists are used to convert non-motorized distance into travel time.

The **home-based work mode choice model** was originally a three-level nested choice model in the BAYCAST model set (See Figure 3). Trips are first split into motorized modes, bicycle and walk-only modes. Motorized trips are then split into drive alone, shared ride 2, shared ride 3+ and transit. Lastly, transit trips are split into transit with walk access versus transit with auto access. For application in the SVRT project, a lower-level transit submode nest was added to split walk-access to transit into the walk-access to heavy rail, commuter rail, light rail, express bus and local bus. In addition, the drive-access to transit nest was further stratified to include a lower level nest that splits out drive-access to park-and-ride access and kiss-and-ride access. Market segmentation into the HBW mode choice model is zone-to-zone trips by AO level (3) by household income quartile level (4). Where the auto ownership is zero, work trips are prohibited from taking the drive alone or transit-auto access modes. Coefficients for the HBW mode choice model are shown in Table 16. The home-based work mode choice model includes variables about tripmaker demographics (auto ownership, income, household size, workers in the household); trip characteristics (travel time and trip cost); and density; "dummy" variables to represent high bicycle commute shares in Stanford, Palo Alto and Berkeley; and "dummy" variables for regional "core" zones in the San Francisco financial district.

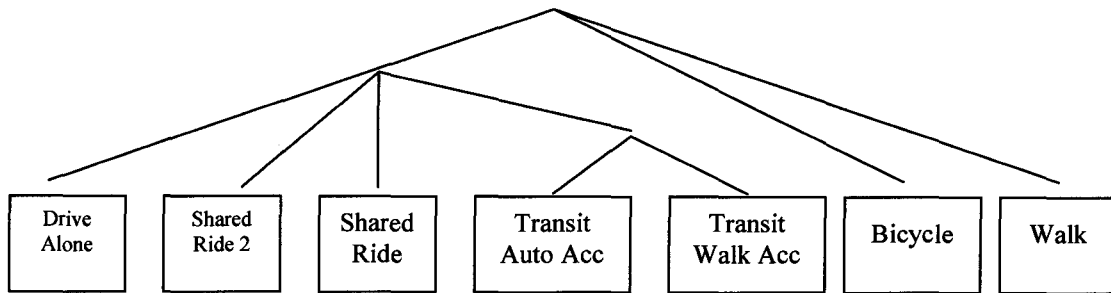
**Table 16**

**Home-Based Work Mode Choice Model**

Utility									
DA	SR2	SR3+	Transit - Auto Access	Transit - Walk Access	Bike	Walk	Variable Name	Coeff.	T-Stat
X							Constant	-9.234	(4.0)
	X						Constant	-13.310	(4.1)
		X					Constant	-13.780	(4.1)
			X				Constant	-12.250	(4.6)
				X			Constant	-10.380	(4.1)
					X		Constant	-8.268	(12.4)
					X		LnEmpDi	0.3243	(2.2)
			X	X			LnEmpDj	0.5461	(3.3)
X							Veh/HH	1.2240	(4.5)
	X						Veh/HH	0.9023	(4.2)
		X					Veh/HH	0.9357	(4.2)
	X						Single VHH	0.8370	(2.9)
			X				Veh/HH	0.5697	(3.1)
				X			No VHH	0.5501	(1.4)
X							Wrkr/HH	-0.2454	(2.3)
	X						Multi-Wrkr/HH	-0.9297	(3.0)
X							Pers/HH	-0.3099	(3.6)
X							Income Leg1	5.878E-05	(2.0)
	X	X					Income Leg1	5.049E-05	(1.7)
X	X	X	X	X	X		IVTT	-0.03326	(4.3)
			X	X			Wait	-0.05233	(3.1)
X	X	X	X	X			Walk	-0.09305	(2.2)
X	X	X	X	X			Cost	-0.002067	(2.6)
					X		Stanfordj	2.09	(3.0)
					X		Palo Altoj	1.584	(2.3)
					X		Berkeleyj	1.01	(1.5)
X							Corej	-1.086	(2.7)
			X				Corej	1.147	(3.3)
					X		LnWalkTime	-2.137	(13.5)
					X		LnEmpDj	0.1418	(2.1)
			X	X			Theta (Transit)	0.7194	(2.2)
X	X	X	X	X			Theta (Motor)	0.9208	(0.6)
<b>Value of Time (IVTT/Cost * .60)</b>								<b>\$9.65</b>	
<b>Ratio of Wait/IVTT</b>								<b>1.57</b>	
<b>Ratio of Walk/IVTT</b>								<b>2.80</b>	

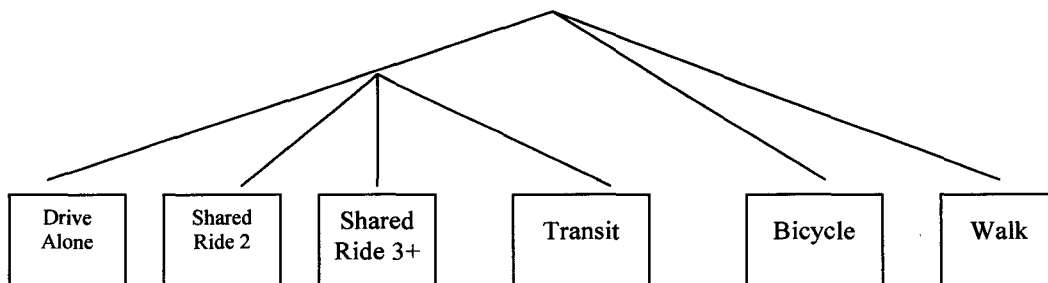
Source: Travel Demand Models for the San Francisco Bay Area (BAYCAST-90). Technical Summary. Metropolitan Transportation Commission, Oakland, California, June 1997.

**Figure 3**  
**Home-Based Work Mode Choice**



The coefficients for the **home-based shop/other** mode choice model are shown in Table 17. Both the home-based shop and home-based social/recreation mode choice models include six alternatives (drive alone, shared ride 2, shared ride 3+, transit, bicycle, walk) and one nest (either motorized or group modes). The nest for the HBSH model (See Figure 4) splits motorized trips from bicycle and walk trips in the upper nest; and drive alone, shared ride 2, shared ride 3+ and transit in the lower nest. For application in the SVRT project, a lower-level transit submode nest was added to split walk-access to transit into the walk-access to heavy rail, commuter rail, light rail, express bus and local bus. In addition, the drive-access to transit nest was further stratified to include a lower level nest that splits out drive-access to park-and-ride access and kiss-and-ride access. As with the HBW model, trips where the auto ownership level is zero are prohibited from using drive alone or auto access to transit. The home-based shop mode choice model is the only model where a total travel time variable is used. All other models were successful in terms of separating in-vehicle travel time (IVTT) from out-of-vehicle travel time (transit wait times, walk times).

**Figure 4**  
**Home-Based Shop/Other Mode Choice**

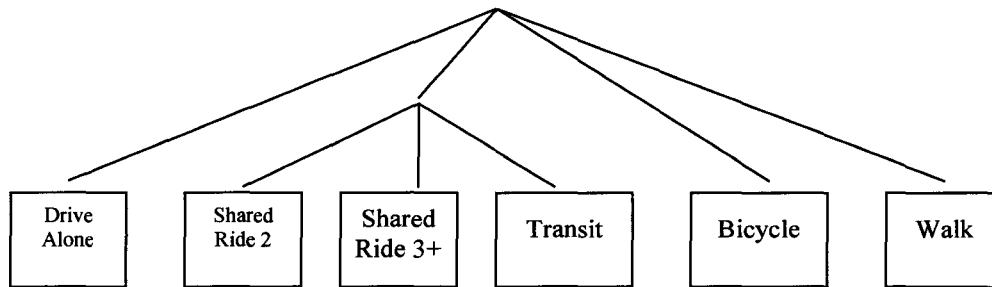


<b>Table 17</b>								
<b>Final Nested Home-Based Shop/Other Mode Choice Model</b>								
Utility						Variable Name	Coeff.	T-Stat
DA	SR2	SR3+	Transit	Bike	Walk			
X						Constant	0.5495	(0.7)
	X					Constant	-0.3612	(0.5)
		X				Constant	-2.4860	(3.4)
			X			Constant	-1.7470	(2.4)
				X		Constant	-3.9280	(13.5)
	X					LnPHH	0.6635	(7.8)
		X				LnPHH	2.2360	(17.9)
			X			Veh/HH	-0.3352	(4.0)
X						LnIncome	0.1952	(2.7)
	X					LnIncome	0.1118	(1.6)
X	X	X	X	X	X	Time (Total)	-0.05815	(13.5)
X	X	X	X			LnCost	-0.2262	(1.4)
			X			Corej	2.3750	(6.0)
X	X	X				LnAreaDeni	-0.4701	(3.8)
				X		Stanfordj	2.488	(2.5)
				X		Berkeleyj	1.630	(3.0)
				X		Palo AltoJ	1.377	(1.7)
X						Zero WHH	-0.2273	(2.0)
			X			Zero VHH	3.2910	(10.8)
					X	Zero VHH	1.7350	(6.6)
X	X	X	X			Theta (Motor)	0.4847	(4.9)
<b>Value to Time (Time/Cost * .60 * 42.65)</b>							<b>\$6.58</b>	

**Source: Travel Demand Models for the San Francisco Bay Area (BAYCAST-90). Technical Summary. Metropolitan Transportation Commission, Oakland, California, June 1997.**

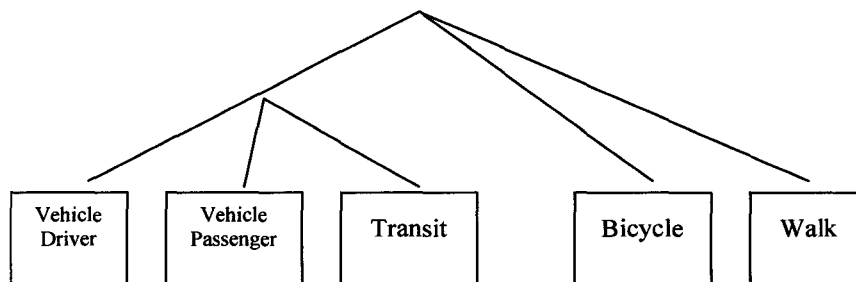
Coefficients for the **home-based social/recreation** mode choice model are summarized in Table 18. The nest for the HBSR model (See Figure 5) is a "group nest." The upper nest splits drive alone, group modes, bicycle and walk trips. The lower nest splits shared ride 2, shared ride 3+ and transit trips. The ratio of the out-of-vehicle to in-vehicle travel time coefficients is 2.48 (-0.06806 / -0.02745) which is consistent with a priori expectations. The value of time for home-based social/recreation trips, at \$0.78 per hour, is on the low side but is fairly reasonable relative to other trip purposes.

**Figure 5**  
**Home-Based Social/Recreation Mode Choice**



The coefficients for the **non-home-based** mode choice model are shown in Table 19. This model (See Figure 6) includes five alternatives (driver, passenger, transit, bicycle walk) and one nest (motorized trips). The upper nest for the NHB mode choice model splits trips into motorized, bicycle and walk modes. The lower nest splits motorized trips into vehicle driver, vehicle passenger and transit modes. For application in the SVRT project, a lower-level transit submode nest was added to split walk-access to transit into the walk-access to heavy rail, commuter rail, light rail, express bus and local bus. The ratio of the wait time to in-vehicle time coefficients is a very respectable 2.42 (-0.07836 / -0.03232). The ratio of the walk time to in-vehicle time coefficients is 2.35 (-0.07583 / -0.03232). Value of time for non-home-based trips is a reasonable \$1.08 per hour. Given that traditional non-home-based trips are not linked with the home characteristics of the trip maker, typical demographic variables such as household income and household size are excluded from this model.

**Figure 6**  
**Non-Home-Based Mode Choice**



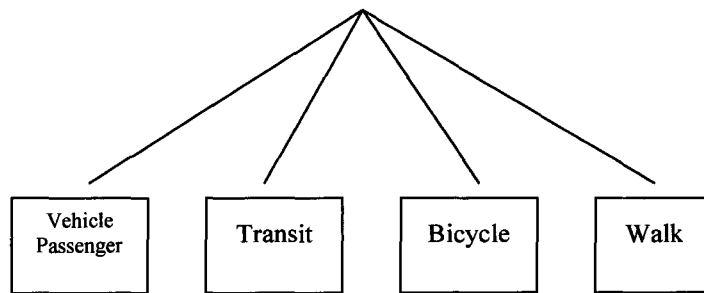
<b>Table 18</b>								
<b>Final Nested Home-Based Social/Recreation Mode Choice Model</b>								
Utility						Variable Name	Nested Model #35	
DA	SR2	SR3+	Transit	Bike	Walk		Coeff.	T-Stat
X						Constant	1.295	(2.0)
	X					Constant	-1.437	(2.2)
		X				Constant	-2.486	(4.5)
			X			Constant	1.703	(1.6)
				X		Constant	-3.149	(7.9)
		X				LnPHH	1.8340	(11.1)
			X			Veh/HH	-0.7475	(3.6)
	X					LnIncome	0.2305	(2.5)
				X		Income	-8.88E-03	(1.7)
X	X	X	X	X		IVTT	-0.02745	(3.4)
X	X	X	X		X	OVTT	-0.06806	(11.9)
X	X	X	X			LnCost	-1.1600	(4.9)
			X			Corej	0.9694	(1.7)
			X			LnAreaDeni	0.3217	(1.9)
				X		Stanfordj	2.2090	(2.9)
	X	X	X			Theta (Group)	0.6271	(3.2)
<b>Value to Time (IVTT/Cost * .60 * 55.33)</b>							<b>\$0.78</b>	
<b>Ratio of OVTT/IVTT</b>							<b>\$2.48</b>	
<b>Source: Travel Demand Models for the San Francisco Bay Area (BAYCAST-90). Technical Summary. Metropolitan Transportation Commission, Oakland, California, June 1997.</b>								



<b>Table 19</b>							
<b>Final Nested Non-Home-Based Mode Choice Model</b>							
Utility					Variable Name	Nested Model #35	
Vehicle Driver	Vehicle Passenger	Transit	Bike	Walk		Coeff.	T-Stat
X					Constant	1.295	(2.0)
	X				Constant	-1.437	(2.2)
		X			Constant	-2.486	(4.5)
			X		Constant	1.703	(1.6)
X					AreaDeni	-3.149	(7.9)
				X	AreaDeni	1.8340	(11.1)
X	X	X	X		IVTT	-0.7475	(3.6)
		X			Wait	0.2305	(2.5)
X	X	X		X	Walk	-8.88E-03	(1.7)
X	X	X			LnCost	-0.02745	(3.4)
X	X	X			Theta (Motor)	-0.06806	(11.9)
<b>Value to Time (IVTT/Cost * .60 * 54.92)</b>						<b>\$1.08</b>	
<b>Ratio of Wait/IVTT</b>						<b>2.42</b>	
<b>Ratio of Walk/IVTT</b>						<b>2.35</b>	
<p><b>Source: Travel Demand Models for the San Francisco Bay Area (BAYCAST-90). Technical Summary. Metropolitan Transportation Commission, Oakland, California, June 1997.</b></p>							

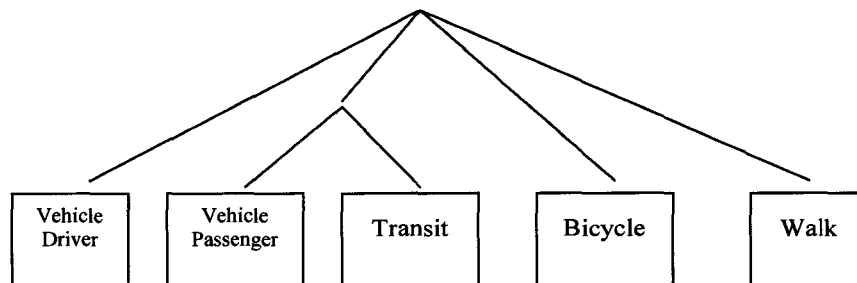
Coefficients for the **home-based grade school trip** mode choice models are included in Table 20. This multinomial logit model (See Figure 7) has four alternatives: vehicle passenger, transit, bicycle and walk. Grade school students are too young to drive to school, so the vehicle driver alternative is excluded in this model. The ratio of out-of-vehicle to in-vehicle travel time coefficients is on the low side, at 1.09 (-0.06384 / -0.05855). The value of time for home-based grade school trips is also (reasonably) low at \$0.36 per hour.

**Figure 7**  
**Home-Based School: Grade School Mode Choice**



The coefficients for the **home-based high school** mode choice model are included in Table 21. There are five alternatives in this model (See Figure 8) and the home-based college model: vehicle driver, vehicle passenger, transit, bicycle and walk. The upper nest in the home-based high school model splits trips into vehicle driver, "group modes," bicycle and walk. The lower nest splits group modes into vehicle passenger and transit passenger modes. The ratio of out-of-vehicle to in-vehicle time coefficients is also on the low side, at 1.07 (-0.03463 / -0.03228). The value of time is the lowest of all mode choice models, at \$0.23 per hour.

**Figure 8**  
**Home-Based School: High School Mode Choice**

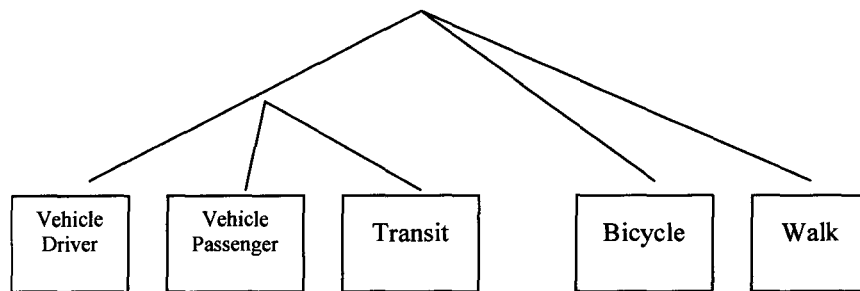


<b>Table 20</b>						
<b>Final Home-Based School (Grade School) Mode Choice Model</b>						
Utility				Variable Name	Nested Model #35	
Vehicle Passenger	Transit	Bike	Walk		Coeff.	T-Stat
X				Constant	2.6250	(5.3)
	X			Constant	7.3003	(7.4)
		X		Constant	-3.1550	(9.3)
	X		X	PHH^3	0.004436	(5.4)
	X			Rurali	1.5440	(3.3)
X				Income (000s)	0.009757	(3.3)
X	X	X		IVTT	-0.05855	(4.1)
X	X		X	OVTT	-0.06384	(10.7)
X	X			LnCost	-1.93000	(8.7)
<b>Value to Time (IVTT/Cost * .60 * 19.57)</b>					<b>\$0.36</b>	
<b>Ratio of OVTT/IVTT</b>					<b>1.09</b>	
<b>Source: Travel Demand Models for the San Francisco Bay Area (BAYCAST-90). Technical Summary. Metropolitan Transportation Commission, Oakland, California, June 1997.</b>						

<b>Table 21</b>							
<b>Final Nested Home-Based School (High School) Mode Choice Model</b>							
Utility					Variable Name	Nested Model #35	
Vehicle Driver	Vehicle Passenger	Transit	Bike	Walk		Coeff.	T-Stat
X					Constant	-0.6729	(1.0)
	X				Constant	0.1929	(0.2)
		X			Constant	2.9550	(2.8)
			X		Constant	-3.5240	(5.5)
X					Veh/HH	3.5580	(2.0)
	X				Veh/HH	0.5994	(3.5)
X					Pers/HH	-1.5000	(1.6)
		X			Net ResDensl	0.1442	(3.5)
X	X	X	X		IVTT	-0.03228	(1.7)
X	X	X		X	OVTT	-0.03463	(5.9)
X	X	X			LnCost	-2.0340	(5.6)
	X	X			Theta (Group)	0.2583	(5.5)
<b>Value to Time (IVTT/Cost * .60 * 23.9)</b>						<b>\$0.23</b>	
<b>Ratio of OVTT/IVTT</b>						<b>1.07</b>	
<b>Source: Travel Demand Models for the San Francisco Bay Area (BAYCAST-90). Technical Summary. Metropolitan Transportation Commission, Oakland, California, June 1997.</b>							

The final mode choice model, the **home-based college** mode choice model is documented in Table 22. The upper level nest in this model (See Figure 9) splits motorized modes, bicycle and walk trips. The lower level splits motorized trips into vehicle driver, vehicle passenger and transit passenger modes. For application in the SVRT project, a lower-level transit submode nest was added to split walk-access to transit into the walk-access to heavy rail, commuter rail, light rail, express bus and local bus. In addition, the drive-access to transit nest was further stratified to include a lower level nest that splits out drive-access to park-and-ride access and kiss-and-ride access. To represent the high bike-to-college share to Stanford and Berkeley, "dummy" variables are used to represent residential areas in Stanford, Berkeley and Palo Alto. A separate bicycle time coefficient is estimated in the home-based college model; in comparison, all other models include bicycle travel time as "in-vehicle" travel time. The out-of-vehicle to in-vehicle coefficient ratio is on the low side, at 1.44 (-0.03923 / -0.02731). Value of time is higher for college trips than for grade school or high school trips, at \$0.67 per hour.

**Figure 9**  
**Home-Based School: College Mode Choice**



## 5.1 Mode Choice Model Calibration

The home-based work mode choice models were recalibrated to match year 2000 PUMS 5-percent sample data mode shares for the primary modes of drive-alone, 2 person carpool, 3+ person carpool, transit, walk and bicycle modes. Transit submode calibration target values were based on shares used in the existing SVRTC model calibration for transit walk-access and transit drive-access supplemented with the most recent transit on-board survey data from VTA (2000), Caltrain (2000) and BART (1998) for submode walk-access market shares. Calibration of the home-based work constants followed the methodology outlined by FTA in the December 2003 recalibration effort, which considered the calibration of regional mode choice constants with no stratification of transit submode walk-access constants by income quartile.

During the course of transit assignment validation, the only departure from the previous calibration was the application of home-based work transit submode constants to improve the validation of boardings by submode (walk to BART, walk to commuter rail, walk to LRT, walk to express bus and walk to local bus). This was done in an attempt to improve the validation for the transit submodes of heavy rail, commuter rail, light rail, express bus and local bus. The previous calibration only applied a walk-access to BART and walk-access to all other transit submode stratification. The regional constant calibration results for home-based work trips are summarized in Table 22 and Table 23. The results of the calibrated constants summarized in Table 23 indicate that relative to walk-to-express bus submodes, heavy rail (BART) and commuter rail offers a rail travel time 'bonus' of +14.9 minutes (-2.49251 walk-to-BART versus -3.50000 for walk-to-express bus) and 12.7 minutes over walk-to-local bus (-2.49251 walk-to-BART versus -3.34821 for walk-to-local bus). The overall characteristics and trends of the home-based work constants appear to be reasonable, as shown in Figures 10 and 11. The constants for both the upper-level choices of drive-alone, shared ride, transit walk and drive access, bicycle and walk in Figure 10 and the transit submode choices in Figure 11 show reasonable patterns across income quartiles.

Non-work mode choice validation target values were based on the previous non-work model calibration shares, supplemented by data from the on-board surveys. From the surveys, observed transit trips for home-based shop/other, home-based social-recreational and non-home-based trips were calculated for rail submodes and compared to the model estimated results. The final regional non-work mode choice calibration is summarized in Table 24 for home-based shop/other, home-based social-recreational and non-home-based trips. Table 25 summarizes the home-based school results. During transit assignment validation, it was shown that the use of generic transit walk-access and transit drive-access constants (i.e., no transit submode stratifications for the constants) was appropriate for all non-work trip purposes with the exception of non-home-based trips. The use of generic transit constants for non-home-based trips resulted in an underestimation of those trips for both BART and light rail transit. Therefore, submode specific constants were developed for BART and light rail non-home-based trips to improve the transit validation. These constants resulted in a travel time bonus of +10.0 for BART (4.11494 BART submode versus 3.26430 commuter rail/bus submodes) and

+14.5 minutes for light rail (4.5 light rail submode versus 3.26430 commuter rail/bus submodes).

**Table 22**  
**2000 Calibration Run with Regional Constants, Home-based Work Trips**

Observed 2000

Mode	HBW Income 1	HBW IQ1 %	HBW Income 2	HBW IQ2 %	HBW Income 3	HBW IQ3 %	HBW Income 4	HBW IQ4 %	HBW ALL	ALL %
Drive Alone	401,635	60.1%	757,799	68.7%	1,157,895	73.1%	1,401,972	75.8%	3,719,301	71.5%
Shared Ride 2 Person	68,232	10.2%	117,788	10.7%	162,029	10.2%	177,695	9.6%	525,744	10.1%
Shared Ride 3+ Person	24,824	3.7%	42,144	3.8%	55,076	3.5%	55,992	3.0%	178,036	3.4%
Transit Walk-access	93,337	14.0%	99,492	9.0%	96,488	6.1%	89,516	4.8%	378,944	7.3%
Transit Auto-access	6,449	1.0%	27,668	2.5%	57,241	3.6%	71,360	3.9%	162,718	3.1%
Bike	14,215	2.1%	14,119	1.3%	15,571	1.0%	16,292	0.9%	60,197	1.2%
Walk	59,696	8.9%	43,289	3.9%	39,826	2.5%	36,375	2.0%	179,186	3.4%
Walk to BART	19,840	3.0%	31,320	2.8%	26,027	1.6%	24,485	1.3%	101,672	2.0%
Walk to Commuter Rail	1,314	0.2%	2,388	0.2%	3,243	0.2%	3,654	0.2%	10,599	0.2%
Walk to LRT	13,610	2.0%	21,931	2.0%	13,588	0.9%	10,000	0.5%	63,240	1.2%
Walk to Express Bus	4,465	0.7%	5,885	0.5%	5,074	0.3%	4,870	0.3%	20,294	0.4%
Walk to Local Bus	53,107	7.9%	36,968	3.4%	47,556	3.0%	45,489	2.5%	183,120	3.5%
Park-and-Ride	4,509	0.7%	21,410	1.9%	45,656	2.9%	61,215	3.3%	132,790	2.6%
Kiss-and-Ride	1,940	0.3%	6,258	0.6%	11,585	0.7%	10,145	0.5%	29,928	0.6%
ALL	668,388	100.0%	1,102,299	100.0%	1,584,126	100.0%	1,849,202	100.0%	5,204,018	100.0%

Estimated 2000

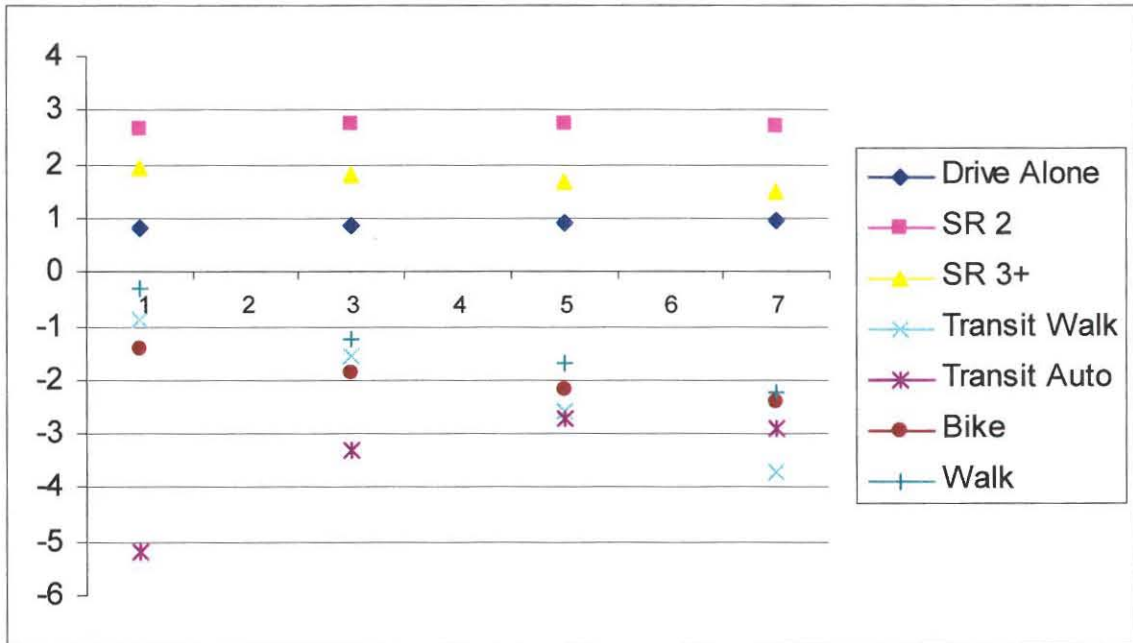
Mode	HBW Income 1	HBW IQ1 %	HBW Income 2	HBW IQ2 %	HBW Income 3	HBW IQ3 %	HBW Income 4	HBW IQ4 %	HBW ALL	ALL%
Drive Alone	390,611	60.0%	755,186	68.7%	1,171,168	73.1%	1,454,850	75.9%	3,742,556	71.4%
Shared Ride 2 Person	66,365	10.2%	117,358	10.7%	163,746	10.2%	184,041	9.6%	529,696	10.1%
Shared Ride 3+ Person	24,134	3.7%	41,974	3.8%	55,623	3.5%	57,969	3.0%	179,426	3.4%
Transit Walk-access	92,013	14.1%	99,430	9.0%	96,914	6.1%	91,307	4.8%	382,733	7.3%
Transit Auto-access	6,208	1.0%	27,930	2.5%	58,301	3.6%	74,095	3.9%	164,548	3.1%
Bike	13,824	2.1%	14,018	1.3%	15,656	1.0%	16,728	0.9%	60,823	1.2%
Walk	58,090	8.9%	42,834	3.9%	39,855	2.5%	37,144	1.9%	181,042	3.5%
Walk to BART	27,062	4.2%	26,047	2.4%	26,377	1.6%	22,539	1.2%	103,047	2.0%
Walk to Commuter Rail	2,667	0.4%	3,175	0.3%	2,381	0.1%	2,316	0.1%	10,670	0.2%
Walk to LRT	11,069	1.7%	15,021	1.4%	17,954	1.1%	19,035	1.0%	63,747	1.2%
Walk to Express Bus	4,532	0.7%	4,671	0.4%	5,305	0.3%	5,606	0.3%	20,296	0.4%
Walk to Local Bus	46,660	7.2%	50,485	4.6%	44,867	2.8%	41,783	2.2%	184,943	3.5%
Park-and-Ride	4,333	0.7%	21,605	2.0%	46,496	2.9%	63,553	3.3%	134,185	2.6%
Kiss-and-Ride	1,865	0.3%	6,316	0.6%	11,797	0.7%	10,532	0.5%	30,335	0.6%
ALL	651,245	100.0%	1,098,730	100.0%	1,601,263	100.0%	1,916,134	100.0%	5,267,372	100.0%



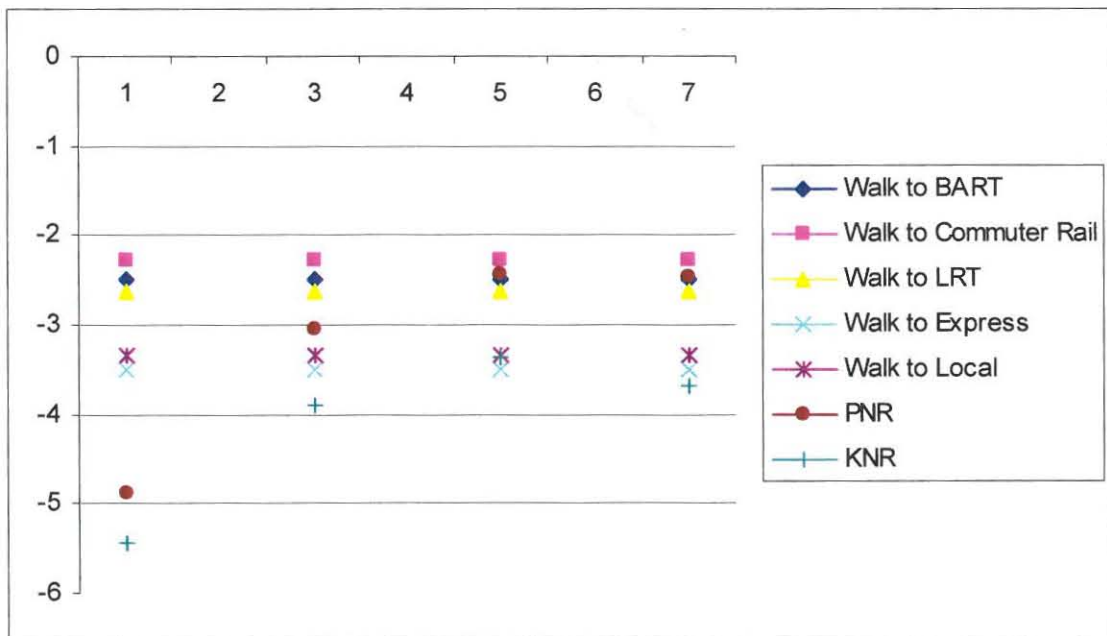
**Table 23**  
**Final Constants**  
**Home-based Work**

Mode	Home-based Work Income Quartile 1	Home-based Work Income Quartile 2	Home-based Work Income Quartile 3	Home-based Work Income Quartile 4
Drive Alone	0.83171	0.86833	0.88560	0.93362
Shared Ride 2 Person	2.65345	2.73927	2.74497	2.71616
Shared Ride 3+ Person	1.93364	1.81999	1.65029	1.49475
Transit Walk-access	-0.87058	-1.55028	-2.58932	-3.69138
Transit Auto-access	-5.17817	-3.31904	-2.71332	-2.91656
Bike	-1.43914	-1.88537	-2.17019	-2.40754
Walk	-0.31856	-1.25180	-1.70656	-2.23369
Walk to BART	-2.49251	-2.49251	-2.49251	-2.49251
Walk to Commuter Rail	-2.49251	-2.49251	-2.49251	-2.49251
Walk to LRT	-2.63394	-2.63394	-2.63394	-2.63394
Walk to Express Bus	-3.50000	-3.50000	-3.50000	-3.50000
Walk to Local Bus	-3.34821	-3.34821	-3.34821	-3.34821
Park-and-Ride	-4.87506	-3.05092	-2.44171	-2.47202
Kiss-and-Ride	-5.44979	-3.89091	-3.37863	-3.69993

**Figure 10 Home-based Work Upper Level Nest Calibration Constants**



**Figure 11 Home-based Work Lower Level Nest Calibration Constants**



**Table 24**  
**2000 Mode Choice Calibration, Non-work Trips**

**Home-based Shop\Other**

Mode	Observed	Observed %	Estimated	Estimated %	Constants
Drive Alone	2,330,286	42.3%	2,314,914	42.3%	0.67073
Shared Ride 2 Person	1,550,871	28.2%	1,540,624	28.2%	1.48221
Shared Ride 3+ Person	898,212	16.3%	892,238	16.3%	2.59093
All Transit	215,132	3.9%	212,645	3.9%	
Transit Walk-access	197,473	3.6%	197,088	3.6%	
Transit Drive-access	14,753	0.3%	15,557	0.3%	
Bike	38,884	0.7%	38,755	0.7%	0.57345
Walk	471,626	8.6%	470,018	8.6%	0.34156
Walk to BART	26,448		27,292		0.84202
Walk to Commuter Rail	1,252		1,660		0.84202
Walk to LRT	18,720		18,758		0.84202
Walk to Express Bus	Not Available		8,555		0.84202
Walk to Local Bus	Not Available		140,814		0.84202
Park-and-ride	11,807		13,752		1.07708
Kiss-and-ride	2,946		1,797		0.12896
ALL	5,505,011	100.0%	5,469,194	100.0%	

**Home-based Social-Recreational**

Mode	Observed	Observed %	Estimated	Estimated %	Constants
Drive Alone	826,323	33.1%	821,504	33.1%	1.05611
Shared Ride 2 Person	699,454	28.1%	695,435	28.0%	0.70521
Shared Ride 3+ Person	611,335	24.5%	607,810	24.5%	1.81390
All Transit	75,195	3.0%	79,764	3.2%	
Transit Walk-access	76,423	3.1%	75,958	3.1%	
Transit Drive-access	3,557	0.1%	3,806	0.2%	
Bike	68,549	2.7%	68,297	2.7%	0.53810
Walk	212,527	8.5%	211,724	8.5%	0.58425
Walk to BART	9,828		10,595		1.26987
Walk to Commuter Rail	815		1,024		1.26987
Walk to LRT	7,200		7,400		1.26987
Walk to Express Bus	Not Available		5,696		1.26987
Walk to Local Bus	Not Available		51,239		1.26987
Park-and-ride	2,797		3,312		-0.32232
Kiss-and-ride	760		482		-1.20555
ALL	2,493,383	100.0%	2,484,534	100.0%	

**Non-home-based**

Mode	Observed	Observed %	Estimated	Estimated %	Constants
Vehicle Driver	4,058,191	67.0%	4,038,986	67.0%	0.95691
Vehicle Passenger	1,017,067	16.8%	1,012,217	16.8%	1.23825
All Transit	192,331	3.2%	189,719	3.1%	
Bike	47,976	0.8%	47,824	0.8%	0.60370
Walk	745,134	12.3%	742,564	12.3%	0.81203
Walk to BART	35,508		34,813		4.11494
Walk to Commuter Rail	1,117		1,270		3.26430
Walk to LRT	40,320		39,081		4.50000
Walk to Express Bus	Not Available		6,934		3.26430
Walk to Local Bus	Not Available		107,610		3.26430
ALL	6,060,699	100.0%	6,031,310	100.0%	

**Table 25**  
**2000 Mode Choice Calibration, Home-based School Trips**

**Home-based Grade School**

Mode	Observed	Observed %	Estimated	Estimated %	Constants
Vehicle Driver	0	0.0%	0	0.0%	0.77731
Vehicle Passenger	733,301	63.2%	732,701	63.2%	-0.55552
All Transit	100,225	8.6%	100,338	8.6%	0.54184
Bike	44,335	3.8%	44,400	3.8%	1.21559
Walk	282,130	24.3%	282,551	24.4%	0.77731
ALL	1,159,991	100.0%	1,159,990	100.0%	
Walk to BART	Not Available		4,389		0.54184
Walk to Commuter Rail	Not Available		374		0.54184
Walk to LRT	Not Available		2,653		0.54184
Walk to Express Bus	Not Available		8,515		0.54184
Walk to Local Bus	Not Available		84,406		0.54184

**Home-based High School**

Mode	Observed	Observed %	Estimated	Estimated %	Constants
Vehicle Driver	66,130	15.6%	65,161	15.4%	1.01930
Vehicle Passenger	209,074	49.3%	208,558	49.1%	1.03271
All Transit	54,662	12.9%	56,201	13.2%	-1.58560
Bike	16,121	3.8%	14,810	3.5%	-3.91060
Walk	78,356	18.5%	79,613	18.8%	0.29907
ALL	424,343	100.0%	424,343	100.0%	
Walk to BART	Not Available		2,762		-1.58560
Walk to Commuter Rail	Not Available		287		-1.58560
Walk to LRT	Not Available		1,390		-1.58560
Walk to Express Bus	Not Available		4,194		-1.58560
Walk to Local Bus	Not Available		47,567		-1.58560

**Home-based College**

Mode	Observed	Observed %	Estimated	Estimated %	Constants
Vehicle Driver	240,892	57.2%	238,367	56.6%	1.57956
Vehicle Passenger	70,963	16.8%	70,373	16.7%	2.70830
All Transit	56,253	13.4%	58,950	14.0%	
Transit Walk-access	49,764	11.8%	50,331		
Transit Drive-access	6,489	1.5%	8,619		
Bike	18,483	4.4%	18,626	4.4%	0.59666
Walk	34,771	8.3%	35,046	8.3%	1.31531
ALL	421,362	100.0%	421,362	100.0%	
Walk to BART	Not Available		7,800		-1.12201
Walk to Commuter Rail	Not Available		838		-1.12201
Walk to LRT	Not Available		3,801		-1.12201
Walk to Express Bus	Not Available		4,100		-1.12201
Walk to Local Bus	Not Available		33,793		-1.12201
Park-and-ride	6,196		8,521		-1.45019
Kiss-and-ride	293		98		-3.53573

## 6.0 Model Validation

### *Transit Validation*

Transit validation was an iterative procedure and directly tied to mode choice calibration and highway volume and speed validation. Transit assignment validation is the comparison of estimated to observed daily boardings by operator and transit submode. Transit validation was performed for daily boardings by transit submodes of heavy rail, commuter rail, light rail, express bus and local bus and by major operators in the project corridor (e.g., BART, Caltrain, ACE, VTA LRT, VTA bus, etc.). In addition, observed BART station entries and exits and BART park-and-ride vehicle demand was compared to model estimated results summarized by county location. Initial transit validation goals were as follows:

<i>Transit Validation Level-of-Detail</i>	<i>Acceptable Percent Error</i>
• Daily boardings by transit submode – regional-level (heavy rail, commuter rail, LRT, express bus, local bus)	+ or – 5 percent
• Daily boardings by major operator (in the corridor)	+ or – 15 percent
• BART daily boardings by station by groups/corridors	+ or – 15 percent

Table 26 summarizes the transit assignment of daily estimated versus observed boardings by the different operators and transit submodes. For transit assignment validation, heavy rail, light rail and bus submodes exceed the validation goal of plus or minus 5 percent error. Only commuter rail did not exceed the validation target, however, estimated volumes are within 6.7 percent of observed. Of the major operators in the corridor, the most significant difference between estimated and observed boardings is with the VTA Guadalupe LRT line, with an underestimation of –20.3 percent of observed boardings. This underestimation is offset somewhat by the overestimation on the Tasman LRT line

A primary area of interest in the transit validation using regional calibration constants is the performance of the BART system when summarized at subregional groups of stations. Table 27 summarizes BART station entries and exits for the counties that comprise the BART service area. While BART system validation is excellent at -0.1 percent of observed volumes, there is a wide variation in the validation performance for counties and for station groupings within counties. For BART volumes in the stations closest to the Silicon Valley Rapid Transit Corridor (SVRTC); south Alameda County stations of San Leandro, Bayfair, Hayward, South Hayward, Union City and Fremont, the model estimates are within 6 percent (94 percent of estimated versus observed) of the observed station ons and offs.

At the county level of station aggregation, there is actually a narrow range of variation, with BART entries and exits being slightly underestimated for San Francisco County stations and slightly overestimated for Contra Costa County stations. However, the

results indicate there are no significant geographical biases at the county level of detail, even when using the application of regional transit submode constants. In fact, the results of the transit validation are quite accurate at the varying levels of detailed stratification; at the transit operator level, at the transit submode level and at the BART county-level station detail.

**Table 26**  
**2000 Transit Assignment Validation**  
**10-Jan-07**

<b>Operator</b>	<b>Submode Category</b>	<b>Estimated Boardings - Revised</b>	<b>Observed Boardings</b>	<b>Percent Difference</b>
BART	Heavy Rail	331,774	333,877	-0.6%
Caltrain	Commuter Rail	37,288	35,610	4.7%
Capitols	Commuter Rail	3,844	2,822	36.2%
ACE	Commuter Rail	3,939	3,827	2.9%
MUNI Metro LRT	Light Rail	133,746	129,149	3.6%
MUNI Bus/Cable Cars	Local Bus	566,798	571,649	-0.8%
VTA LRT Total	Light Rail	25,869	29,177	-11.3%
Guadalupe LRT	Light Rail	19,225	24,113	-20.3%
Tasman LRT	Light Rail	6,644	5,064	31.2%
VTA Express Bus	Express Bus	2,988	2,772	7.8%
Routes 180/140/520	Express Bus	2,245	2,409	-6.8%
VTA Local/Limited Bus	Local Bus	145,698	152,463	-4.4%
Dumbarton Express	Express Bus	1,518	1,000	51.8%
Samtrans Bus	Express Bus	75,762	59,901	26.5%
AC Transit Transbay	Express Bus	14,110	14,500	-2.7%
AC Transit Local Bus	Local Bus	193,683	194,500	-0.4%
<b>ALL</b>	<b>ALL</b>	<b>1,537,017</b>	<b>1,531,247</b>	<b>0.4%</b>
<b>Subtotals by Submode</b>	Heavy Rail	331,774	333,877	-0.6%
	Commuter Rail	45,071	42,259	6.7%
	Light Rail	159,615	158,326	0.8%
	Express Bus	18,616	18,272	1.9%
	Local Bus	981,941	978,513	0.4%

**Table 27**  
**2000 BART ONS + OFFS**  
**(Production-Attraction Format)**

10-Jan-07

Station	County	Estimated	Estimated	Estimated	Observed	Est/Obs
		Ons	Offs	Ons and Offs	Ons and Offs	
Richmond	Contra Costa	6,613	696	7,309	8,492	0.86
El Cerrito DN	Contra Costa	20,205	2,089	22,294	17,008	1.31
El Cerrito PI	Contra Costa	7,372	1,732	9,104	8,091	1.13
N. Berkeley	Alameda	6,106	1,097	7,203	7,545	0.95
Berkeley	Alameda	5,545	17,494	23,039	21,870	1.05
Ashby	Alameda	6,846	1,997	8,843	8,786	1.01
MacArthur	Alameda	11,903	3,956	15,859	13,189	1.20
19th Street	Alameda	7,025	16,089	23,114	16,421	1.41
12th Street	Alameda	8,045	14,180	22,225	24,645	0.90
Lake Merritt	Alameda	8,063	6,549	14,612	9,482	1.54
Fruitvale	Alameda	18,488	2,891	21,379	19,247	1.11
Coliseum	Alameda	6,601	2,310	8,911	14,869	0.60
San Leandro	Alameda	8,462	3,051	11,513	10,717	1.07
Bay Fair	Alameda	7,772	3,172	10,944	11,185	0.98
Hayward	Alameda	5,243	3,669	8,912	10,208	0.87
S. Hayward	Alameda	5,033	1,468	6,501	6,373	1.02
Union City	Alameda	5,511	2,494	8,005	8,259	0.97
Fremont	Alameda	5,806	4,242	10,048	12,741	0.79
Concord	Contra Costa	10,489	3,033	13,522	12,127	1.12
Pleasant Hill	Contra Costa	9,195	2,308	11,503	13,404	0.86
Walnut Creek	Contra Costa	8,842	4,414	13,256	11,977	1.11
Lafayette	Contra Costa	4,560	832	5,392	6,187	0.87
Orinda	Contra Costa	5,212	1,516	6,728	5,321	1.26
Rockridge	Alameda	6,873	1,189	8,062	9,483	0.85
West Oakland	Alameda	6,863	2,142	9,005	9,804	0.92
Embarcadero	San Francisco	5,630	67,623	73,253	71,436	1.03
Montgomery	San Francisco	6,155	71,226	77,381	73,766	1.05
Powell	San Francisco	4,864	32,818	37,682	48,726	0.77
Civic Center	San Francisco	5,973	24,868	30,841	36,892	0.84
16th Street	San Francisco	9,234	9,284	18,518	17,935	1.03
24th Street	San Francisco	15,854	3,515	19,369	22,723	0.85
Glen Park	San Francisco	11,449	1,179	12,628	14,438	0.87
Balboa Park	San Francisco	12,829	5,433	18,262	23,631	0.77
Daly City	San Mateo	11,128	3,488	14,616	16,917	0.86
Colma	San Mateo	14,508	3,244	17,752	13,689	1.30
Castro Valley	Alameda	4,448	646	5,094	4,272	1.19
Dublin/Pleasanton	Alameda	8,134	2,453	10,587	12,362	0.86
N. Concord	Contra Costa	4,532	1,002	5,534	4,106	1.35
Bay Point	Contra Costa	14,362	387	14,749	9,418	1.57
All		331,773	331,776	663,549	667,742	0.99
<b>County Summary</b>	San Francisco	71,988	215,946	287,934	309,547	0.93
	Alameda	142,767	91,089	233,856	231,458	1.01
	Contra Costa	91,382	18,009	109,391	96,131	1.14
	San Mateo	25,636	6,732	32,368	30,606	1.06
	All	331,773	331,776	663,549	667,742	0.99



### ***Highway Assignment Validation***

Year 2000 highway assignments were validated to AM and PM peak hour conditions for Santa Clara County roadways and at the Alameda and Santa Clara County line. The highway assignment validation goal was to match observed vehicle volumes within + or – 5 percent systemwide and across each facility type. For each city and for assigned volumes at the Alameda/Santa Clara County line, the validation goal was plus or minus 15 percent, however, each city had to have a minimum of 30 count observations in order to be considered.

Highway validation for the AM peak hour is summarized in Table 28 for each city jurisdiction and by facility type. The results of the AM peak hour highway validation shows very close estimates of vehicle volumes compared to observed at – 0.6 percent error for the county. Across each city, vehicle volumes of estimated to observed show wide variations, however, all validation goals were met for cities with greater than 30 count observations. Validation by facility type was also excellent for the higher-order facilities of freeway, expressway and arterials, all matching within + or – 5 percent of observed values.

Highway validation for the PM peak hour is summarized in Table 29 for each city jurisdiction and by facility type and show results similar to the AM conditions. The results of the PM peak hour highway validation shows very close estimates of vehicle volumes compared to observed at – 2.5 percent error for the county. Across each city, vehicle volumes of estimated to observed show wide variations, however, as with the AM peak hour, all validation goals were met for cities with greater than 30 count observations. Validation by facility type was also excellent for the higher-order facilities of freeway and arterials, all matching within + or – 5 percent of observed values, with expressway just missing the 5 percent error threshold at 6 percent.

Table 30 summarizes the estimated and observed traffic volumes at the Alameda/Santa Clara County line for the AM peak hour and AM peak period conditions. Only the northbound AM peak hour volumes do not meet the + or – 15 percent threshold value for validation by exceeding observed volumes by + 15.4 percent.

### ***Highway Speed Validation***

The final validation test was to compare the model estimated speeds for key origin-destination itineraries in the SVRTC corridor with observed AM peak period travel time runs shown in Table 31. Six primary origin-destination pairs were examined for travel time validation; itineraries 1 through 4 travel from southern Pleasanton to north San Jose and Sunnyvale along Interstates I-880, I-680 and State Route 237. Itineraries 5 and 6 travel on the I-880 corridor from I-280 in central Santa Clara County to I-80 in central Alameda County. Using a validation goal of within + or - 15 percent error, five out of six corridors meet or exceed the validation goal.

**Table 28**  
**2000 Assignment Validation - AM Peak Hour Traffic**  
**Volumes**  
**Estimated v. Observed by City Jurisdiction and Facility Type**

**AM Peak Hour**

City Code	City	Estimated Volume	Observed Volume	Est/Obs	No. Obs
1	Campbell	37,568	39,870	0.94	* 28
2	Cupertino	96,424	99,304	0.97	75
3	Gilroy	48,540	47,622	1.02	72
4	Los Altos	17,710	20,647	0.86	* 25
5	Los Altos Hills	887	1,382	0.64	* 1
6	Los Gatos	18,812	14,239	1.32	* 7
7	Milpitas	222,961	219,754	1.01	172
8	Monte Sereno	1,610	1,909	0.84	* 2
9	Morgan Hill	8,051	7,023	1.15	* 2
10	Mountain View	84,610	87,020	0.97	84
11	Palo Alto	34,821	36,959	0.94	38
12	San Jose	1,103,598	1,076,188	1.03	842
13	Santa Clara	165,309	178,005	0.93	134
14	Saratoga	13,434	13,610	0.99	* 12
15	Sunnyvale	123,411	145,969	0.85	136
	ALL	1,977,746	1,989,501	0.99	1,630

Note: \*  
 Insufficient  
 No. of  
 Observations  
 < 30

**AM Peak Hour**

Code	Facility Type	Estimated Volume	Observed Volume	Est/Obs	No. Obs
2	Freeway	554,511	551,184	1.01	155
3	Expressway	325,806	335,047	0.97	183
4	Collector	54,516	98,580	0.55	233
5	Ramp	96,267	69,589	1.38	126
7	Arterial	1,040,437	1,019,540	1.02	992
	ALL	2,071,537	2,073,940	1.00	1,689

Note: Shaded  
 Areas Meet  
 Validation  
 Goals

**Table 29**  
**2000 Assignment Validation - PM Peak Hour Traffic Volumes**  
 Estimated v. Observed by City Jurisdiction and  
 Facility Type

**PM Peak Hour**

City Code	City	Estimated Volume	Observed Volume	Est/Obs	No. Obs
1	Campbell	45,005	49,763	0.90	* 28
2	Cupertino	109,550	109,419	1.00	75
3	Gilroy	47,122	52,426	0.90	70
4	Los Altos	24,761	24,430	1.01	* 25
5	Los Altos Hills	487	524	0.93	* 1
6	Los Gatos	18,398	18,940	0.97	* 7
7	Milpitas	230,914	219,967	1.05	160
8	Monte Sereno	1,477	1,098	1.35	* 2
9	Morgan Hill	8,099	6,558	1.23	* 2
10	Mountain View	94,954	88,644	1.07	81
11	Palo Alto	45,748	40,471	1.13	38
12	San Jose	1,199,476	1,160,896	1.03	843
13	Santa Clara	188,435	183,752	1.03	134
14	Saratoga	10,942	10,247	1.07	* 12
15	Sunnyvale	140,181	154,526	0.91	134
	ALL	2,165,549	2,121,661	1.02	1,612
Note: * Insufficient No. of Observations < 30					

**PM Peak Hour**

Code	Facility Type	Estimated Volume	Observed Volume	Est/Obs	No. Obs
2	Freeway	587,980	585,188	1.00	159
3	Expressway	375,440	352,761	1.06	182
4	Collector	66,765	103,475	0.65	233
5	Ramp	100,974	75,953	1.33	123
7	Arterial	1,153,662	1,111,700	1.04	978
	ALL	2,284,821	2,229,077	1.03	1,675
Note: Shaded Areas Meet Validation Goals					

**Table 30**  
**Year 2000 Traffic Volumes at Santa Clara/Alameda County Line (AM Peak Hour)**

<b>Southbound</b>					
<b>Facility</b>	<b>Location</b>	<b>Direction</b>	<b>Model</b>	<b>Count</b>	<b>% Difference</b>
I-880	South of Dixon Landing Rd	SB	7,000	6,500	+ 7.7 %
I-680	South of Scott Creek Rd	SB	7,100	6,200	+ 14.5 %
Warm Springs Rd	North of Milpitas City Limits	SB	2,000	2,000	+ 0.0 %
<b>TOTAL</b>		<b>SB</b>	<b>16,100</b>	<b>14,700</b>	<b>+ 10.0 %</b>
<b>Northbound</b>					
<b>Facility</b>	<b>Location</b>	<b>Direction</b>	<b>Model</b>	<b>Count</b>	<b>% Difference</b>
I-880	South of Dixon Landing Rd	NB	4,600	4,300	+ 7.0 %
I-680	South of Scott Creek Rd	NB	6,100	5,100	+ 19.6 %
Warm Springs Rd	North of Milpitas City Limits	NB	1,300	1,000	+ 30.0 %
<b>TOTAL</b>		<b>NB</b>	<b>12,000</b>	<b>10,400</b>	<b>+ 15.4 %</b>

**Year 2000 Traffic Volumes at Santa Clara/Alameda County Line (3 Hour AM Peak Period)**

<b>Southbound</b>					
<b>Facility</b>	<b>Location</b>	<b>Direction</b>	<b>Model</b>	<b>Count</b>	<b>% Difference</b>
I-880	South of Dixon Landing Rd	SB	19,700	18,600	+ 5.9 %
I-680	South of Scott Creek Rd	SB	21,200	17,600	+ 20.5 %
Warm Springs Rd	North of Milpitas City Limits	SB	5,500	4,400	+ 25.0 %
<b>TOTAL</b>		<b>SB</b>	<b>46,400</b>	<b>40,600</b>	<b>+ 14.3 %</b>
<b>Northbound</b>					
<b>Facility</b>	<b>Location</b>	<b>Direction</b>	<b>Model</b>	<b>Count</b>	<b>% Difference</b>
I-880	South of Dixon Landing Rd	NB	13,100	12,600	+ 4.0 %
I-680	South of Scott Creek Rd	NB	14,800	14,400	+ 2.8 %
Warm Springs Rd	North of Milpitas City Limits	NB	1,000	2,100	- 52.4 %
<b>TOTAL</b>		<b>NB</b>	<b>28,900</b>	<b>29,100</b>	<b>- 0.7 %</b>

**Table 31**  
**Year 2000 AM Peak Period Highway Speed Validation for SVRTC Corridor**  
**Origin-Destination Pairs - Freeways**

Itinerary	Observed Times in Minutes	Modeled Times in minutes	Percent Difference	Range of Observed Times
1	78	74	- 5 %	76 - 80
2	60	69	+ 15 %	58 - 62
3	85	87	- 2 %	81 - 88
4	68	82	+ 21 %	64 - 72
5	80	92	+ 15 %	69 - 91
6	56	61	+ 9 %	44 - 68

Itinerary Descriptions:

- 1: Sunol Blvd/I-680 southbound on I-680, eastbound on Calaveras Blvd/Route 237 to Tasman /Zanker
- 2: Sunol Blvd/I-680 southbound on I-680, Route 262 and I-880, eastbound on Route 237 to Tasman /Zanker
- 3: Sunol Blvd/I-680 southbound on I-680, eastbound on Calaveras Blvd/Route 237 to Lockheed Martin
- 4: Sunol Blvd/I-680 southbound on I-680, Route 262 and I-880, eastbound on Route 237 to Lockheed Martin
- 5: Southbound on I-880, I-80 in Alameda County to I-280 in Santa Clara County
- 6: Northbound on I-880, I-280 in Santa Clara County to I-80 in Alameda County

**APPENDIX B**

**Definition of the Express Bus Alternative—  
Express Bus Service to San Francisco  
Peninsula**

## **DEFINITION OF THE EXPRESS BUS ALTERNATIVE—EXPRESS BUS SERVICE TO SAN FRANCISCO PENINSULA**

The shortlisted Monterey County Fixed Guideway Study “Build” Alternatives (Alternatives A, B, and C) address a variety of travel markets. These include Monterey County to San Francisco Bay Area commuters; local Monterey Peninsula trips; intra-Monterey County trips between Salinas and the Monterey Peninsula; and inter-city trip making by residents and visitors between the Monterey Peninsula and San Francisco. For an Alternatives Analysis, the Express Bus Alternative must be defined to mimic whichever service or services are selected as the locally preferred build alternative (LPA).

### ***Fixed Guideway Investment***

The Build Alternatives (A, B, and C) shortlisted for detailed definition and testing include components to address each of the travel markets noted above. Insofar as the Monterey County to San Francisco Bay Area commuters, all three alternatives specify a Caltrain extension from Gilroy to Salinas to address this travel market. The definition of the Caltrain Extension service and capital investment is identical for all three shortlisted Build Alternatives. TAMC Board policy and the results of this Fixed Guideway Study therefore identify the Caltrain Extension as the LPA for this travel market.

An Express Bus Alternative does not typically include fixed-guideway investments; however, roadway and intersection improvements can be constructed to speed local or express bus transportation. These may include high-occupancy vehicle bypass lanes at ramp metered highway interchanges, traffic queue bypass lanes at signalized intersections, and traffic signal priority measures. These features are also elements of many non-guideway bus rapid transit (BRT) deployments. Major construction of highway lanes or exclusive roadways for transit is typically beyond the investment contemplated for TSM alternatives.

In the case of Monterey County, however, failure to address capacity shortfalls in an express bus or “Baseline” alternative merely ignores the county’s transportation problems. Demonstrated capacity problems exist currently in the U.S. 101, SR 1, Route 68, SR 156, Route 183 and the Marina–Salinas corridors (Blanco Road and Davis Road). Environmental, topographic, and funding constraints, plus the cost of major road construction, all limit options for non-transit solutions. Therefore, to consider express bus or baseline proposals as a viable alternative to “build” transit guideway options, definition of this alternative must include the delivery of equivalent travel time savings, comfort and convenience for transit users.

### ***Service/Stations/Stops***

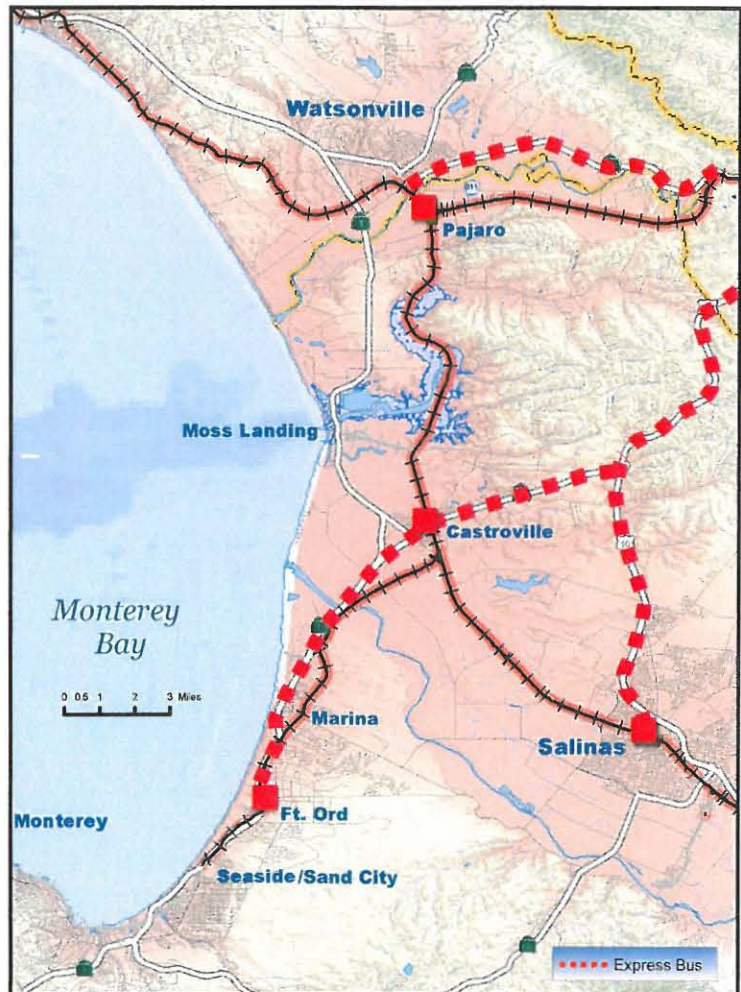
To provide Caltrain comparable service, MST express bus service will be established as part of the Express Bus Alternative and will operate from four Monterey County Transit Centers to the San Francisco Peninsula. An MST Transit Center/Park-n-Ride facility will be constructed at Eighth Street in Marina as part of the University Villages redevelopment of Fort Ord. Additional transit centers with park-and-ride facilities will be located in Salinas, Castroville, and Pajaro with express bus service operating via existing surface roadways to Santa Clara and San Mateo counties. The location of these park-and-ride facilities is illustrated in Figure 3-8.

The Express Bus Alternative will include the construction of park-and-ride facilities to support express bus operations at comparable Caltrain Extension Alternative rail station locations. These will include Salinas, Castroville and Pajaro/Watsonville, as well as Marina (Fort Ord). Service will be provided to attract comparable ridership. Hence, facilities will be similarly sized to the locally preferred Caltrain Extension Alternative.

### Operations

The Express Bus Alternative will be similarly defined to the Caltrain Extension Alternative as a commuter-oriented service. Express bus service between Monterey County origin stations will be defined to run non-stop to select stations in Santa Clara, San Mateo, and San Francisco counties. Table 3-5 identifies the matrix of station origins and destinations proposed for this service. The table also indicates the frequency of service required to accommodate Year 2030 passenger demands. The objective will be to provide comparable service from both a ride quality and travel time perspective. Ultimately, providing a similar level of corridor capacity and the removal of vehicle trips from the U.S. 101 Corridor will be the objective of the Express Bus Alternative. Over the road, commuter vehicles with more comfortable seating will be substituted for standard MST coaches.

**Figure 3-8**  
**Location of Express Bus Alternative Park-and-Ride Facilities**





**Table 3-5  
Express Bus Alternative Service Matrix and Frequency of Service (Headway Minutes)**

Monterey County	Santa Clara–Mid		Santa Clara–North		San Mateo and San Francisco
	A-1	A-2	B-1	B-2	C
Pajaro	30		30	30	60
Castroville/Fort Ord	60		30		60
Salinas	30	30	15	15	30

**Station Matrix Key:** A-1 = San Jose Diridon  
A-2 = Santa Clara (SJIA), Lawrence, Sunnyvale  
B-1 = Mountain View, San Antonio  
B-2 = California, Palo Alto  
C = Redwood City, Hillsdale, Millbrae (SFO), San Francisco

### Vehicle Requirements

Luxury, high-speed transmission, over the road motor coaches will be acquired for this service. These coaches will feature all-forward-facing high back seats, individual air controls and reading lights for passenger comfort and convenience. For costing purposes, 40-foot coaches are assumed with a capacity of 45 to 49 passengers per vehicle. Assuming an average load factor of 85 percent, equivalent to 40 passengers per vehicle, 30 vehicles will be required to operate the service (including spares) in the near term—carrying 1,028 commuters to the San Francisco Peninsula each weekday. This is equivalent to two Caltrain trips extended from Gilroy to Salinas. Longer term, a fleet of 60 motor coaches (50 vehicles in revenue service plus 10 spares) will be required to accommodate the four Caltrain each way ridership scenario.



This is equivalent to two Caltrain trips extended from Gilroy to Salinas. Longer term, a fleet of 60 motor coaches (50 vehicles in revenue service plus 10 spares) will be required to accommodate the four Caltrain each way ridership scenario.

### Fares and Revenues

The same fare structure as proposed for the Caltrain Extension Alternative is assumed for the Express Bus Alternative. All fare revenues will be used to offset operating and maintenance expenses.

### Physical Facilities of the Express Bus Alternative

As noted above, the Express Bus Alternative assumes that MST will provide express bus service from four park-and-ride facilities located in Pajaro Valley, Castroville, Salinas, and Marina. In addition, the planned Frank J. Lichtanski Monterey Bay Operations Center facility will need to be enlarged in scope to accommodate the express bus fleet.

### **Pajaro Valley Park-and-Ride Facility**

The Express Bus Alternative assumes that a park-and-ride facility will be constructed in Pajaro at the site of the proposed Caltrain station. Given this location along the UPRR Coast line track, the Express Bus Alternative investment could be used for Caltrain Extension Alternative passenger rail service, when capacity/operations and maintenance cost tradeoffs warrant.

In general, the Pajaro park-and-ride facility will include the same elements as the Caltrain Extension Alternative minus the Caltrain passenger loading platform and the track, switch and signaling improvements needed to accommodate Caltrain service. The resulting park-and-ride facility will include the following elements:

- Station building (provided by others), furniture and fixtures, information displays
- Bus, shuttle, and van loading/unloading berths, shelters, information displays
- Parking, bicycle facilities, sidewalks, and circulation roadways
- Roadway, signing and striping, and roadway median construction
- Site drainage, lighting, and landscaping.

Surface parking for approximately 410 vehicles will be provided on the west side of the tracks, roughly parallel with Salinas Road. The northwest corner of the site will remain vacant and provide an opportunity for expansion of parking or other future development. The express bus loading and turn-around area will be located on the northeast corner of the parking lot.

Vehicular traffic will access the station via two driveways on Salinas Road between its intersections with Lewis Road and Railroad Avenue.

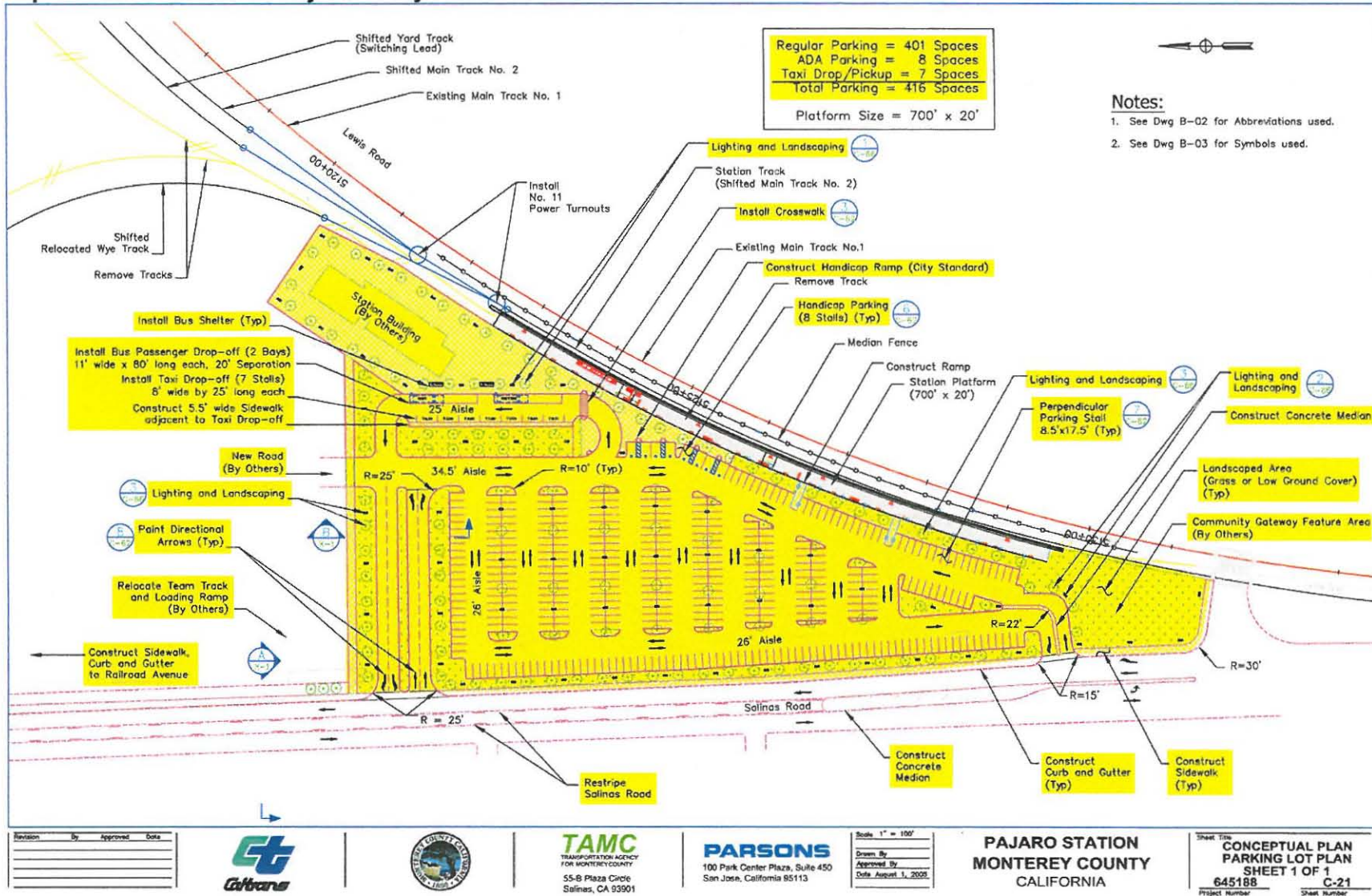
Features included with the Express Bus Alternative are highlighted on Figure 3-9. The estimated cost of this facility is \$7.8 million expressed in FY 2007 dollars and \$8.3 million expressed in year of expenditure dollars.

### **Castroville Park-and-Ride**

Similar to Pajaro, the Castroville park-and-ride facility will be sited adjacent to the UPRR Coast Line track, to facilitate conversion to a rail passenger facility at a later date. A smaller parking supply will be provided at this location compared to the Caltrain Extension Alternative. A companion facility will be constructed at Marina to provide an equivalent supply of parking. The Castroville park-and-ride will include:

- Bus, shuttle, and van loading/unloading berths, shelters, information displays
- Parking, bicycle facilities, sidewalks, and circulation roadways
- Access roadway construction, signing, and striping
- Site drainage, lighting, and landscaping
- Pedestrian grade separation crossing of the main line and Castroville station tracks
- Shoofly track to permit construction of a pedestrian grade separation
- Safety fencing to control pedestrian at-grade crossing of the UPRR main line track
- Access to the station location via the Monterey branch rail line.
- Surface parking for approximately 53 vehicles will be provided to the west of the UPRR track. Local Castroville residents will access the station via Benson Road, which will be connected to Salinas Road, and via a pedestrian undercrossing of the UPRR track.

**Figure 3-9**  
**Express Bus Alternative Pajaro Valley Park-and-Ride**



Auto passenger drop-off, express bus and taxi loading will take place adjacent to the park-and-ride lot.

The conceptual plan for the park-and-ride facility is illustrated on Figure 3-10. Elements pertaining to the Express Bus Alternative are highlighted.

The Castroville park-and-ride facility is estimated to cost \$7.3 million expressed in FY 2007 dollars and \$7.8 million expressed in year of expenditure dollars.

### **Salinas ITC Expansion**

The Salinas ITC will be expanded to accommodate MST local bus operations, intercity bus operations, Express Bus Alternative operations, and upgrades of the Amtrak platform to meet current design standards. Elements of the project will include:

- Increased parking supply adjacent to the station with approximately 550 net parking spaces
- Bicycle lockers and bicycle racks
- Reconstruction of the passenger loading platform for Amtrak use
- Resurfacing and reballasting track to provide a consistent boarding elevation adjacent to the platform
- Installation of a public address system, benches, trash receptacles, and shelters
- Installation of an electronic message sign consistent with Amtrak improvement plans
- Addition of new site access and circulation roadways
- Traffic signalization, signing, and striping
- Relocation of the Monterey-Salinas Transit Center in downtown Salinas and the Greyhound bus depot to the site of the ITC
- Site lighting and landscaping
- Modifications to adjacent structures.

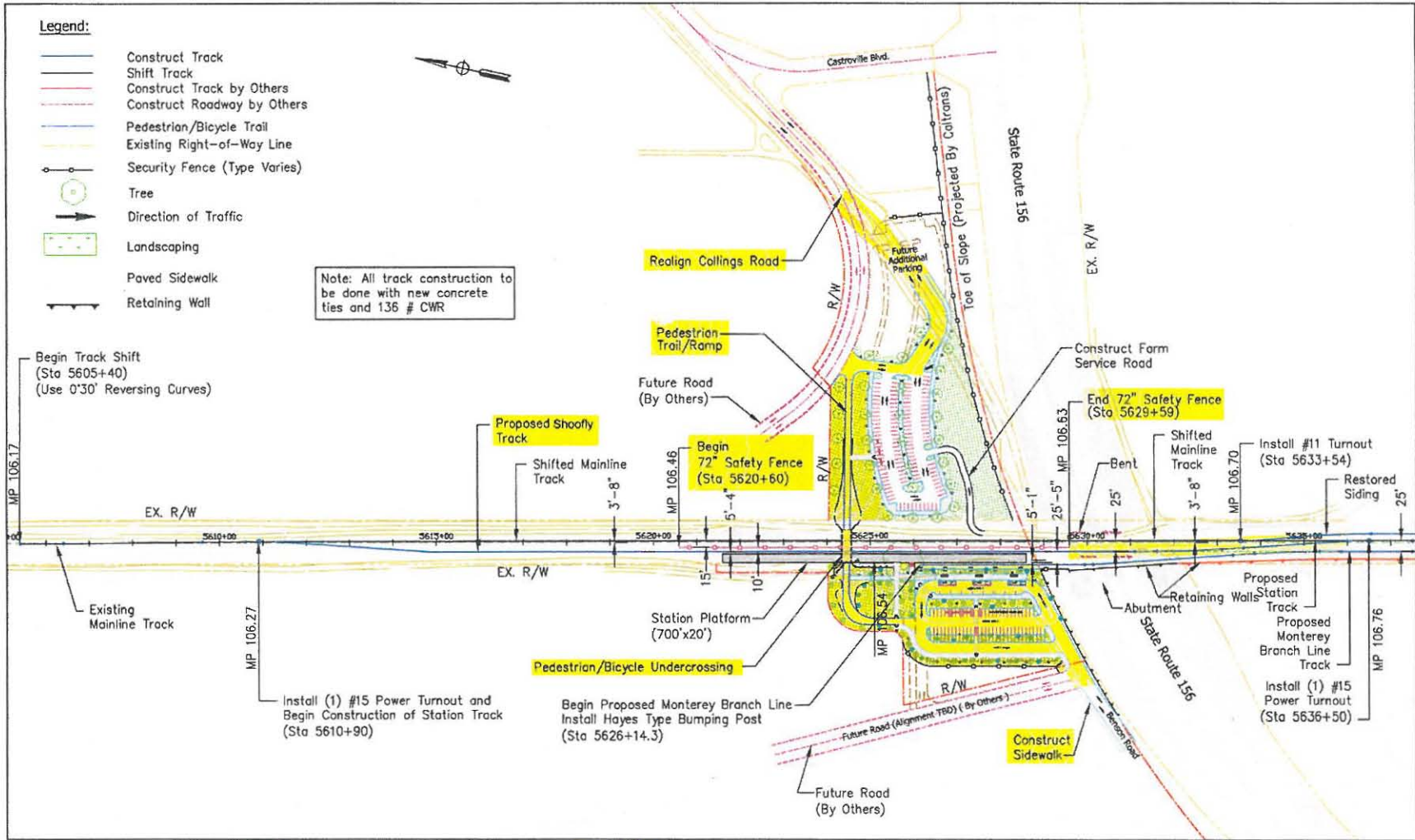
Structured parking for approximately 700 vehicles will be provided adjacent to the existing Amtrak station building. The parking supply and the expanded ITC will be accessed by a new roadway extension of Lincoln Avenue. Palmetto Street will also be available for site access/egress.

The reconstructed station platform will allow for Amtrak patron loading from an elevation 8 inches above the top of rail. Currently, the platform is level with the top of rail. A canopy will cover the Amtrak station platform and connect this passenger loading area with the parking supply.

Figure 3-11 illustrates the conceptual plan for expansion option 17. A parking structure is assumed (see Figure 3-12) as there will be no need to acquire lands to the west for a track connection to a Caltrain layover facility.

The estimated cost of these capital improvements is \$32.1 million expressed in FY 2007 dollars and \$34.3 million expressed in year of expenditure dollars.

**Figure 3-10**  
**Express Bus Alternative Castroville Park-and-Ride**



Revision	By	Approved	Date



**TAMC**  
TRANSPORTATION AGENCY  
FOR MONTEREY COUNTY  
55-B Plaza Circle  
Salinas, CA 93901

**PARSONS**  
100 Park Center Plaza, Suite 450  
San Jose, California 95113

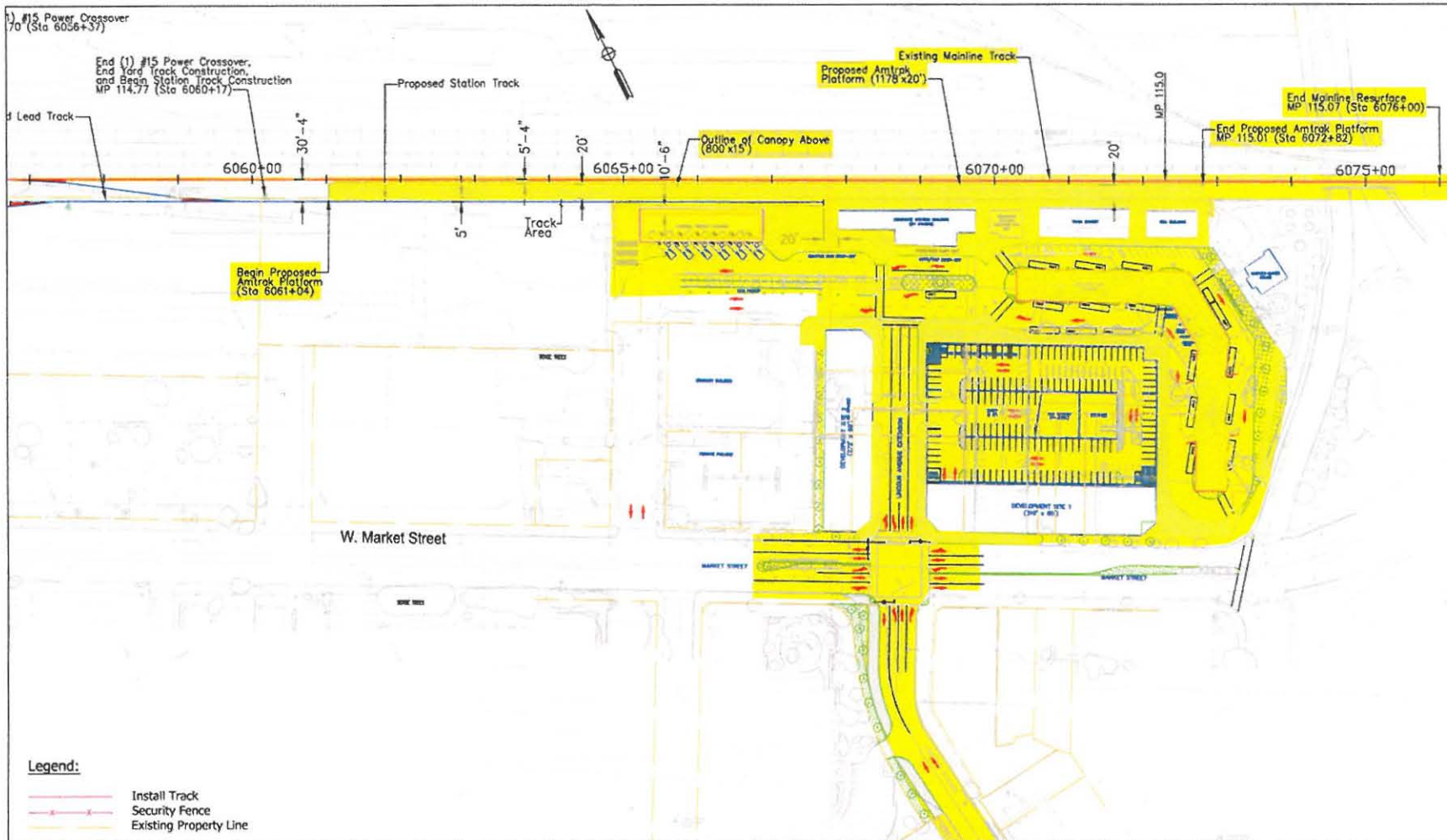
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Drawn By: \_\_\_\_\_  
Approved By: \_\_\_\_\_  
Date: Sept 15, 2005

**CASTROVILLE STATION**  
**MONTEREY COUNTY**  
CALIFORNIA

Sheet Title:  
**CONCEPTUAL PLAN**  
**STATION SITE PLAN**  
**(NON-FRA COMPLIANT EQUIPMENT)**  
645188 C-1  
Project Number: \_\_\_\_\_ Sheet Number: \_\_\_\_\_

645188AA-027

**Figure 3-11**  
**Express Bus Alternative Salinas Intermodal Transportation Center Expansion Option 17**



Revision	By	Approved	Date



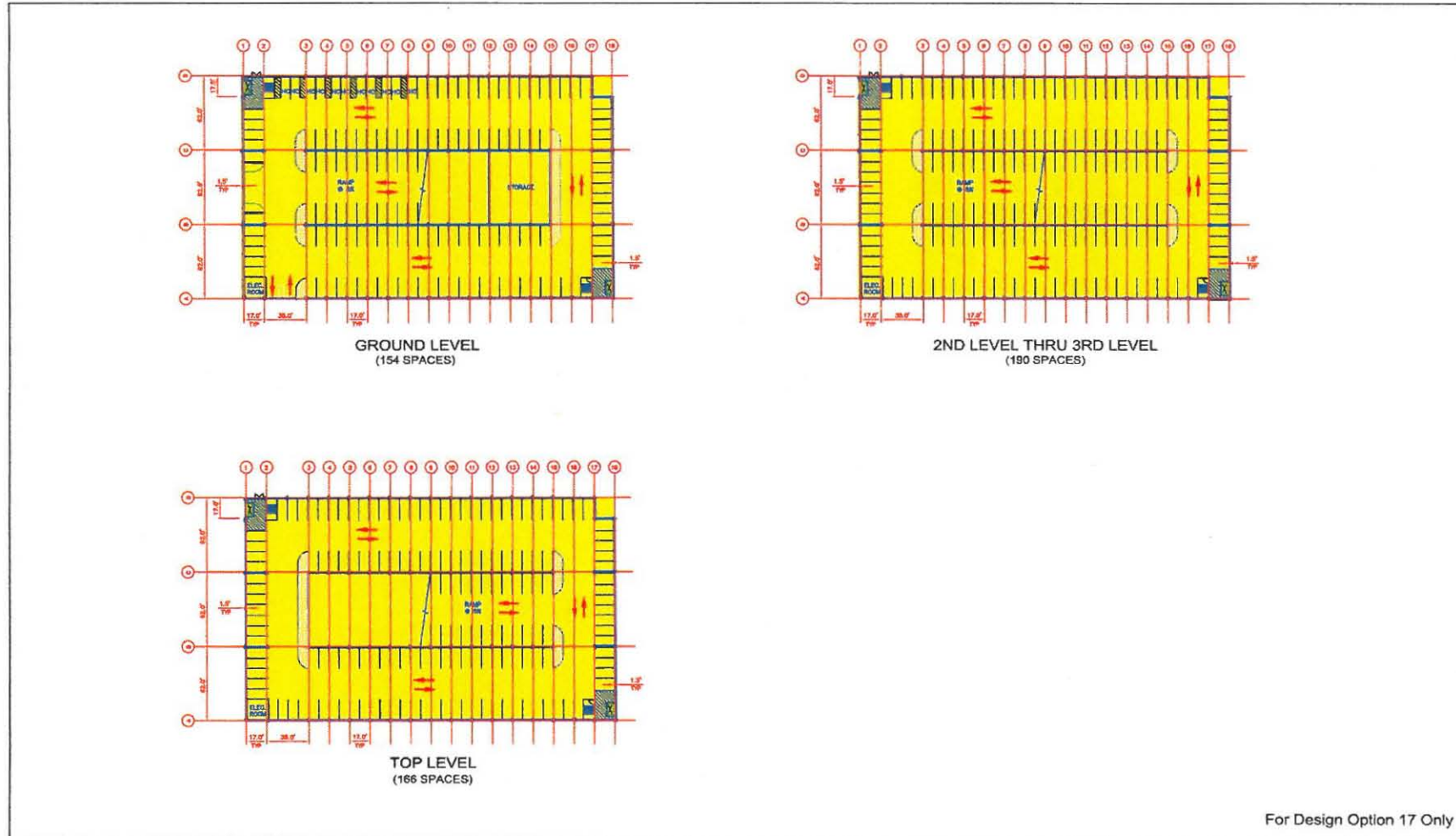
Scale	1" = 120'
Drawn By	CEK
Approved By	SCS
Date	June 28, 2005

**SALINAS STATION**  
**MONTEREY COUNTY**  
CALIFORNIA

Sheet Title	CONCEPTUAL SITE PLAN DESIGN OPTION 17
Project Number	645188
Sheet Number	S-2 (17)

645188AA-028

**Figure 3-12**  
**Express Bus Alternative Salinas Intermodal Transportation Center Expansion Parking Structure Floor Plans**



Revision	By	Approved	Date



Scale	N.P.S.
Drawn By	
Approved By	
Date	June 29, 2005

**SALINAS STATION**  
**MONTEREY COUNTY**  
CALIFORNIA

Sheet Title	CONCEPTUAL PARKING STRUCTURE TYPICAL FLOORS
Project Number	645188
Sheet Number	S-11 (17)

645188AA-029

### **Marina/California State University–Monterey Bay (CSUMB) Transit Center and Park-and-Ride**

In addition to the park-and-ride facilities at Pajaro Valley, Castroville, and the Salinas ITC, the Express Bus Alternative will include construction of an MST Transit Center and park-and-ride facility in Marina at CSUMB (former Fort Ord). The site will be on lands owned by TAMC, proposed for use as a transportation center, adjacent to a proposed transit-oriented development.

As illustrated on Figure 3-13, Express Bus Alternative elements will include:

- Bus, shuttle and van loading/unloading berths
- Bus passenger waiting and a driver/operations and ticket sales enclosed spaces
- Parking, bicycle facilities, sidewalks and circulation roadways
- Access roadway construction, signing and striping
- Site drainage, lighting and landscaping
- Access to the transit center via the Monterey branch rail line.

Surface parking for approximately 128 vehicles will be provided to complement the reduced parking supplied at the Castroville facility. Combined, the Castroville and Marina park-and-rides will provide equivalent capacity for the Express Bus Alternative when compared with the Caltrain Extension Alternative.

Access to the park-and-ride will be via Eighth Street and First Avenue.

The estimated capital cost of this facility is \$8.7 million expressed in FY 2007 dollars and \$9.2 million expressed in year of expenditure dollars.

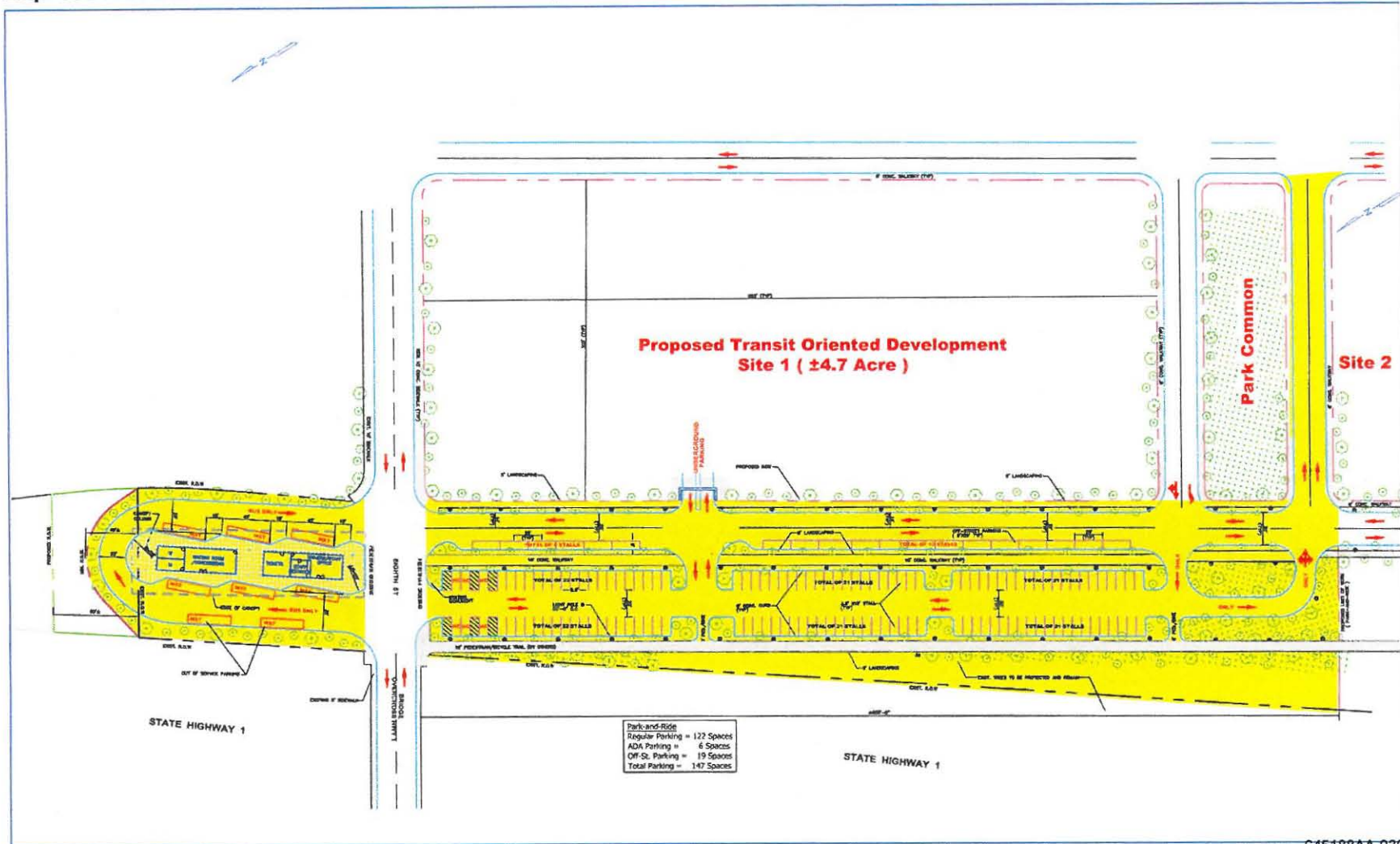
### **Frank J. Lichtanski Monterey Bay Operations Center Expansion**

Monterey-Salinas Transit anticipates that the demands on the region's transportation infrastructure and services will greatly increase. MST has out-grown its operating divisions in Monterey and Salinas. Fleet expansion to meet growing community needs requires upgraded maintenance, operations and administrative facilities to provide adequate support. On January 13, 2003, MST received quitclaim deeds from the United States Department of the Army for three parcels of the former Fort Ord military Reservation. A portion of this acreage will serve as the site of the Frank J. Lichtanski Monterey Bay Operations Center. The estimated cost to design and construct the facility is approximately \$28.0 million and the facility will accommodate 170 buses.

MST officials state that the new operations center has not been planned to accommodate the express bus fleet anticipated by the Express Bus Alternative. The Frank J. Lichtanski Monterey Bay Operations Center will therefore need to be expanded, or an existing facility (Monterey) reutilized to accommodate the express bus fleet. In either event, an allowance of \$100,000 per vehicle is assumed to expand, purchase, or upgrade a maintenance and operations base for the Express Bus Alternative fleet.



**Figure 3-13**  
**Express Bus Alternative Marina/CSUMB Monterey-Salinas Transit Centre**



Revision	By	Approved	Date



Scale	1" = 80'
Drawn By	
Approved By	
Date	Apr. 8, 2008

**MONTEREY BRANCH LINE**  
**MONTEREY COUNTY**  
CALIFORNIA

Sheet Title	645188AA-030
<b>CONCEPTUAL PLAN PARK-AND-RIDE SITE PLAN</b>	
<b>BRT-17(E)</b>	
Project Number	Sheet Number

## APPENDIX C

# Transportation System User Benefits

## TRANSPORTATION SYSTEM USER BENEFITS

Transportation system user benefits (TSUB) represent the changes in mobility for individual travelers that are induced by a project. TSUB estimates are required by the FTA for projects being considered for Section 5309 New Starts discretionary funding provided through the FTA. TSUB are used by the FTA to compare projects throughout the U.S. They are measured in hours of travel time savings and summed over all travelers.

The formulae and procedures for calculating TSUB are specified by the FTA and produced using the Summit computer software provided by the FTA. TSUB are sensitive to both travel times and travel costs. The measure also recognizes benefits for both existing transit users and new users diverted from other modes. As TSUB represent changes in mobility, the alternatives must be compared to a baseline alternative.

For this analysis, the Build Alternatives are compared to the No-Build Alternative, and the Build Caltrain Extension Alternative with 20 minutes of maximum wait time is compared to the Enhanced Shuttle Bus Service to Gilroy Alternative—operating with 30-minute headways. The No-Build Alternative is arguably the most appropriate “baseline alternative” for TSUB comparisons, as it is the only low-cost alternative. All express bus alternatives, including the Enhanced Shuttle Bus to Gilroy option, are relatively expensive to construct, purchase vehicles, and operate.

The Caltrain Extension (2005) and Shuttle Train to San Jose (2035) create high numbers of daily user benefit hours over the No-Build, as can be seen in Table 1. The Caltrain Extension (2005) produces 1,048 user benefit hours daily over the No-Build, representing an average savings per passenger of 18.5 minutes. The Shuttle Train to San Jose (2035) produces 3,234 user benefit hours daily over the No-Build, representing 21.2 minutes of average savings per passenger.

The Enhanced Shuttle Bus Service to Gilroy (2005) produces 726 user benefit hours daily if operated with 20-minute headways, assuming no scheduling allowance for congestion; or 476 user benefit hours daily if operating with 30-minute headways and built in scheduling allowances to account for congestion (equivalent to 40-minute headways). Under the 20-minute headway option, which assumes optimal transfer conditions, passengers would save 19.3 minutes of travel time compared to the No-Build option. Under the 30-minute headway option, which takes “slack time” into account to address potential congestion delays, passengers would save 16.5 minutes of travel time on average.

**Table 1. Daily Transit System User Benefits**

Alternatives Compared	TSUB Hours	Daily Passengers*	Minutes/Passenger
Caltrain Extension (2005) with 20-min max wait versus No-Build	1,048	3,394	18.5
Shuttle Train to Gilroy (2035) with 20-min max wait versus No-Build	3,234	9,134	21.2
Enhanced Shuttle Bus (2005) with 20-min headway versus No-Build	726	2,255	19.3
Enhanced Shuttle Bus (2005) with 30-min headway versus No-Build	476	1,733	16.5
Caltrain Extension (2005) with 20-min max wait versus Enhanced Shuttle Bus with 30-min headway	572	1,661	20.7

\*Ridership as modeled. Reflects no trip table correction factor.

The Caltrain Extension (2005) Build Alternative produces 572 user benefit hours daily over the Enhanced Shuttle Bus to Gilroy (2005) Build Alternative.<sup>1</sup>

Tables 2 through 6 summarize the user benefits on a district-to-district basis for the various alternative comparisons. Figure 1 shows the areas defined by each district. The tables provide information about which interchanges and districts are benefiting most from the alternatives.

Figures 2 through 7 show the TSUB on a TAZ-by-TAZ basis for the Caltrain Extension (2005) versus No-Build Alternative, for the Enhanced Shuttle Bus Service to Gilroy Alternative versus the No-Build Alternative, and for the Caltrain Extension (2005) versus the Enhanced Shuttle Bus to Gilroy Alternative. Two plots are shown for each comparison:

- The **production** user benefit plots (Figures 2, 4 and 6) show the total user benefits summed from each production TAZ to all attraction TAZs. The production user benefits are analogous to the row totals shown in Tables 2, 5 and 6.
- The **attraction** user benefit plots (Figures 3, 5 and 7) show the total user benefits summed from all production TAZs to each attraction TAZs. The attraction user benefits are analogous to the column totals shown in Tables 2, 5 and 6.

The colored plots are useful for identifying areas that are not well served by the alternative. They can be used to identify areas where network connectivity, a transportation system design issue, a modeling error, or some other modeling idiosyncrasy generally reduces the productivity of an alternative to a TAZ or set of TAZs.

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<sup>1</sup> Operating with 30-minute headways and scheduling allowances to account for congestion.

**Table 2. TSUB Hours by Production/Attraction District: Caltrain Extension (2005) with 20-minute Maximum Wait versus No-Build**

Production District	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1. Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. East Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. North Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. San Joaquin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Santa Clara8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Santa Clara9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Santa Clara10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Santa Clara11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. Santa Clara12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10. Santa Clara13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11. Santa Clara14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12. Santa Cruz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13. Monterey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14. San Benito	0.49	0.10	0.02	0	0.86	2.48	1.18	2.94	0.57	1.60	4.90	0	0	0	0	0	0	15.11
15. Watsonville	69.91	4.49	2.41	0	23.09	66.38	31.58	82.22	18.61	42.62	117.09	0	0	0	0	0	0	458.39
16. Castroville	40.47	4.46	4.87	0	18.65	41.30	18.84	44.34	10.46	25.04	58.40	0	0	0	0	0	0	266.82
17. Salinas	34.24	3.95	3.58	0	22.42	53.32	24.28	50.68	12.09	32.96	70.63	0	0	0	0	0	0	308.16
<b>Total</b>	<b>145.11</b>	<b>13.00</b>	<b>10.86</b>	<b>0</b>	<b>65.02</b>	<b>163.48</b>	<b>75.87</b>	<b>180.18</b>	<b>41.73</b>	<b>102.21</b>	<b>251.02</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,048.48</b>

Source: SVRTC Mode Choice

**Table 3. TSUB Hours by Production/Attraction District: Shuttle Train to Gilroy (2035) with 20-minute Maximum Wait versus No-Build**

Production District	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1. Peninsula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. East Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. North Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. San Joaquin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Santa Clara8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Santa Clara9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Santa Clara10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Santa Clara11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9. Santa Clara12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10. Santa Clara13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11. Santa Clara14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12. Santa Cruz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13. Monterey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14. San Benito	0.80	0.48	0.02	0	0.78	2.19	1.23	4.47	1.27	2.38	2.93	0	0	0	0	0	0	16.55
15. Watsonville	147.73	27.14	2.05	0	27.15	75.40	43.62	132.53	45.93	61.53	157.88	0	0	0	0	0	0	720.96
16. Castroville	90.05	39.49	14.66	0	49.91	123.48	75.24	194.19	78.26	102.33	216.74	0	0	0	0	0	0	984.35
17. Salinas	96.91	54.00	13.19	0	71.77	222.41	121.46	285.67	122.17	169.75	355.26	0	0	0	0	0	0	1,512.59
<b>Total</b>	<b>335.49</b>	<b>121.11</b>	<b>29.92</b>	<b>0</b>	<b>149.61</b>	<b>423.47</b>	<b>241.55</b>	<b>616.86</b>	<b>247.64</b>	<b>335.98</b>	<b>732.81</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,234.44</b>

Source: SVRTC Mode Choice

**Table 4. TSUB Hours by Production/Attraction District: Enhanced Shuttle Bus (2005) with 20-minute Headway versus No-Build**

Production District	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1. Peninsula	-0.53	0.84	0.09	0.15	-0.39	-0.33	-0.13	-0.19	-0.24	-0.04	-0.01	0.06	0.02	0	0	0.03	0.01	-0.65
2. East Bay	-0.27	2.82	0.31	-0.96	-1.44	-8.64	-3.83	-4.74	-1.04	-1.61	-0.52	1.96	0.09	0.04	0.12	0.15	0.06	-17.53
3. North Bay	-0.06	-0.22	-0.16	-0.30	-0.01	-0.10	-0.03	-0.06	-0.04	-0.01	0	0.05	0.02	0	0.01	0.04	0.01	-0.87
4. San Joaquin	1.78	29.80	0.62	0	0.36	6.53	2.55	1.32	0.21	0.48	0.46	0	0	0	0	0	0	44.11
5. Santa Clara8	-0.30	2.89	0.03	-0.01	-0.36	0.26	0.12	0.14	0.22	0.05	0	0.03	0	0	0	0	0	3.08
6. Santa Clara9	-1.58	4.39	0.01	-0.01	0.47	0.14	0.17	-0.08	0.22	0	0.09	0.07	0	0	0	0	0	3.91
7. Santa Clara10	-0.44	1.58	0.01	-0.01	-0.07	0	-0.07	-0.03	0.19	-0.10	0.02	0.13	0	0	0	0.01	0	1.23
8. Santa Clara11	-0.91	1.75	0	0	-0.22	-0.84	-0.16	-0.01	-0.18	0	0	0.06	0	0	0	0.01	0.02	-0.47
9. Santa Clara12	-0.24	0.26	-0.02	0	1.40	2.52	0.87	0.66	-0.14	0.10	-0.06	0.02	0	0	0	0.01	0.03	5.41
10. Santa Clara13	-0.17	0.55	0	0.02	-0.02	-0.16	0.03	0.03	-0.17	-0.02	0	0.05	0	0	0	0.01	0.03	0.18
11. Santa Clara14	0.03	0.15	0	0	-0.03	-0.06	0.11	0.01	0.08	-0.05	-0.03	0.02	0	0	0	0.08	0.26	0.59
12. Santa Cruz	0.13	0.95	0.25	0	-0.09	2.88	4.70	2.75	1.20	1.17	0.07	0	0	0	0	0	0	14.01
13. Monterey	0.85	-1.16	-0.97	0	-0.09	-0.06	0.16	0	0	-0.01	0.02	0	0	0	0	0	0	-1.26
14. San Benito	0.55	-1.09	-0.38	0	0.30	1.08	0.77	1.47	0.36	0.81	4.85	0	0	0	0	0	0	8.72
15. Watsonville	41.85	2.65	1.49	0	12.61	35.48	19.32	53.48	11.35	30.46	135.42	0	0	0	0	0	0	344.12
16. Castroville	21.09	2.27	3.51	0	8.44	17.96	8.67	20.15	4.56	11.72	41.89	0	0	0	0	0	0	140.27
17. Salinas	19.99	0.89	0.98	0	11.69	26.75	12.11	26.82	5.82	17.89	57.86	0	0	0	0	0	0	180.81
<b>Total</b>	<b>81.77</b>	<b>49.32</b>	<b>5.77</b>	<b>-1.12</b>	<b>32.57</b>	<b>83.41</b>	<b>45.35</b>	<b>101.73</b>	<b>22.40</b>	<b>60.82</b>	<b>240.05</b>	2.45	0.13	0.05	0.14	0.35	0.43	<b>725.63</b>

Source: SVRTC Mode Choice

**Table 5. TSUB Hours by Production/Attraction District: Enhanced Shuttle Bus (2005) with 30-minute Headway versus No-Build**

Production District	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1. Peninsula	-0.17	0.52	0.11	0.16	0.15	0.85	0.24	0.40	0.18	0.12	0	-0.06	0	0	0	-0.06	0	2.44
2. East Bay	0.31	2.75	0.22	-0.35	0.11	-10.38	-4.98	-5.91	-0.53	-1.82	-0.70	2.01	0.03	0.02	0.08	-0.08	0.04	-19.19
3. North Bay	0.04	0.06	0.11	-0.19	0.01	-0.07	-0.02	-0.05	-0.03	-0.02	-0.01	0	0	0	-0.01	-0.04	0.01	-0.20
4. San Joaquin	-7.48	-26.03	-1.37	-0.01	-3.42	-0.25	0.49	-0.72	-2.82	-0.94	-0.79	0	0	0	0	0	0	-43.35
5. Santa Clara8	-0.55	2.21	0.02	-0.01	-0.37	0.49	-0.06	0.37	0.36	0.10	-0.01	0.01	0	0	0	-0.01	0	2.55
6. Santa Clara9	-1.13	4.56	0.02	-0.01	-0.23	0.23	-0.10	0.08	0.22	0.01	0.04	0.04	0	0	0	-0.02	0	3.73
7. Santa Clara10	-0.31	1.85	0.02	-0.01	-0.27	-0.05	-0.11	-0.07	0.21	-0.09	0.02	0.01	0	0	0	-0.05	0	1.15
8. Santa Clara11	-0.72	1.37	0	0	-0.55	-0.86	0.10	0.07	-0.32	0	0.01	0.01	0	0	0	-0.05	0.02	-0.93
9. Santa Clara12	0.04	-0.02	-0.02	0.01	0.28	3.43	1.15	0.79	-0.79	0.09	-0.13	0.01	0	0	-0.01	-0.06	0.02	4.79
10. Santa Clara13	-0.09	0.41	0	0.01	-0.04	0.11	-0.13	0.05	-0.03	-0.13	-0.05	0.02	0	0	0	-0.06	0.03	0.10
11. Santa Clara14	0.01	-0.04	0	0.01	-0.02	-0.08	0.03	-0.03	0.06	-0.02	0	-0.01	0	0	0	-0.61	0.25	-0.45
12. Santa Cruz	-2.76	0.60	0.01	0	-1.59	3.89	6.11	3.43	1.43	1.64	0.16	0	0	0	0	0	0	12.92
13. Monterey	0.73	-1.05	-0.91	0	0.10	0.13	0.20	0.07	0.07	0.03	0.07	0	0	0	0	0	0	-0.56
14. San Benito	0.39	-1.12	-0.42	0	0.38	0.94	0.79	1.18	0.47	0.76	3.56	0	0	0	0	0	0	6.94
15. Watsonville	32.31	1.98	1.06	0	9.31	27.40	15.38	41.40	8.75	23.04	102.97	0	0	0	0	0	0	263.58
16. Castroville	16.23	1.70	2.73	0	6.29	13.69	6.81	15.39	3.58	8.99	31.98	0	0	0	0	0	0	107.39
17. Salinas	15.20	0.44	0.51	0	8.80	19.90	9.07	20.14	4.42	13.46	43.46	0	0	0	0	0	0	135.39
<b>Total</b>	<b>52.05</b>	<b>-9.81</b>	<b>2.10</b>	<b>-0.39</b>	<b>18.94</b>	<b>59.36</b>	<b>34.97</b>	<b>76.58</b>	<b>15.22</b>	<b>45.20</b>	<b>180.58</b>	<b>2.05</b>	<b>0.03</b>	<b>0.02</b>	<b>0.06</b>	<b>-1.05</b>	<b>0.39</b>	<b>476.29</b>

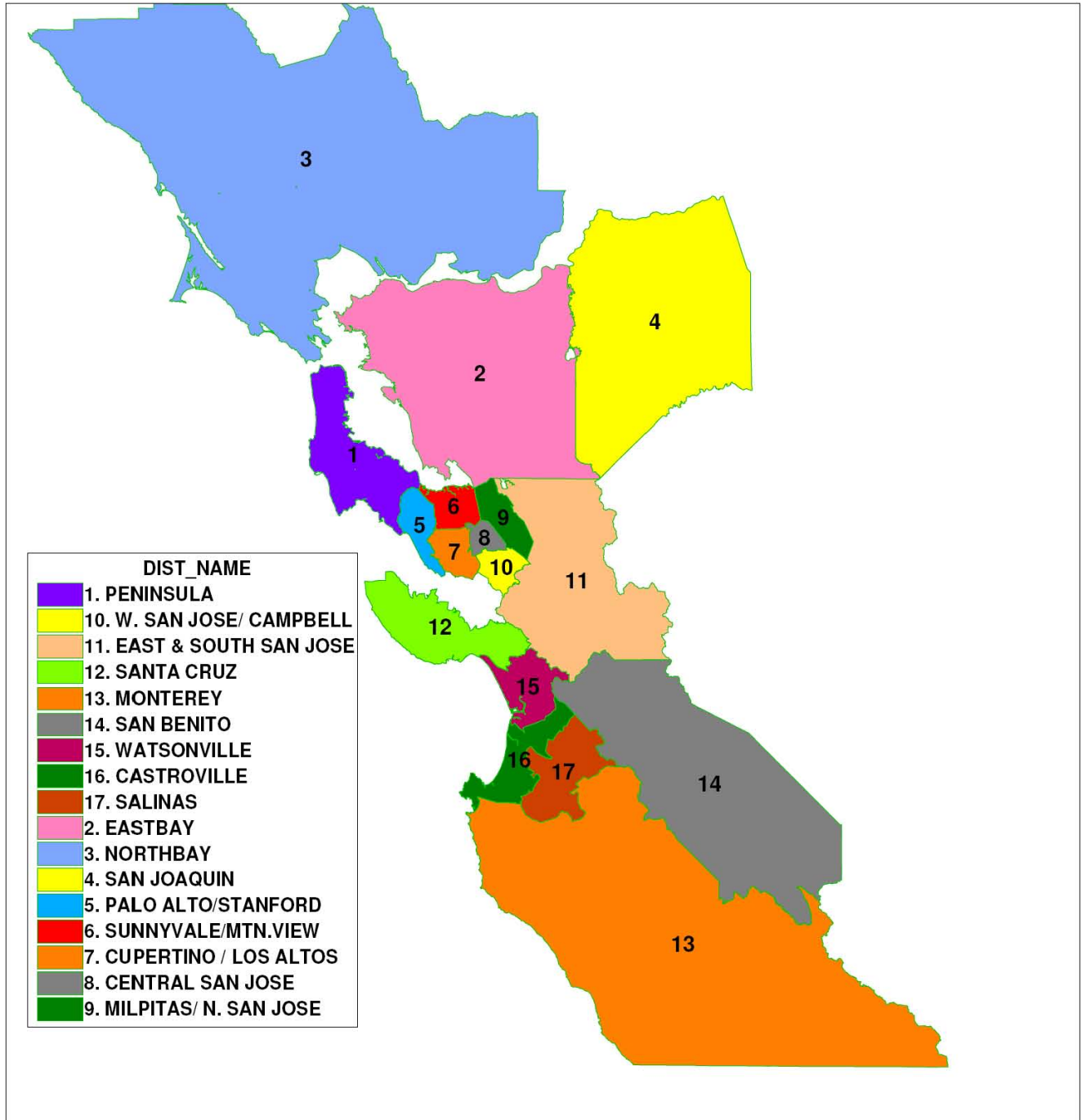
Source: SVRTC Mode Choice

**Table 6. TSUB Hours by Production/Attraction District: Caltrain Extension (2005) with 20-minute Maximum Wait versus Enhanced Shuttle Bus with 30-minute Headway**

Production District	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
1. Peninsula	0.17	-0.52	-0.11	-0.16	-0.15	-0.85	-0.24	-0.40	-0.18	-0.12	0	0.06	0	0	0	0.06	0	-2.44
2. East Bay	-0.31	-2.75	-0.22	0.35	-0.11	10.38	4.98	5.91	0.54	1.82	0.70	-2.01	-0.03	-0.02	-0.08	0.08	-0.04	19.19
3. North Bay	-0.04	-0.06	-0.11	0.19	-0.01	0.07	0.02	0.05	0.03	0.02	0.01	0	0	0	0.01	0.04	-0.01	0.20
4. San Joaquin	7.48	26.03	1.37	0.01	3.42	0.25	-0.49	0.72	2.82	0.94	0.79	0	0	0	0	0	0	43.35
5. Santa Clara8	0.55	-2.21	-0.02	0.01	0.37	-0.49	0.06	-0.37	-0.36	-0.10	0.01	-0.01	0	0	0	0.01	0	-2.55
6. Santa Clara9	1.13	-4.56	-0.02	0.01	0.23	-0.23	0.10	-0.08	-0.22	-0.01	-0.04	-0.04	0	0	0	0.02	0	-3.73
7. Santa Clara10	0.31	-1.85	-0.02	0.01	0.27	0.05	0.11	0.07	-0.21	0.09	-0.02	-0.01	0	0	0	0.05	0	-1.15
8. Santa Clara11	0.72	-1.37	0	0	0.55	0.86	-0.10	-0.07	0.32	0	-0.01	-0.01	0	0	0	0.05	-0.02	0.93
9. Santa Clara12	-0.04	0.02	0.02	-0.01	-0.28	-3.43	-1.15	-0.79	0.79	0.09	0.13	-0.01	0	0	0.01	0.06	-0.02	-4.79
10. Santa Clara13	0.09	-0.41	0	-0.01	0.04	-0.11	0.13	-0.05	0.03	0.13	0.05	-0.02	0	0	0	0.06	-0.03	-0.10
11. Santa Clara14	-0.01	0.04	0	-0.01	0.02	0.08	-0.03	0.03	-0.06	0.02	0	0.01	0	0	0	0.61	-0.25	0.45
12. Santa Cruz	2.76	-0.60	-0.01	0	1.59	-3.89	-6.11	-3.43	-1.43	-1.64	-0.16	0	0	0	0	0	0	-12.92
13. Monterey	-0.73	1.05	0.91	0	-0.10	-0.13	-0.20	-0.07	-0.07	-0.03	-0.07	0	0	0	0	0	0	0.56
14. San Benito	0.09	1.21	0.43	0	0.48	1.54	0.38	1.76	0.10	0.83	1.33	0	0	0	0	0	0	8.17
15. Watsonville	37.60	2.52	1.35	0	13.77	38.98	16.20	40.83	9.87	19.58	14.13	0	0	0	0	0	0	194.81
16. Castroville	24.23	2.76	2.13	0	12.36	27.61	12.03	28.95	6.89	16.05	26.42	0	0	0	0	0	0	159.42
17. Salinas	19.04	3.52	3.07	0	13.63	33.43	15.21	30.54	7.67	19.51	27.17	0	0	0	0	0	0	172.77
<b>Total</b>	<b>93.06</b>	<b>22.81</b>	<b>8.76</b>	<b>0.39</b>	<b>46.08</b>	<b>104.12</b>	<b>40.91</b>	<b>103.60</b>	<b>26.51</b>	<b>57.01</b>	<b>70.44</b>	<b>-2.05</b>	<b>-0.03</b>	<b>-0.02</b>	<b>-0.06</b>	<b>1.05</b>	<b>-0.39</b>	<b>572.19</b>

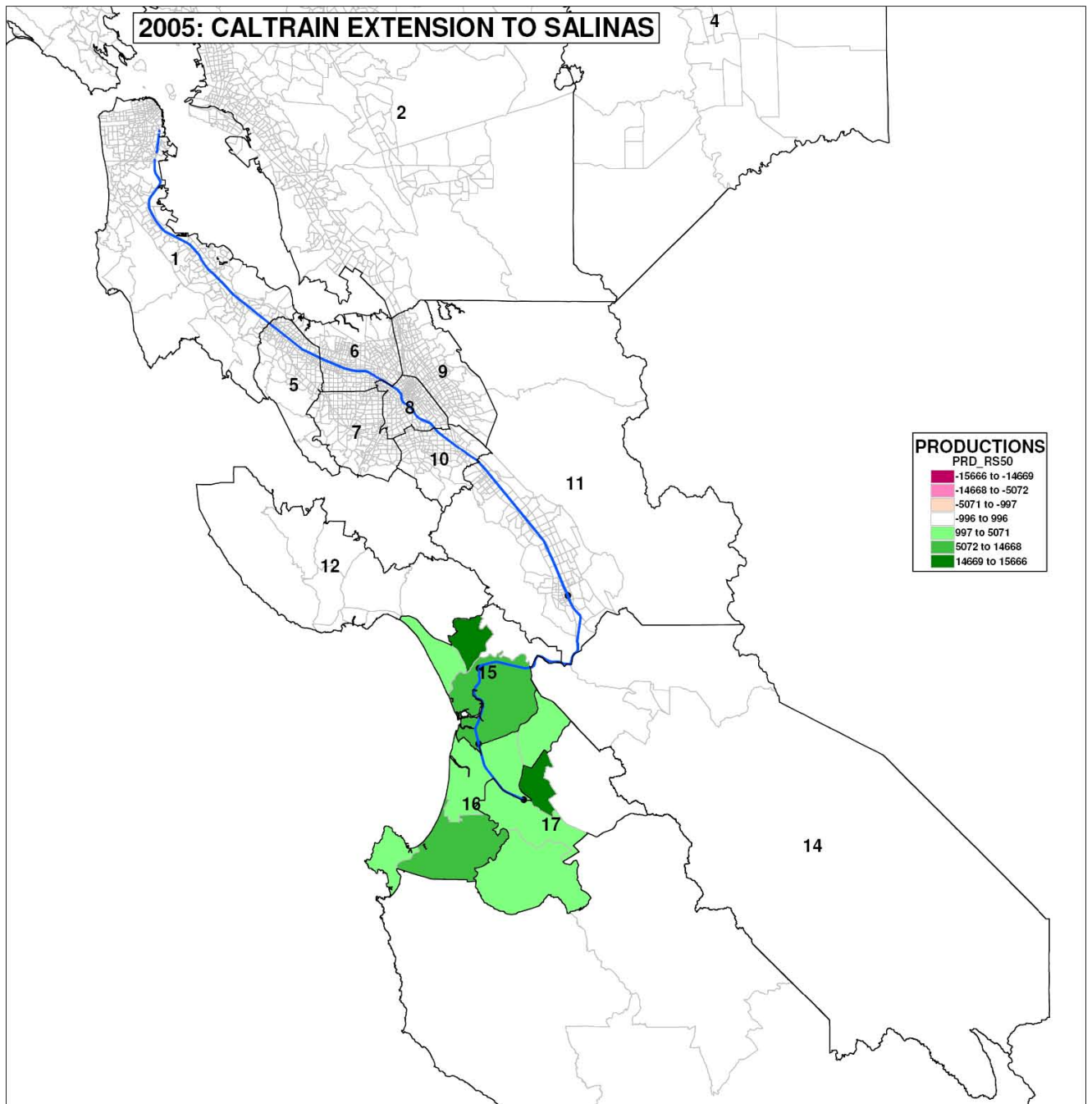
Source: SVRTC Mode Choice

Figure 1. Areas Defined by Each District

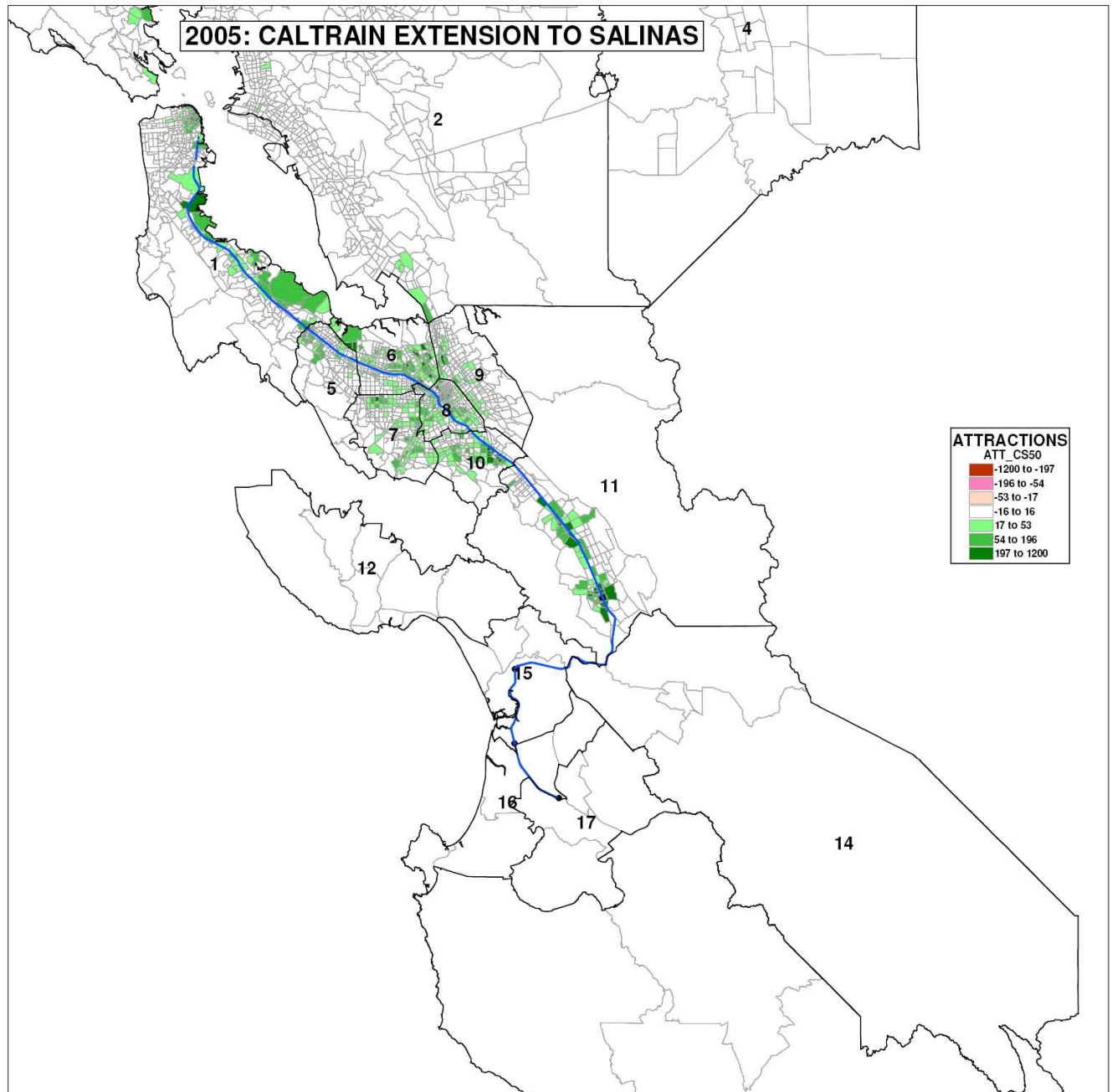




**Figure 2. Caltrain Extension (2005) versus No-Build Alternative Productions**



**Figure 3. Caltrain Extension (2005) versus No-Build Alternative Attractions**



**Figure 4. Enhanced Shuttle Bus Service to Gilroy Alternative versus No-Build Alternative  
Productions**

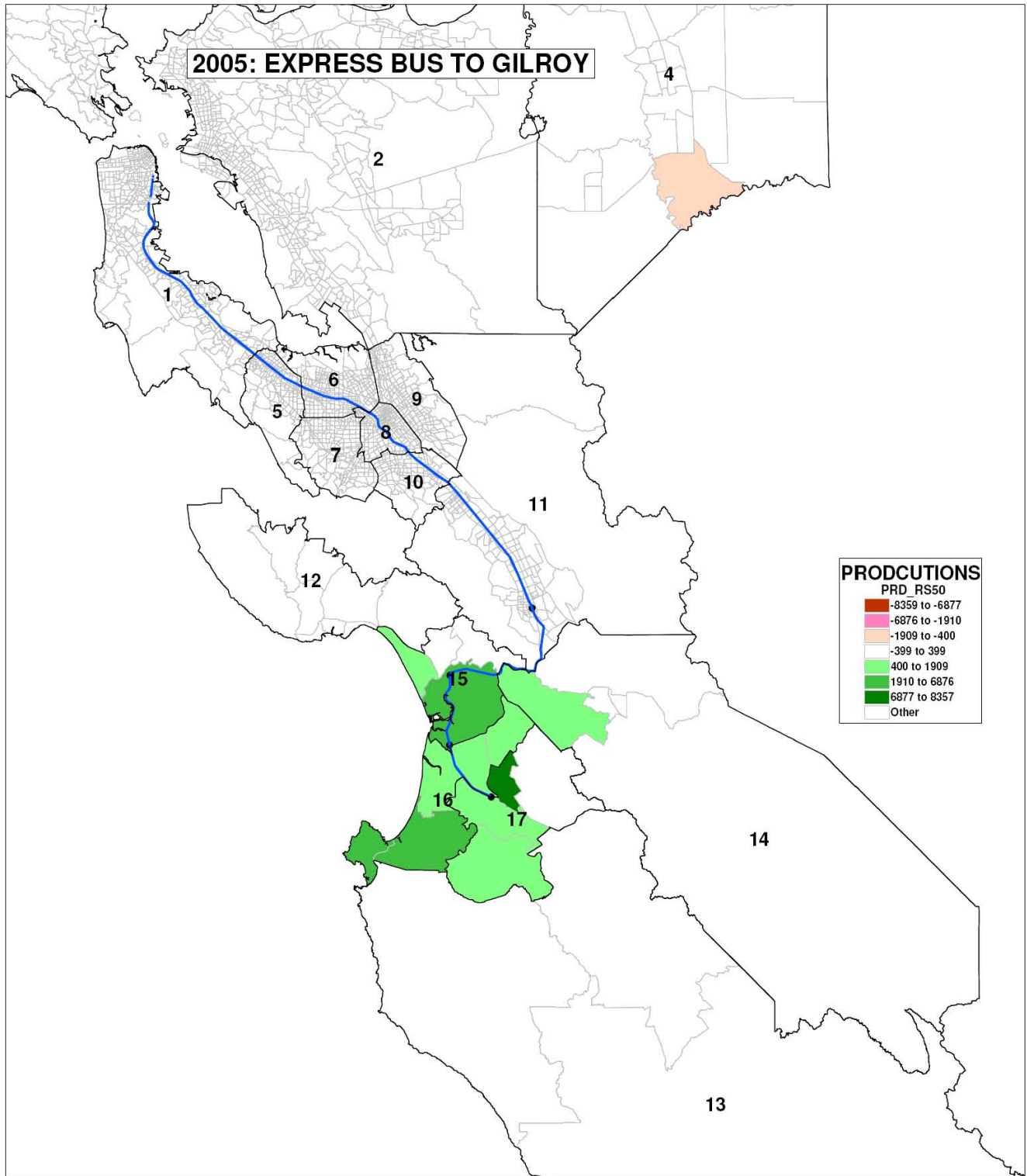


Figure 5. Enhanced Shuttle Bus Service versus No-Build Alternative Attractions

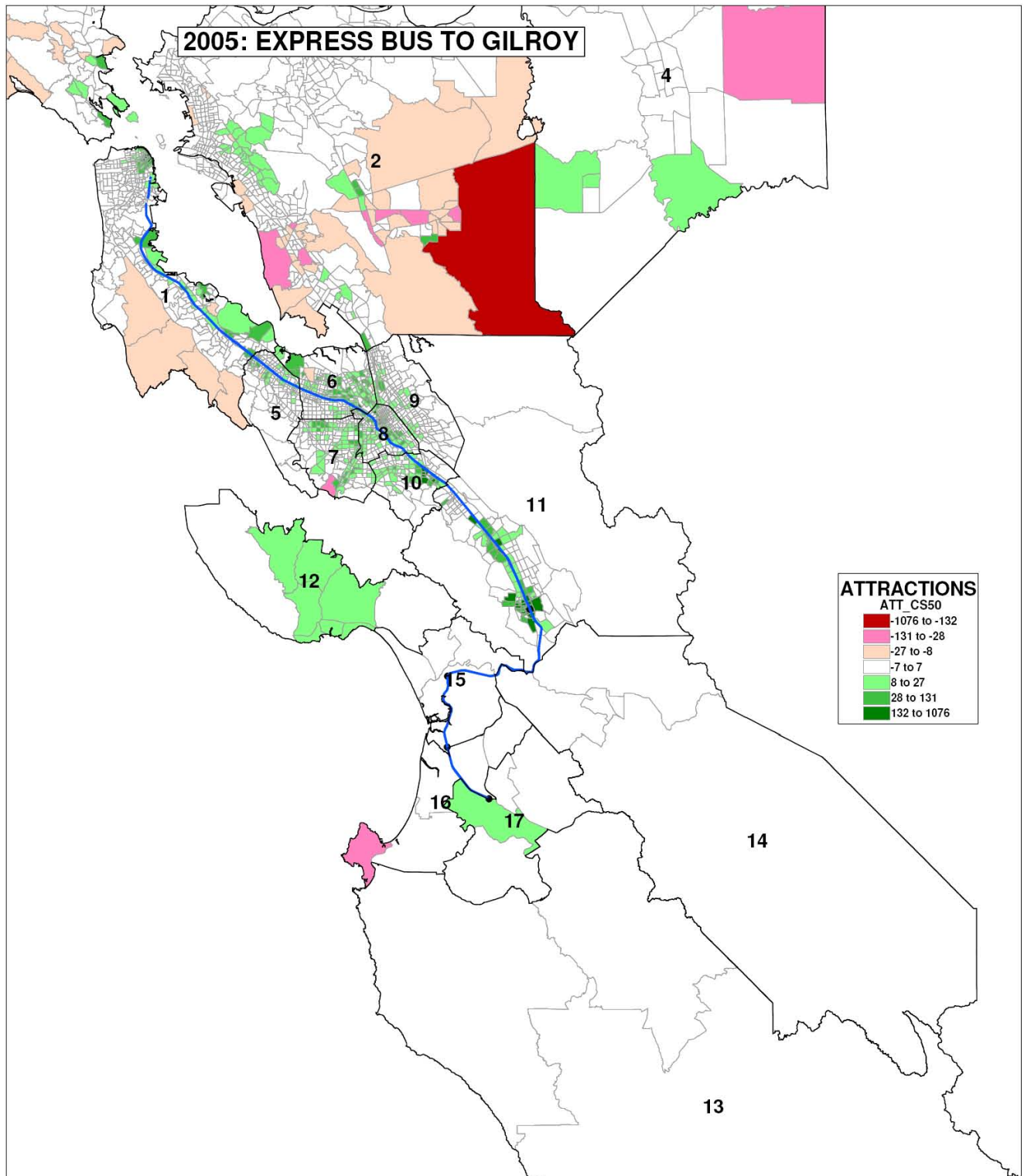
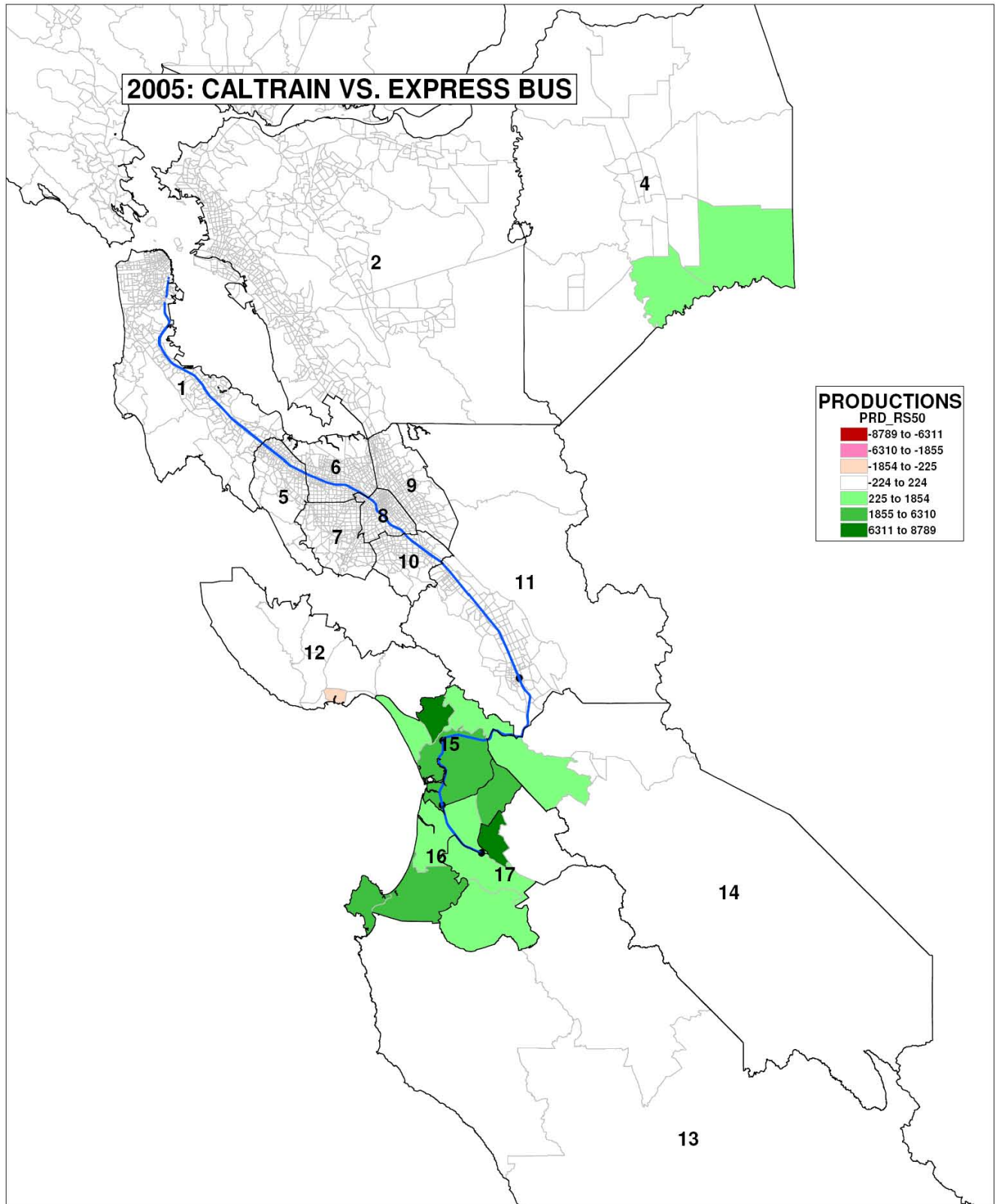


Figure 6. Caltrain Extension (2005) versus Enhanced Shuttle Bus Service Productions



**Figure 7. Caltrain Extension (2005) versus Enhanced Shuttle Bus Service Attractions**

