Appendix F

Valley Link Ridership Technical Memorandum – Revised

Memorandum

To:	**Ric Rattray, Program Manager**
Cc:	**Michael Tree, Executive Director**
Subject:	**Valley Link Ridership Technical Memorandum – Revised**
From:	**Ryan Park and Laura McWethy, AECOM**
Date:	**July 2, 2020**

Introduction

This technical memorandum summarizes recent ridership forecasts for Valley Link, a new transit service connecting the San Joaquin Valley communities of North Lathrop, River Islands, Tracy, and Mountain House with the City of Livermore and Dublin/Pleasanton BART Station. This memorandum describes the process of developing the ridership forecasts, including key assumptions and inputs such as demographic data and conceptual operating plans, and summarizes the modeling results for each of the analyzed alternatives.

Ridership Methodology

The ridership forecasts were developed using two tools: (1) the ACE Passenger Rail Forecasting Model ("ACE Model"), and (2) a version of the Alameda County Transportation Commission (ACTC) travel demand forecasting model ("ACTC Model").

ACE Model

AECOM developed and has used the ACE Model to forecast ridership for recent and ongoing plans and projects to implement service improvements to the Altamont Corridor Express (ACE) and San Joaquins services, including the ACE*forward* program and the ACE Sacramento Extension.

The ACE Model takes into account intercity and commuter passengers and is based on the Amtrak forecasting model developed by AECOM. The ACE Model was calibrated to match existing ACE ridership and updated to account for future short- and long-term investments in the passenger rail network in Northern California, including connections with statewide high-speed rail (HSR) and select connections with BART.

ACTC Model

The ACTC Model is the countywide transportation planning model for use within Alameda County. Like the other countywide models in use within the nine-county San Francisco Bay Area, the ACTC Model is consistent with the regional travel demand forecasting models maintained by the Metropolitan Transportation Commission (MTC), as well as the land use and socio-economic database maintained by the Association of Bay Area Governments (ABAG).

In support of the BART to Livermore Extension Draft Environmental Impact Report ("BLVX DEIR"), a modified version of the ACTC model was developed, with refinements to improve model validation for travel between the Tri-Valley and San Joaquin County and the rest of the San Francisco Bay Area. This version of the ACTC model was then used to forecast traffic volumes and transit ridership in the Tri-Valley area for the BLVX DEIR.

Joint ACTC–ACE Model

For Valley Link, AECOM developed a joint model based on the ACE Model and the "BLVX" version of the ACTC Model. Outputs from the ACE Model were combined with the ACTC Model to take advantage of the ACTC Model's network assignment procedures, enabling better reporting of transfers and other ridership statistics.

The first step in this process was to run the ACE Model to forecast ridership outside the geographic area of the ACTC Model. For this step, station-to-station trip tables were produced for the ACE network and the new Valley Link service.

Next, the base year ACTC Model was run, and the resulting station boardings were compared to boardings from the ACE Model. To facilitate this comparison, trips from the ACE Model were allocated to specific origins and destinations, approximated using a contiguous series of transportation analysis zones (TAZs) covering the geographic extent of the modeling effort. The results were then checked to avoid double-counting trips forecast in the ACTC Model, creating a combined set of transit trip tables to assign to the ACTC Model networks for generating ridership estimates for Valley Link.

Demographic Assumptions

The demographic assumptions for the ACE Model and ACTC Model are described below.

ACE Model

In addition to the rail service operating plan, demographic forecasts are one of the key inputs to the ACE Model. Demographic growth forecasts from Moody's Economy.com procured in 2013 were used in the ACE Model to generate trips on both ACE and Valley Link. These forecasts are based on detailed national and regional econometric modeling and provide corridor-wide consistency with respect to key measures of growth, including population, income, and employment. This dataset is a custom forecast of demographic data at the county level, and includes low, base, and high forecasts of total population, total non-farm employment, and total personal income.

The ACE Model, however, requires demographic data for each station. To translate county-level demographic data to smaller-scale station-level data, AECOM employed a custom geographic information system (GIS) application to calculate the population and employment contained within buffers around each station. Buffers ranging in radius from five to twenty miles around stations were used, and the weighted average population and employment for each buffer were inputted into the ACE Model.

The ACE Model was previously updated to reflect demographics from the ACTC Model in the first phase of the Valley Link feasibility study. For this phase, percentage changes in demographic data by jurisdiction from the base (2013) model to the updated (2018) model, for 2025 and 2040, were estimated. These jurisdictional-level percentage changes were applied to ACE Model base demographic data associated with each station, with consideration to the geographic location, catchment area, and other characteristics of each station.

ACTC Model

The BLVX version of the ACTC Model uses land use and socio-economic databases developed by ABAG and MTC as part of Plan Bay Area 2013, which is the regionally adopted long-range plan for the nine-county Bay Area. Therefore, employment data for all Bay Area counties was readily available from the Plan Bay Area databases. San Joaquin County, however, is outside the nine-county Bay Area, and is under the jurisdiction of the San Joaquin Council of Governments (SJCOG), a separate metropolitan planning organization (MPO) from the Bay Area's MTC. Therefore, the employment numbers for this county were obtained from the SJCOG's 2014 Regional Transportation Plan (RTP)[1].

As described in further detail later in this memorandum, ridership forecasts were developed for an approximate opening year (assumed to be 2025) and a future horizon year (2040). Demographics from the 2018 version of the ACTC Model, which contains data for 2020 and 2040, was utilized for this study, with the 2025 data derived by interpolating between the 2020 and 2040 data.

For TAZs within San Joaquin County (TAZs 2301–2326), demographic data published by San Joaquin County for 2024 and 2042 were interpolated to derive data for 2025 and 2040. An equivalency between San Joaquin County zones and the TAZ system in the ACTC Model was then established based on area, and the demographic data for the San Joaquin County zones in the ACTC Model was updated based on this equivalency.

[1] BART to Livermore Ridership Projections Report, February 2018

Scenarios and Forecasts

The scenarios and resulting forecasts are described below. Ridership impacts, including passenger revenue (order-of-magnitude estimate only), parking demand at stations, and reduction in vehicle miles traveled (VMT), are also presented.

The ridership modeling considers two future years: the approximate opening year (assumed to be 2025), and a long-term horizon year (2040), capturing future population and employment growth along the route in the next 15–20 years. Scenarios with and without the Valley Link project (i.e., "Build" and "No Build", respectively) were modeled to determine the incremental effects of the project.

No Build Scenario

For the 2025 No Build and 2040 No Build scenarios, the "No Build" versions of the BLVX ACTC Model, which do not include the previously proposed BART extension to Livermore (i.e., Isabel Avenue), were used for the ACTC portion of the joint ACTC–ACE model. No adjustments were made to the transit network assumptions in either the ACE Model or the ACTC Model.

Build Scenarios

Six different Build scenarios were modeled, covering the full project from Dublin/Pleasanton to North Lathrop as well as three initial operating segments (IOS) terminating at Southfront Road, Greenville Road, or Mountain House. The full route and IOS to Mountain House scenarios were modeled with a station in eastern Livermore at either Southfront Road or Greenville Road (but not both). An overview of the stations included in each scenario is found in **Table 1**.

Table 1: Scenario Station Locations

	Full Build – Greenville	Full Build – Southfront	IOS – Greenville	IOS – Southfront	IOS – Greenville + Mountain House	IOS – Southfront + Mountain House
Dublin/Pleasanton	x	x	x	x	x	x
Isabel Avenue	x	x	x	x	x	x
Greenville Road	x		x		x	
Southfront Road		x		x		x
Mountain House	x	x			x	x
Downtown Tracy	x	x				
River Islands	x	x				
North Lathrop	x	x				

The operating plans for the build scenarios are defined in **Table 2**. The 2025 scenarios (both full build and IOS options) assume that Valley Link would operate with an initial service window between 5:00 a.m. and 8:00 p.m. By 2040, it is assumed that there would be sufficient ridership growth to justify a longer service window that would more closely match BART's current service hours.

Table 2: Project Scenarios

Scenario	Hours of Service			Headways (minutes) Tri-Valley segment | full route						
				Weekdays						Weekends And Holidays
	Weekdays	Saturdays	Sundays and Holidays	Morning (start – 5 a.m.)	AM peak (5 a.m. – 8 a.m.)	Midday (8 a.m. – 4 p.m.)	PM peak (4 p.m. – 7 p.m.)	Evening (7 p.m. – 8 p.m.)	Late Evening (8 p.m. – 1 a.m.)	
2025 Build	5 a.m. – 8 p.m.	8 a.m. – 8 p.m.		—	12 | 24	36 | 72	12 | 24	24 | 48	—	36 | 72
2040 Build	4 a.m. – 1 a.m.	6 a.m. – 1 a.m.	8 a.m. – 1 a.m.	24 | 48	12 | 12	24 | 48	12 | 12	24 | 48	24 | 48	36 | 72

For each scenario, AECOM developed a conceptual weekday timetable and operating plan according to the service characteristics summarized in **Table 2**.

Ridership Forecasts

The ridership forecasts are summarized below using multiple metrics to describe the directionality of trips and station-level activity. **Total boardings** are the number of riders who get on trains at each station throughout the day, which is equivalent to the total one-way riders. The ridership at each station is also described with productions and attractions at each station, which indicates the directionality of the trips. **Productions** are the total number of trips that are produced at each station, or the home end of the trip. **Attractions** are the other end of the trip, and typically refers to the non-home end of the trip, such as work location. In this way, each round-trip is comprised of two productions at the home end of the trip and two attractions at the non-home end of the trip. Describing trips in this manner helps connect residential and employment areas, and allows for an accurate calculation of parking requirements, as parking is tied to the home end of the trip.

Table 3 summarizes the ridership results for Valley Link from the joint ACTC–ACE model forecasts with the total boardings for an average weekday for each scenario.

For the IOS terminating at Greenville, unconstrained ridership would require more parking than is practicable to provide at this station. The ridership of 8,372 average weekday total boardings reflects a parking constraint at Greenville, resulting in a reduction of approximately ten percent from the unconstrained result.

Table 3: Valley Link Average Weekday Performance

Scenario Year	Scenario	Average Weekday Total Boardings
2025	IOS – Greenville (constrained)	8,372
	IOS - Southfront	10,057
	IOS - Greenville + Mountain House	9,944
	IOS - Southfront + Mountain House	11,101
	Full Build - Greenville	12,704
	Full Build - Southfront	13,356
2040	Full Build - Greenville	31,710
	Full Build - Southfront	32,993

Table 4, **Table 5,** and **Table 6** summarize the total average weekday ridership for Valley Link, as well as by station, including productions (originating trips) and attractions (destined trips), for each of the scenarios and forecast years.

Table 4: Valley Link Average Weekday Ridership – 2025 IOS Runs (Detail)

Station	Average Weekday (2025 IOS Runs)											
	IOS – Greenville (constrained)			IOS - Southfront			IOS - Greenville + Mountain House			IOS - Southfront + Mountain House		
	Boardings	Productions	Attractions	Boardings	Productions	Attractions	Boardings	Productions	Attractions	Boardings	Productions	Attractions
Dublin/Pleasanton	4,100	155	8,045	4,931	242	9,619	4,795	224	9,365	5,413	327	10,498
Isabel Avenue	1,130	2,051	209	538	846	230	589	892	286	639	942	336
Southfront Road				4,588	8,967	209				1,493	2,719	267
Greenville Road	3,142	6,165	118				683	1,072	293			
Mountain House							3,878	7,755	0	3,557	7,113	0
Downtown Tracy												
River Islands												
North Lathrop												
Total	**8,372**	**8,371**	**8,372**	**10,057**	**10,055**	**10,058**	**9,944**	**9,943**	**9,944**	**11,101**	**11,101**	**11,101**

Table 5: Valley Link Average Weekday Ridership – 2025 Full Runs (Detail)

Station	Average Weekday (2025 Full Runs)					
	Greenville Build			Southfront Option		
	Boardings	Productions	Attractions	Boardings	Productions	Attractions
Dublin/Pleasanton	5,907	413	11,401	6,507	456	12,558
Isabel Avenue	816	1,178	454	832	1,186	478
Southfront Road				1,177	2,073	281
Greenville Road	1,030	1,248	811			
Mountain House	1,231	2,461	0	921	1,841	0
Downtown Tracy	1,107	2,213	0	1,067	2,134	0
River Islands	865	1,729	0	871	1,741	0
North Lathrop	1,750	3,459	41	1,982	3,924	40
Total	**12,704**	**12,701**	**12,707**	**13,356**	**13,355**	**13,357**

Table 6: Valley Link Average Weekday Ridership – 2040 Full Runs (Detail)

Station	Average Weekday (2040 Full Runs)					
	Greenville Build			Southfront Option		
	Boardings	Productions	Attractions	Boardings	Productions	Attractions
Dublin/Pleasanton	15,160	692	29,627	16,051	750	31,351
Isabel Avenue	3,532	6,064	1,000	3,561	6,015	1,106
Southfront Road				1,926	3,372	479
Greenville Road	1,814	2,601	1,027			
Mountain House	1,392	2,784	0	1,460	2,920	0
Downtown Tracy	3,006	6,011	0	3,095	6,190	0
River Islands	2,100	4,200	0	2,108	4,216	0
North Lathrop	4,707	9,359	54	4,793	9,530	56
Total	**31,710**	**31,711**	**31,708**	**32,993**	**32,993**	**32,992**

Parking Demand

An estimate of parking demand was prepared based on the daily direct boardings by station described above (subtracting out transfers from other services) and applying an anticipated drive mode share and average vehicle occupancy for Valley Link riders. Based on the 2014 ACE Ridership Survey, it was assumed that approximately 72 percent of Valley Link riders would drive to/from stations. However, in 2040, based on the Authority Transit Oriented Development (TOD) policy and existing TODs around the proposed Isabel, Downtown Tracy, and River Islands Station, the mode split is reduced to 50 percent. The parking demand estimates also assume that each parked car represents two trips on transit (outgoing and incoming).

A factor determined by the percentage of productions in the combined total of productions and attractions was also applied to determine the parking demand estimates. For Dublin/Pleasanton, this percentage ranges between two to four percent depending on the scenario, reflecting this station's role as a transfer location and trip attractor. Since relatively few round trips on Valley Link would originate at this station, demand is estimated at less than ten parking spaces in each of the scenarios modeled.

Table 7, **Table 8**, and **Table 9** summarize the estimated parking demand at each station, rounded up to the nearest multiple of ten.

Table 7: Valley Link Average Weekday Parking Demand Estimates by Station – 2025 IOS Runs

Station	Average Weekday Parking Demand (2025 IOS Runs)			
	IOS – Greenville (constrained)	IOS - Southfront	IOS - Greenville + Mountain House	IOS - Southfront + Mountain House
Dublin/Pleasanton	10	10	10	10
Isabel Avenue	700	270	290	310
Southfront Road		3,170		920
Greenville Road	1,900		130	
Mountain House			2,800	2,570
Downtown Tracy				
River Islands				
North Lathrop				

Table 8: Valley Link Average Weekday Parking Demand Estimates by Station – 2025 Full Runs

Station	Average Weekday Parking Demand (2025 Full Runs)	
	Greenville Build	Southfront Build
Dublin/Pleasanton	10	10
Isabel Avenue	370	380
Southfront Road		680
Greenville Road	250	
Mountain House	890	670
Downtown Tracy	800	770
River Islands	630	630
North Lathrop	1,050	1,160

Table 9: Valley Link Average Weekday Parking Demand Estimates by Station – 2040 Full Runs

Station	Average Weekday Parking Demand (2040 Full Runs)	
	Greenville Build	Southfront Build
Dublin/Pleasanton	10	10
Isabel Avenue*	1,520	1,450
Southfront Road		1,070
Greenville Road	610	
Mountain House	1,010	1,060
Downtown Tracy*	1,510	1,550
River Islands*	1,050	1,060
North Lathrop	3,100	3,080

*Mode split changes to 50%

VMT Reduction

The proposed Valley Link service would provide an alternative to automobile travel within the Altamont Pass corridor linking the Tri-Valley and San Joaquin Valley. Although ACE currently provides commuter rail service within this corridor, Valley Link would substantially improve transit options in the corridor by providing a direct connection with BART, securing access to/from many key destinations throughout the Bay Area. An estimate of VMT can be derived from the ridership forecasts presented above, and then a net effect can be calculated by comparing the No Build and Build scenarios.

Table 10 summarizes the estimated reduction in automobile VMT for an average weekday in 2025 and 2040. The reported VMT reduction represents the net effect of changes in transit due to Valley Link, ACE, and BART.

Table 10: Average Weekday VMT Reduction

Scenario Year	Scenario	Average Weekday VMT		Average Weekday VMT Reduction
		No Build	Build	
2025	IOS – Greenville (constrained)	176,750,000	176,682,000	68,800
	IOS - Southfront	176,750,000	176,670,000	79,900
	IOS - Greenville + Mountain House	176,750,000	176,666,000	85,100
	IOS - Southfront + Mountain House	176,750,000	176,660,000	90,300
	Full Build - Greenville	176,750,000	176,548,000	202,300
	Full Build - Southfront	176,750,000	176,544,000	206,100
2040	Full Build - Greenville	198,537,000	197,981,000	556,500
	Full Build - Southfront	198,537,000	197,959,000	578,500