

West Contra Costa High-Capacity Transit Study
PRELIMINARY DRAFT TECHNICAL MEMORANDUM #12
Ridership Estimates



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With
Kittelson Associates

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Acronyms and Abbreviations

AC Transit	Alameda-Contra Costa Transit District
BART	San Francisco Bay Area Rapid Transit District
BRT	bus rapid transit
CCTA	Contra Costa Transportation Authority
HCT	high-capacity transit
I-80	Interstate 80
MTC	Metropolitan Transportation Commission
RPTC	Richmond Parkway Transit Center
UPRR	Union Pacific Railroad
WCCTAC	West Contra Costa Transportation Advisory Committee
WestCAT	Western Contra Costa Transit Authority Transit Service

EXECUTIVE SUMMARY

In an effort to reduce congestion and plan for future growth, the Western Contra Costa High-Capacity Transit (HCT) Study is evaluating options for major transit investments along I-80 corridor. The Study is focused on rapid and direct services that can attract new riders among the 250,000 residents and provide a viable and competitive alternative to driving. The ultimate goal of the Study is to identify, evaluate and refine projects to improve high-capacity transit in West County, expand alternatives to driving on congested streets and highways, and improve regional air quality and quality of life.

Central to the study purpose is providing WCCTAC with the analyses necessary to determine and advance the most promising HCT alternative(s). Eight initial alternatives for enhanced public transportation in West County were identified, including express bus, bus rapid transit (BRT), commuter rail, and BART options. These alternatives were structured to serve the key travel markets in West County and underwent an initial evaluation using screening criteria developed from the Study goals and objectives. The WCCTAC Board advanced five of the eight conceptual alternatives for further study based on feedback from the Study Management Group (SMG), WCCTAC Technical Advisory Committee (TAC), and community feedback.

This Technical Memorandum #12 presents travel forecasts and transit ridership forecasts for the five alternatives advanced for further study in the West Contra Costa High-Capacity Transit Study. The transit improvements were evaluated as part of five packages that were crafted to determine how the proposed improvements performed as part of an overall enhanced transit network in West County. The assumptions for the five packages are summarized below.

2020 Packages

- Package A: Express Bus + San Pablo Bus Rapid Transit (BRT)
- Package B: Express Bus + 23rd Street BRT

2040 Packages

- Package C: Express Bus + San Pablo BRT + 23rd Street BRT + BART Rumrill Boulevard alignment
- Package D: Express Bus + San Pablo BRT + 23rd Street BRT + BART Richmond Parkway alignment
- Package E: Express Bus + San Pablo BRT + 23rd Street BRT

Methodology

Travel forecasts were prepared for the 2020 and 2040 study years using the Contra Costa County regional travel model. The travel model includes estimates of travel between origins and destinations throughout the nine-county Bay Area, for all trip purposes and travel modes.

The demographic forecasts and transportation improvement assumptions are consistent with the Metropolitan Transportation Commission (MTC) Plan Bay Area regional transportation plan.

2020 Forecasts

Package A which includes the San Pablo/Macdonald Avenue BRT would increase 2020 transit ridership by about 28 percent compared to the 2020 No Build scenario. The San Pablo BRT is projected to carry nearly 30,000 daily passengers. The ridership increases associated with Package B would be smaller, about 8 percent, with the 23rd Street BRT carrying about 4,000 daily passengers.

2040 Forecasts

Each of the three improvement packages would significantly increase 2040 transit ridership compared to the No Build scenario. Packages C and D with BART extensions would result in about a 40 percent increase in 2040 West County transit ridership compared to No Build conditions. Package E with bus improvements and without a BART extension would result in a 30 percent increase in transit ridership.

With this unconstrained demand forecast, the BART extensions are projected to attract 6,000 to 6,400 new BART passengers compared to the 2040 No Build scenario. The increases could be greater if potential constraints on station parking and system capacity are included in the No Build analysis, reducing the No Build ridership forecast.

1 INTRODUCTION

1.1 Purpose of the Study

West Contra Costa County is a sub-region within the Bay Area set between the San Francisco Bay and the East Bay hills. The West Contra Costa Transportation Advisory Committee (WCCTAC) is responsible for transportation planning for the sub-region and is one of four regional transportation planning committees in Contra Costa County

WCCTAC is conducting the West Contra Costa High-Capacity Transit Study to review multimodal high-capacity transit options for reducing congestion and to plan for future growth, with consideration of costs and funding opportunities. High-capacity transit (HCT) provides substantially higher levels of passenger capacity with typically fewer stops, higher speeds, and more-frequent service than community-based or local public bus services.

The purpose of this study is to identify and evaluate the feasibility and effectiveness of HCT options in West County for WCCTAC's consideration. Central to the study purpose is providing WCCTAC with the analyses necessary to determine and advance the most promising HCT alternative(s).

Why do we need this study?

Interstate 80 is one of the most congested corridors in the Bay Area, and the Richmond BART line often reaches full capacity during commute hours.

Since its inception in 1988, WCCTAC's policy goals have called for facilitating the use of transit, encouraging transit projects aimed at congestion relief, and participating in studies focused on transit capital investments. West County action plans since that time have included consideration and prioritization of transit improvements such as express bus expansion, ferry implementation, a BART extension, and other types of rail improvements. For example, the most recent 2014 Action Plan called for participation in a study of HCT options in the I-80 corridor.¹

The investment strategy outlined by this study will position WCCTAC to be competitive for transportation funds within the county and to leverage outside funding sources. The transit capital investments will also benefit a wide range of people and trip types in West County.

1.2 Study Area

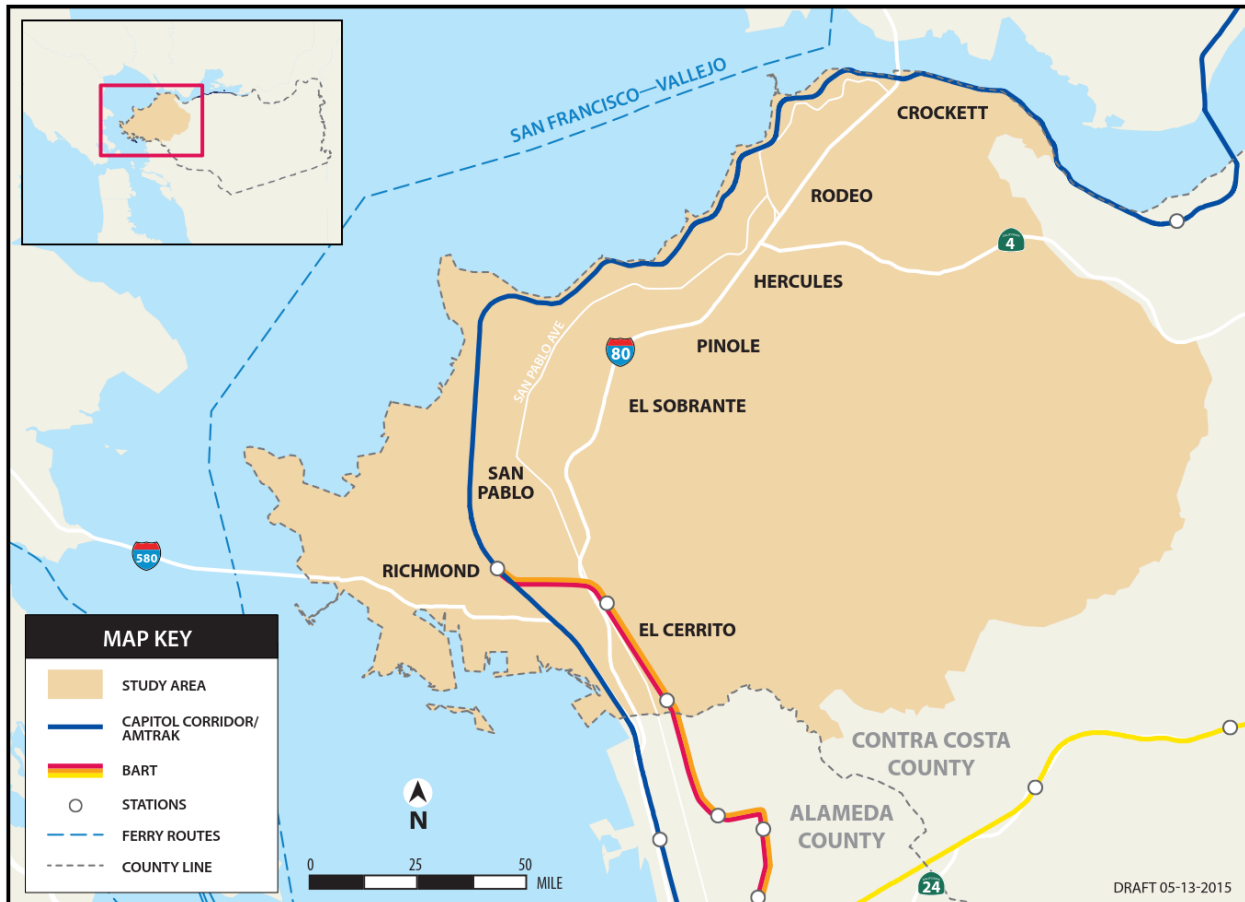
The study area encompasses West Contra Costa County (West County) from the southern boundary at the Alameda County line north to the Carquinez Bridge and Solano County line.

¹ Item #46 of the 2014 West County Action Plan.

The study area essentially encompasses the Metropolitan Transportation Commission’s (MTC) Superdistrict 20, which includes the cities of El Cerrito, Hercules, Pinole, Richmond, and San Pablo and the unincorporated communities of Crockett, El Sobrante, and Rodeo.

Figure 1-1 displays a map of the core Study Area, which includes Interstate 80 (I-80), Interstate 580 (I-580), and State Route (SR-4), as well as major surface streets, including San Pablo Avenue and Richmond Parkway.

Figure 1-1: Study Area



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

1.3 Purpose of this Technical Memorandum

Technical Memorandum #12, Ridership Estimates, provides projected weekday ridership on existing and proposed transit services for the 2020 and 2040 horizon years. It also provides forecasts of changes in auto traffic, and overall system performance measures for the West County sub-region.

The transit improvements were evaluated as part of five packages that were crafted to determine how the proposed improvements performed as part of an overall enhanced transit network in West County as well as individually. The assumptions for the five packages are summarized below.

2020 Packages

- Package A: Express Bus + San Pablo BRT
- Package B: Express Bus + 23rd Street BRT

2040 Packages

- Package C: Express Bus + San Pablo BRT + 23rd Street BRT + BART Rumrill Blvd alignment
- Package D: Express Bus + San Pablo BRT + 23rd Street BRT + BART Richmond Parkway alignment
- Package E: Express Bus + San Pablo BRT + 23rd Street BRT

The memorandum includes a discussion of the ridership methodology (Section 2) and a description of the ridership estimates and travel characteristics for each of the future analysis years, 2020 (Section 3) and 2040 (Section 4).

2 RIDERSHIP METHODOLOGY

This section includes a brief description of the primary tool used for ridership estimates, the Contra Costa County Travel Model, as well as the background assumptions, and the adjustments applied to ensure a reasonable comparison between alternatives.

2.1 Travel Model

The primary tool used for the ridership estimates was the Contra Costa County Travel Model (Contra Costa model). The model is a standard trip-based regional travel forecast model developed and maintained by the Contra Costa Transportation Authority (CCTA).

The Contra Costa model was based on the regional BAYCAST travel model that was developed and operated by the Metropolitan Transportation Commission (MTC). The MTC model has since been updated to a newer system (Model One), but the Contra Costa model has been updated to use similar assumptions as MTC Model One to maintain some level of consistency.

2.1.1 Model Study Area

The Contra Costa model includes all of the nine Bay Area counties, similar to the MTC travel models. Within Contra Costa County, the Contra Costa model has a more detailed representation of land uses and the transportation network than the MTC model.

Travel to and from areas outside the nine-county Bay Area is represented as “gateway” vehicle trips. The growth in gateway vehicle trips is forecast based on historical growth rather than specific demographic assumptions. The model does not explicitly represent non-auto trips outside the Bay Area (such as Capitol Corridor trips to and from Sacramento).

2.1.2 Model Inputs

Inputs to the travel model include descriptions of demographic characteristics that define demand for transportation, and representations of the transportation network that represents supply.

2.1.3 Model Outputs

The outputs from the model include:

- Trip Tables – matrices of trips from each origin to each destination by trip purpose, travel mode and/or time period
- Vehicle Volumes – Maps or listings of the road network with projected traffic volumes on each segment, by time period

- Transit Volumes – Listings of volumes on individual transit routes, by segment, as well as estimated activity at each transit stop.

2.1.4 Model Process

The Contra Costa model follows a standard “four step” process used by many regional travel forecast models:

1. Trip Generation
2. Trip Distribution
3. Mode Choice
4. Trip Assignment

2.2 Forecast Assumptions

The key assumptions for the ridership estimates include demographic forecasts and transportation improvements.

2.2.1 Demographic Forecasts

The forecasts of population and employment are consistent with the projections from the Association of Bay Area Governments (ABAG) used for the current MTC Regional Transportation Plan (RTP) known as Plan Bay Area. Within Contra Costa County, the Plan Bay Area land use forecasts were further disaggregated based on information from local jurisdictions on zoning and planned development.

2.2.2 Transportation Improvements

The transportation improvements assumed for forecasts are consistent with those used for MTC Plan Bay Area.

2.3 Travel Model Adjustments

Several adjustments were applied to the travel model to provide more representative forecasts of travel patterns and transit ridership.

2.3.1 Origin-Destination Adjustments based on Big Data

The choices of travel destinations in the travel model are primarily based on measures of auto accessibility, rather than transit accessibility. As a result, the model could potentially underestimate the attractiveness of transit-friendly destinations.

As an early step in the modeling process, “big data” was used to validate the model assumptions on trip origins and destinations. The dataset was purchased from AirSage. AirSage compiles data using anonymous signals from mobile sources including cell phones and GPS

units, and provides estimates of weekday travel patterns between selected origins and destinations. The data is described in more detail in Technical Memorandum 7: Travel Markets.²

The adjustments were applied within the modeling process by factoring the model's estimates of destination choices to more closely resemble the patterns from the AirSage data. The factors were calculated for the model base year (2013), and then the same adjustment factors were applied to 2040. In other words, if the model was underestimating the percentage of work trips from Pinole to San Francisco by a factor of 2 in the base year, the model's standard estimates of future work trips between Pinole and San Francisco would be increased by a factor of two.

The AirSage adjustments were only applied to work trips, and only to trips to and from or through the West Contra Costa County study area.

² *West Contra Costa High-Capacity Transit Study, Technical Memorandum #7, Travel Markets*, January 2016, WCCTAC, prepared by WSP/Parsons Brinckerhoff, Kimley-Horn, and Kittelson & Associates.

3 2020 TRAVEL FORECASTS

Travel forecasts and transit ridership estimates for the 2020 forecast year are provided for three scenarios:

- No Build
- Package A: Express Bus + San Pablo BRT
- Package B: Express Bus + 23rd Street BRT

The results are presented in terms of transit ridership, mode choice, and road system performance measures including volumes, speeds, vehicle-miles of travel (VMT) and vehicle-hours of travel (VHT).

3.1 Transit Ridership

3.1.1 BART Boardings

Average weekday boardings for the three BART stations in West Contra Costa County are summarized in Table 3-1. The growth in the region with no transit improvements (No Build) would cause BART ridership to increase by 20 percent between 2015 and 2020. With Package A, the San Pablo BRT would result in a slight increase in BART ridership compared to No Build, most likely due to some increased accessibility to BART stations. Package B 23rd Street BRT is estimated to result in a slight decrease in BART boardings, most likely due to improved bus service which attracts a small component of local BART passengers.

Table 3-1: 2020 BART Weekday Ridership

Station	2015 Observed	2020 No Build	2020 Package A	2020 Package B
El Cerrito Plaza	4,810	5,890	6,670	5,710
El Cerrito del Norte	8,560	10,160	10,460	9,700
Richmond	4,270	5,050	4,850	5,470
Total	17,640	21,100	21,980	20,880

3.1.2 AC Transit Boardings

Average weekday boardings for the AC Transit Transbay lines serving West Contra Costa County are summarized in Table 3-2. The growth in the region with no transit improvements (No Build) would cause Transbay ridership to increase by 13 percent between 2014 and 2020. Both packages A and B would result in a significant increase in ridership on the L lines, as both packages include an improvement in headways from 20 to 10 minute frequencies. In total, Package A would result in a 30 percent increase in Transbay ridership compared to No Build,

while Package B would result in a 47 percent increase. This significant increase in use of the AC Transit Transbay service would most likely explain the slight decrease forecast in BART ridership with Package B.

Table 3-2: 2020 AC Transit Transbay Weekday Ridership

Line	2014 Observed	2020 No Build	2020 Package A	2020 Package B
G	360	410	370	410
H	600	680	670	610
L	1,200	1,350	2,120	2,570
Total	2,160	2,440	3,160	3,590

Average weekday boardings for the AC Transit local lines serving West Contra Costa County are summarized in Table 3-3. The growth in the region with no transit improvements (No Build) would cause local ridership to increase by 15 percent between 2014 and 2020.

Table 3-3: 2020 AC Transit Local Weekday Ridership

Line	2014 Observed	2020 No Build	2020 Package A	2020 Package B
7	730	820	640	810
25	840	980	860	960
70	1,190	1,330	1,410	1,810
71	1,750	1,880	1,690	1,620
72 (M,R)	14,790	17,120	-	16,010
72 (BRT)	-	-	29,910	-
74	1,370	1,660	1,590	590
76	2,610	2,880	3,000	2,550
23 rd BRT	-	-	-	4,110
Express Berkeley	-	-	430	470
Express Emeryville	-	-	190	150
Express Oakland	-	-	500	610
Total	23,280	26,670	40,220	29,690

With Package A, the Line 72 San Pablo Avenue/Macdonald Avenue BRT would significantly increase ridership compared to the current Line 72/M/R services it would replace, resulting in a 75 percent increase in ridership on the corridor and an overall increase of 51 percent in AC Transit local ridership.

The 23rd Street BRT included in Package B would attract over 4,000 daily riders, and would result in an 11 percent increase in AC Transit local ridership.

The three proposed express bus services to employment centers in Berkeley, Emeryville and Oakland are projected to attract ridership similar to the daily ridership on several of the current AC Transit Transbay lines.

3.1.3 WestCAT Boardings

Average weekday boardings for the Western Contra Costa Transit Authority service (WestCAT) are summarized in Table 3-1. The growth in the region with no transit improvements (No Build) would cause WestCAT ridership to increase by 14 percent between 2015 and 2020. Both Package A and Package B would include service frequency improvements on the Express and LYNX services, causing a 13 percent increase in daily ridership compared to the 2020 No Build scenario.

Table 3-4: 2020 WestCAT Weekday Ridership

Service	2015 Observed	2020 No Build	2020 Package A	2020 Package B
Local & Regional	1,600	1,820	1,920	1,940
Express (J,JX,JPX)	2,400	2,640	3,130	3,130
LYNX	1,000	1,220	1,370	1,350
Total	5,000	5,680	6,420	6,420

3.1.4 Total Transit Boardings

The total transit ridership for all services in West Contra Costa County is summarized in Table 3-5. The No Build growth in transit ridership would be 16 percent between 2015 and 2020, or about 3.3 percent per year. Package A would significantly increase 2020 transit ridership by about 28 percent compared to No Build, due to service frequency improvements and high projected ridership on the San Pablo BRT corridor. Package B would result in an 8 percent increase in 2020 ridership compared to No Build conditions.

Table 3-5: 2020 West Contra Costa County Weekday Transit Ridership

Service	2014/2015 Observed	2020 No Build	2020 Package A	2020 Package B
BART	17,640	21,100	21,980	20,880
AC Transbay	2,160	2,440	3,160	3,590
AC Local	23,280	26,670	40,220	29,690
WestCAT	5,000	5,680	6,420	6,420
Total	48,080	55,890	71,780	60,580

4 2040 TRAVEL FORECASTS

Travel forecasts and transit ridership estimates for the 2040 forecast year are provided for four scenarios:

- No Build
- Package C: Express Bus + San Pablo BRT + 23rd Street BRT + BART Rumrill Blvd alignment
- Package D: Express Bus + San Pablo BRT + 23rd Street BRT + BART Richmond Parkway alignment
- Package E: Express Bus + San Pablo BRT + 23rd Street BRT

The results are presented in terms of transit ridership, mode choice, and road system performance measures including volumes, speeds, vehicle-miles of travel (VMT) and vehicle-hours of travel (VHT).

4.1 Transit Ridership

4.1.1 BART Boardings

Average weekday boardings for the three existing BART stations and proposed extension stations in West Contra Costa County are summarized in Table 4-1. Projected regional growth to 2040 with no West County transit improvements (No Build) would cause BART ridership to increase by 48 percent between 2015 and 2040, about 1.9 percent per year.

Table 4-1: 2040 BART Weekday Ridership

Station	2015 Observed	2040 No Build	2040 Package C	2040 Package D	2040 Package E
El Cerrito Plaza	4,810	7,130	8,060	8,170	8,050
El Cerrito del Norte	8,560	12,490	4,580	4,640	12,340
Richmond	4,270	6,540	5,380	6,780	6,830
Contra Costa College	-	-	4,540	-	-
Hilltop Mall	-	-	-	2,390	-
Richmond Parkway Transit Center	-	-	2,880	-	-
Appian Way	-	-	-	3,650	-
Hercules Transit Center	-	-	7,090	6,540	-
Total	17,640	26,160	32,530	32,170	27,220

Package C which includes a BART extension on the Rumrill Boulevard alignment would increase West County ridership by about 6,400 daily passengers, or about a 24 percent increase

compared to the 2040 No Build. The ridership demand at El Cerrito del Norte would significantly decrease, as the Hercules Transit Center would become the end of the line station capturing most of the park-and-ride passengers from the north (Solano County) and east (Martinez). The Contra Costa College station would also appear to divert some demand from the Richmond station.

Package D with the Richmond Parkway alignment BART extension would have similar overall BART ridership as Package C, with similar effects on demand at El Cerrito del Norte. Compared to the Rumrill Boulevard alignment, not as many passengers would be diverted from the Richmond station, and the Appian Way station would attract more of the demand at the north end of the extension compared to the Richmond Parkway Transit Center station location.

4.1.1.1 Limitations of BART Forecast

It must be noted that these BART ridership forecasts reflect demand based on travel time and accessibility, but do not reflect the following constraints:

- Capacity of the BART system to add the extension service
- Parking capacity for auto access at each station
- Load capacity of the BART trains allowing passengers to board

It can often be assumed that parking areas and feeder bus services at new BART extensions can be designed to accommodate the projected demand. However, in the No Build scenario, there is no guarantee that stations such as El Cerrito del Norte and Richmond could actually accommodate the projected increases in passenger demand and therefore parking demand. An analysis that includes parking constraints could result in a lower forecast for the No Build scenario, and therefore a larger increment of additional passengers for the BART extension alternatives.

4.1.2 AC Transit Boardings

Average weekday boardings for the AC Transit Transbay lines serving West Contra Costa County are summarized in Table 4-2. Regional growth to 2040 with no transit improvements (No Build) would cause Transbay ridership to increase by 39 percent between 2014 and 2040, about 1.6 percent per year. Each of the transit improvement packages are expected to further increase Transbay ridership, including Packages C and D which include BART extensions, primarily due to service frequency improvements on the L line assumed in all three packages.

Table 4-2: 2040 AC Transit Transbay Weekday Ridership

Line	2014 Observed	2040 No Build	2040 Package C	2040 Package D	2040 Package E
G	360	540	490	500	490
H	600	820	800	780	800
L	1,200	1,650	2,090	2,490	2,490
Total	2,160	3,010	3,380	3,770	3,780

Average weekday boardings for the AC Transit local lines serving West Contra Costa County are summarized in Table 3-3. The growth in the region with no transit improvements (No Build) would cause local ridership to increase by 56 percent between 2014 and 2040, or about 2.2 percent per year.

The Line 72 San Pablo BRT is expected to attract significant increases in ridership compared to the current Line 72 services under all three packages.

Table 3-3: 2040 AC Transit Local Weekday Ridership

Line	2014 Observed	2040 No Build	2040 Package C	2040 Package D	2040 Package E
7	730	1,050	830	830	840
25	840	1,350	1,100	1,120	1,110
70	1,190	1,700	2,170	2,830	2,230
71	1,750	2,530	2,120	2,090	2,080
72 (M,R)	14,790	23,540	-	-	-
72 (BRT)	-	-	40,760	39,420	38,820
74	1,370	2,190	920	640	770
76	2,610	4,010	3,850	3,520	3,470
23 rd BRT	-	-	5,340	5,340	5,250
Express Berkeley	-	-	630	630	810
Express Emeryville	-	-	300	290	440
Express Oakland	-	-	650	640	810
Total	23,280	36,370	58,670	57,350	56,630

4.1.3 WestCAT Boardings

Average weekday boardings for the Western Contra Costa Transit Authority service (WestCAT) are summarized in Table 4-4. Regional growth to 2040 with no transit improvements (No Build) would cause WestCAT ridership to increase by 48 percent between 2015 and 2040, about 1.9 percent per year.

Table 4-4: 2040 WestCAT Weekday Ridership

Service	2015 Observed	2040 No Build	2040 Package C	2040 Package D	2040 Package E
Local & Regional	1,600	2,290	2,490	3,280	2,010
Express (J,JX,JPX)	2,400	3,420	2,480	3,610	3,360
LYNX	1,000	1,700	1,680	1,590	1,960
Total	5,000	7,410	6,650	8,480	7,330

Each of the 2040 packages would have a different impact on WestCAT ridership. Package C with the Rumrill BART alignment would reduce demand for the WestCAT express bus services, resulting in a net decrease in system ridership. Package D with the Richmond Parkway BART alignment is not projected to reduce demand on the express services, and would result in increased demand on local routes. Package D with BRT improvements and no BART extension would have WestCAT ridership very similar to the No Build scenario.

4.1.4 Total Transit Boardings

The total 2040 transit ridership for all services in West Contra Costa County is summarized in Table 4-5. The No Build growth in transit ridership would be 52 percent between 2015 and 2040, or about 2.1 percent per year.

Table 4-5: 2040 West Contra Costa County Weekday Transit Ridership

Service	2014/2015 Observed	2040 No Build	2040 Package C	2040 Package D	2040 Package E
BART	17,640	26,160	32,530	32,170	27,220
AC Transbay	2,160	3,010	3,380	3,770	3,780
AC Local	23,280	36,370	58,670	57,350	56,630
WestCAT	5,000	7,410	6,650	8,480	7,330
Total	48,080	72,950	101,230	101,770	94,960

Each of the three improvement packages would significantly increase 2040 transit ridership compared to the No Build scenario. Packages C and D with BART extensions would result in about a 40 percent increase in 2040 West County transit ridership compared to No Build conditions. Package E with bus improvements and without a BART extension would result in a 30 percent increase in transit ridership.