City of Alameda

Regional Transit Access Study

Draft Report June 2013

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1. INTRODUCTION

PURPOSE

In anticipation of the redevelopment of Alameda Point (the former Alameda Naval Air Station) and the current development at Alameda Landing, the purpose of this report is to compare transit corridor options and select a preferred option as part of the Alameda *Regional Transit Access Study* (RTAS).

This report is divided into the following chapters:

- **Chapter 1: Introduction** describes the report purpose, study background, proposed transit service types and examples, and study corridors.
- **Chapter 2: Existing Transit Service & Ridership** describes existing levels of transit demand, service and ridership in Alameda.
- **Chapter 3: Future Transit Ridership** summarizes forecasted levels of ridership based on future growth under the Alameda *General Plan*.
- **Chapter 4: Corridor Comparison** describes preliminary design options for potential physical improvements on each study corridor and provides a comparison of the study corridor options.
- **Chapter 5: Recommended Improvements** describes the recommended alternative, for consideration by the City, based on the corridor comparison.
- **Chapter 6: Implementation & Phasing** identifies a potential strategy and timeline for implementation of the desired service and recommended improvements.

STUDY BACKGROUND

The RTAS was undertaken to identify and evaluate proposed physical improvements and a transit operations plan to provide enhanced transit service that connects the island of Alameda with the regional transit facilities that converge in Oakland.

Reliable and efficient transit service that connects to the regional transit system is critical for Alameda Point and the greater west end of the City. Previous studies and analyses have shown that access to and from the Webster and Posey Tubes will be at capacity and subjection to unacceptable levels of traffic congestion in the future and will shift traffic to other crossings (Park Street, Miller Sweeney Bridge, and High Street) along the Oakland Estuary. The RTAS was initiated to address the access needs of Alameda Point and the West End through a fast and reliable Bus Rapid Transit (BRT) or rapid bus system, as well as the potential shift of traffic towards other crossings.

To address this concern the RTAS includes an evaluation of potential BRT or Rapid Bus alignment options to attract additional transit demand along the northern parts of the City and to evaluate service options to serve Alameda Point and the West End.

The RTAS was undertaken as part of a Federal Transportation Administration (FTA) grant to study and implement improved regional transit access to/from the City of Alameda. To maximize the effectiveness of the proposed transit services, this study links the existing employment and commercial centers, and the existing regional transit centers, with several planned mixed-use Transit Oriented Developments (TODs) in the cities of Alameda and Oakland.

The following analysis was performed to identify and refine the proposed transit corridors and service options:

- Description of current transit service and ridership.
- Identification of study corridor options.
- Assessment of existing and future transit demand generated by Alameda residents and non-residential land uses, including a description of current transit service and ridership.
- Discuss examples of transit case studies relevant to the service characteristics and potential ridership levels on the proposed study corridors for context.
- Assessment of the ability of each study corridor to accommodate BRT or RBS service between Alameda Point, other locations within the City of Alameda, and the Oakland City Center/12th Street and Fruitvale BART Stations.
- Comparison of several transit route, physical improvement and service-type options within each study corridor, including identification of physical constraints for accommodating the desired transit service within each study corridor.
- Comparison of potential ridership, travel time(s), and operating costs for each study corridor option.
- Preliminary construction cost estimates were prepared.
- Identification of preferred service corridor(s) for BRT or RBS service options.
- Implementation & phasing strategy was identified.

Following selection of a Preferred Corridor by the City, the following additional study elements will be further developed based on the recommended improvements described in Chapter 5, and the phasing and implementation strategy described in Chapter 6:

- Strategic Implementation Plan will be refined for short-term (interim) and long-term transit service operations.
- Capital Improvement Phasing Plan (CIPP) for the physical improvements necessary to implement the preferred service option.

KEY GOALS

The key goals of the RTAS are to identify transit corridor and service options that will allow for the efficient provision of additional transit service that will:

- Enhance regional transit access to employment locations within the City of Alameda including:
  - Alameda Civic Center
  - Alameda Landing
  - Alameda Point (former Alameda Naval Air Station)
  - College of Alameda
  - Marina Village
  - Park Street business district
  - Webster Street business district
  - Future development along the Northern Waterfront areas adjacent to Clement Avenue
  - Complement and, if possible, enhance existing AC Transit service in Alameda
- Increase transit access from Alameda Point, and the West End to major regional destinations and employment centers including:
  - Oakland City Center
  - Oakland Medical Centers, aka "Pill Hill", via transfer in Downtown Oakland to AC Transit or BART
  - San Francisco Financial District via BART, AC Transit, or the Alameda Ferry Service or future service at Alameda Point
  - UC Berkeley via AC Transit or BART
  - South Bay via planned BART extension to San Jose
- Link with other transportation enhancements planned as part of other TOD infill developments in Alameda and Oakland, including the proposed Alameda Point TOD; Alameda Landing; Lake Merritt BART Station TOD, Jack London Square, Oakland Uptown, and Oak to Ninth projects.
- Minimize traffic growth resulting from forecasted increases in jobs and population, particularly for trips through the Tubes connecting Alameda with Oakland and I-880 via the Broadway/Jackson Interchange.
- Increase the rate of transit usage for Alameda jobholders, most of whom live outside of Alameda.
- A key goal identified by the *Alameda Point Station Area Plan* is to achieve a 15 percent transit mode share for trips to and from Alameda Point. This goal is consistent with the 15 percent rate of transit use for work trips by Alameda residents (to/from jobs

primarily outside of Alameda), but is higher than the 5 percent rate of transit use for employees (including non-residents) traveling to/from jobs in Alameda. While not the focus of this study, addition trip reductions (possibly up to 30%) may be achieved at Alameda Point by requiring a systematic approach that includes transit, shuttles, enhanced pedestrian and bicycle facilities and parking pricing.

STUDY CORRIDORS

The City of Alameda *General Plan* identifies West Atlantic Avenue/Ralph Appezzato Memorial Parkway/Clement Avenue and Pacific Avenue/Lincoln Avenue/Tilden Way as exclusive transit right-of-way corridors, as shown on Figure 1-1. Based on this General Plan designation the following two candidate corridors were identified to provide transit service between a proposed terminus at Alameda Point and the Oakland City Center / 12th Street and Fruitvale BART stations:

1. **West Atlantic/Ralph Appezzato/Clement Study Corridor**
2. **Pacific/Lincoln/Tilden Study Corridor**

The two study corridors differed in their primary east-west alignments:

- Figure 1-2 shows the initial transit alignments proposed for the West Atlantic Avenue/Ralph Appezzato Memorial Parkway (RAMP)/Clement Avenue corridor.
- Figure 1-3 shows the initial transit alignment proposed for the Pacific Avenue/Lincoln Avenue/Tilden Way corridor.

Both study corridors were evaluated for their ability to provide service between Alameda Point and Downtown Oakland via Webster Street and the Webster-Posey Tubes, as well as their ability to provide “cross-island” service and an additional regional connection via the Fruitvale BART Station.

Figure 1-1 Transit Priority Streets (City of Alameda General Plan)

The Regional Transit Access Study (RTAS) focuses on the Transit Priority Streets designated for potential "Exclusive Right-of-Way" treatments in the adopted City of Alameda *General Plan*.

Figure 1-2 West Atlantic / Ralph Appezzato / Clement Study Corridor

Figure 1-3 Pacific / Lincoln / Tilden Study Corridor

DESIRED SERVICE TYPES

The study evaluated various transit service options focusing on regional connections to BART stations in Oakland and physical improvements that would benefit existing transit lines, as well as potential future service expansion, including:

- Bus Rapid Transit (BRT) improvement options
- Rapid Bus Service (RBS) improvement options
- Shuttle bus service options

Bus Rapid Transit (BRT)

BRT improvement and service options would provide dedicated travel lanes for bus service in combination with high-occupancy transit vehicles, enhanced boarding platforms and signal pre-emption measures to minimize travel time and maximize potential ridership. BRT systems have been implemented in over 25 cities in North America.

Key features of BRT systems including the following elements:

- **Dedicated Bus Lanes** that remove or reduce conflicts between cars and buses. This provides a BRT vehicle with its own travel lane free of conflicting traffic, double-parked or stopped vehicles. Removing these causes of delay can significantly increase the speed, efficiency, and reliability of transit service, which, in turn, can improve rider experience and increase transit ridership.
- **Increased Distance between Stops** to reduce travel time by providing stops at strategic locations and transfer points, but with fewer total stops. Similar to light-rail, BRT systems often provides stops every half-mile (while typical local-bus service often provides stops every one-fourth mile or less).
- **Transit Signal Priority** helps buses to spend less time stopped at red lights, enabling faster trips and more reliable overall service.
- **Faster Boarding through Improved Fare Collection** is a key element of BRT. Passengers pay before boarding the vehicle at easy-to-use, convenient paystations on the station platform and then are able to board through any door. Once on the bus, tickets or monthly passes serve as proof of payment when requested by inspectors. This multi-door boarding, proof-of-payment system eliminates the need for buses to wait while all passengers pay at the front door, removing a significant factor in vehicle delay. It also improves the rider experience by allowing for a wider variety of payment choices including multi-use universal transit cards, monthly passes, and credit cards.
- **Modern, Low-Floor, High-Capacity Buses** with multiple doors allow for more convenient and faster boarding/exiting, and provide passengers with a more comfortable and quieter ride.

- **Distinctive Stations and Boarding Areas,** ranging from protected shelters to large transit centers, are designed to serve as both traveler amenities and neighborhood enhancements. Improved bus stops aim to enhance safety and comfort for waiting passengers and strengthen neighborhood identity by including better signage and maps, high-quality shelters, and lighting.
- **Real-Time Information** tells riders when the next bus will arrive, allowing users more control over their time.
- **Streetscape, Bicycle, and Pedestrian Access Improvements** such as landscaping, countdown signals, bicycle racks, and well-designed crosswalks, enhance the adjacent neighborhoods and make the street safer and more comfortable for pedestrians and bicyclists accessing the bus stops. Good street design enhances safety and comfort for residents, shoppers, and other users, and gives the street a cohesive sense of identity.

BRT can reduce travel times, increase reliability, and attract new riders, at a lower construction cost compared to more expensive alternatives. For example, a 3-mile BRT line was constructed in Eugene, Oregon at a cost of approximately $25 million (or just over $8 million per mile). Several other US cities are proposing to implement BRT including San Francisco and Oakland.

Rapid Bus Service (RBS)

RBS would provide some of the same key elements as BRT, but with shared travel lanes with motor vehicles and bus stop spacing, while incorporating measures to increase bus operating speed including traffic-signal priority measures, bus queue jump lanes at some locations, and enhanced boarding platforms.

Local RBS examples include the “San Pablo Rapid” service operated in the East Bay by AC Transit that resulted in travel time reductions and increased ridership on the San Pablo Boulevard corridor that connects Oakland, Emeryville, Berkeley, Albany, El Cerrito and Richmond.

Shuttle Bus Service

Shuttle bus service to/from Downtown Oakland BART stations, similar to existing shuttle bus services include the “Emery-go-round” service between the MacArthur BART Station in Oakland and locations in Emeryville as well as the Harbor Bay and Estuary Crossing Shuttle (ECS) that serve Alameda today.

Shuttle bus services typically employ smaller vehicle types, particularly to serve specific employment areas and/or college campuses and focus on providing services during the peak hours of the generator.

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Figure 1-5 BRT & RBS Vehicles & Physical Improvement Examples

RBS vehicle currently in operation in Los Angeles, California (left) and BRT vehicle in Las Vegas, Nevada.

Examples of dedicated bus lanes and stop amenities in Eugene, OR (left) and Vancouver (BC).

SERVICE TYPE EXAMPLES

BART Station Shuttles

Following are two relevant case studies of two successful Bay Area BART Station shuttle services:

- Emery-Go-Round, a free fixed-route shuttle in Emeryville, CA that provides service to the MacArthur BART Station and is funded by commercial property owners
- San Francisco State University shuttle which is a free shuttle for students and staff that provides service to the Daly City BART Station and is run and financed by the University.

Emery-Go-Round, Emeryville

The Emery Go Round is a free fixed-route shuttle service funded by commercial property owners in Emeryville. The service is administered by the Emeryville Transportation Management Association (TMA), a non-profit organization whose purpose is to increase access and mobility to and from Emeryville businesses. The Emeryville TMA began as a two year demonstration project, funded by a Congestion Mitigation and Air Quality (CMAQ) grant.

When the shuttle service was initiated, it was initially funded with three sources:

- Contributions from the developers/employers
- Contributions (monetary as well as ink-kind) from the City of Emeryville
- Bay Area Quality Management District (BAAQMD) funds.

Each year it was a challenge to cobble together the funding required to support the service, until year 2000. The TMA and shuttle service is currently is funded through a property- based business improvement district:

- Fees are assessed on all commercial and industrial property (including rental apartments), based on total square footage and use.
- Property owners pay the assessment through their property tax bills twice a year. The County of Alameda transfers the funds to the City, which in turn, transfers funds to the TMA. Rates may be adjusted a maximum of 5% annually by the TMA Board of Directors and subject to final approval by the City Council, on a calendar year basis. Rates as of November 2008 are as follows:
    - COmmercial/Retail Use: $0.21 per square foot per year
    - Industrial Use: $0.10 per square foot per year
    - Residential (For Rent): $105.00 per unit per year

"For-sale" residential units are not subject to the PBID. However, several new properties are mandated to participate in the TMA through their Conditions of Approval for their Conditional Use Permits and pay equivalent rates.

Figure 1-6 Emery Go-Round Shuttle at MacArthur BART Station

The Emery Go Round (EGR) is free to all passengers and provides service throughout Emeryville, with stops at the Emeryville Amtrak Station, Bay Street Center, and major employers such as Pixar and Novartis. The MacArthur BART Station in Oakland is a key transfer point for connections to regional transit and all routes stop at this BART station.

Weekday service runs from 5:45 am to 10:00 pm, Saturday service is provided from 9:25 am to 9:30 pm and Sunday service is available from 10:20 am to 6:40 pm.

Headways range from 12 to 15 minutes during weekday peak hours to 20 to 60 minutes on weekends depending on route. Real time arrival information for all routes is provided by NextBus. Riders can get arrival times either online or by calling a phone number and entering the code associated with a particular bus stop.

- The Emery Go Round has 13 buses in its fleet that have between 24 and 36 seats, and one van with nine seats.
- The TMA owns seven of these buses and leases the other six.
- Labor for the shuttle is provided through a contract with SFO Shuttle Bus Company.
- Maintenance is provided through full operating leases and contract maintenance with Idealease and Penske Truck Leasing.
- During the peak hour ten buses are in operation. Operating expenses in 2009 were $2.1 million, and the cost per passenger trip was $1.52. Operating revenue for 2010 is budgeted at $2.4 million.1

[1] Emeryville Transportation Management Association. Email Correspondence July 16 2010.

- Ridership on the Emery Go Round has grown steadily since service began in 1997. Ridership in 2003 was 775,392, with an anticipated 1.3 million passenger trips in FY 2008. The largest percent increase occurred between 2007 and 2008, with an 18% growth in ridership:
- In 2008, the shuttle carried about 5,000 passengers a day, with an additional 1,000 passengers each Saturday and 500 each Sunday.

Approximately 80% of all Emery Go Round trips begin or end at MacArthur BART Station, supporting a significant increase in patronage at the station and a shift in primary mode of access.[2]

San Francisco State University Shuttle

For those who commute by BART and the various bus lines serving the station, the University's Department of Parking and Transportation provides a free shuttle service to and from the Daly City BART station, with several stops on and adjacent to the university campus. A direct shuttle operates 7:00 AM to 10:30 PM, Monday through Thursday and 7:00 AM to 7:15 PM on Friday, and a "loop shuttle" operates 7:00 AM to 5:30 PM, Monday through Friday. The shuttle is well utilized, with approximately 17 percent of survey respondents taking the shuttle for the last leg of their commute to campus.

On a daily basis, in the 2009 - 2010 academic year[3] the shuttle service had an average of 5,100 boardings with an average of three runs per hour per shuttle, and a total of 45 to 50 runs per shuttle per day. In 2009 - 2010 the average monthly boardings was 127,740 for a total annual boardings of over 1 million (1,021,922 boardings).

Currently, during the peak hours of 8:00 AM to 10:00 AM and 3:00 PM to 6:30 PM, San Francisco State University shuttles are over capacity, which is defined as 28 persons seated and 10 persons standing. During these time periods, demand is so high that there is a queue of riders waiting in line for a shuttle. In general, over the whole day, 75 percent of the time the shuttles are at 100 percent capacity.

The shuttle fleet is comprised of 7 shuttle vehicles which include one 1995 Metro Trans, two 1999 El Dorados, two 2003 El Dorados, and two 2008 El Dorados. Each shuttle holds 28 seated passengers and 10 additional passengers are allowed to stand. The service is owned and operated by the University.

Information on the shuttle is provided on the San Francisco State University Parking and Transportation website. Under the "Shuttle Buses" link, stop locations and hours of operation are given.

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[2] 2005 BayCap BART Shuttle Rider Survey, Bay Area Air Quality Management District (2005).

[3] The SFSU shuttle operates nine months out of the year.

BRT & RBS Examples

Following are examples of Bus Rapid Transit (BRT) and Rapid Bus Service (RBS) projects in the United States: on-street BRT lines, including Eugene, Oregon's EmX (Emerald Express) and AC Transit's planned East Bay BRT, and three RBS projects, Stockton's Metro Express line and Los Angeles' Metro Rapid system.

Eugene EmX (BRT)

The Eugene/Springfield area has an estimated population in its urbanized area in the year 2008 of about 240,000[4]. Yet a fully featured BRT service exists between the two cities' downtowns.

The EMX line is served by six vehicles (four in service, plus two spares) purchased at a cost of $960,000 each. EmX (Emerald Express) vehicles are specially designed 63-foot buses with doors on both sides (so that some stops can be center island platforms) and stops feature raised platforms to allow near-level boarding.

- The EMX includes several different segments with varying design and operational characteristics:
- About three-fifths of the existing route is in bus-only lanes in the median. EmX buses and part of its route are pictured in Figure 1-7, and a stop is shown in Figure 1-8.

In addition to downtown Eugene and Springfield, the initial EmX route (named the "Green Line"), serves two college campuses (the University of Oregon, with 22,000 students, and Northwest Christian College) and a major regional hospital (Sacred Heart Medical Center). Ridership has exceeded expectations.

Within 17 months of the Green Line's introduction in early 2007, ridership in the corridor had roughly doubled from 2,700 to 5,400 average weekday boardings[5], or about 675 boardings per unidirectional mile. EmX service was free until late-2009). Ridership on the Green Line is now about 90 passengers per hour of revenue service. The Green Line replaced a local bus line (Route 11), and has reportedly reduced approximate average end-to-end travel times over the four-mile route from up 16-22 minutes[6] to a predictable 15 minutes.

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[4] U.S. Census Bureau American Community Survey, 2006-2008

[5] The primary source for information in this case study is *From Buses to BRT: Case Studies of Incremental BRT Projects in North America,* by John Niles and Lisa Callghan Jerram for the Mineta Transportation Institute, 2010.

[6] Travel times for Route 11 vary by source. According to the EmX Frequently Asked Questions page at the Lane Transit District website (http://www.ltd.org/search/showresult.html?versionthread=6d517154d17fc3e09be84a0ee196bd7b), the projected 16-minute travel time for the Green Line was projected to amount to a six-minute savings. Other sources have reported travel time for Route 11 of 16 minutes. It is likely that this discrepancy is a result of different speeds at different times of day, as transit vehicles operating in traffic are often much slower during peak periods.

While these savings may appear insignificant on a per-trip basis, more passengers ride during the most congested peak periods, when time savings are greater, and dedicated rights-of-way ensure that transit speeds remain relatively constant over time, even as traffic congestion increases. Lane Transit District, the operator of EmX, has estimated that cumulative time saved by all riders could reach 175,000 hours annually within roughly 20 years.

Figure 1-7 Eugene, Oregon BRT Vehicle and Right-of-Way

Source: Flickr user "functoruser" (used under Creative Commons license: http://creativecommons.org/licenses/by-sa/2.0/)

Figure 1-8 Eugene, Oregon BRT Station Platform

Source: Flickr user "functoruser" (used under Creative Commons license: http://creativecommons.org/licenses/by-sa/2.0/)

By reducing delay, dedicated rights-of-way improve not just speed, but reliability. On-time performance in the Green Line corridor appears to have been significantly improved, from a standard deviation of 116 seconds for the old local line to 79 seconds for the EmX line.

The EmX Green Line cost about $6.15 million per mile to construct, significantly less than the $30 to $50 million per mile it is estimated a light rail line might have cost[7]. The route is also relatively cost-effective to operate, at $1.54 per boarding[8].

EmX serves as an especially illustrative example of the design and flexibility afforded by BRT, which may be especially applicable to the proposed "*Alameda Point to 12th Street BART*" alignment:

- While much of the EmX alignment is provided within a "median busway", designers were constrained in other locations by a policy decision to limit impacts on traffic and parking.
- In some segments, EmX buses operate in curbside bus lanes.
- In some segments there is only a single bus lane shared by buses in both directions. According to LTD staff, this limits the capacity of the system to seven-minute headways, or about 800 to 900 passengers per hour in each direction.
- Currently, buses run every 10 minutes, and ridership reaches around 500 passengers per hour during peak periods.

Another notable design element of EmX is its raised platforms enabling near-level boarding. As illustrated in Figure A-3, bus floors are at roughly the same height as station platforms, a feature typical of rail systems. This allows able-bodied passengers to simply step onto or out of vehicles, rather than up or down. More importantly, it can greatly reduce the time required for passengers using wheelchair or other mobility devices, or passengers with strollers, to be loaded and unloaded.

One study of the a rapid bus line in Oakland[9] using low-floor vehicles but standard curbside stops requiring wheelchair ramps to be deployed found that it took an average of 4 minutes and 10 seconds to load each passenger using a mobility aid. On EmX buses, a small plate flips out to bridge the gap between bus and platform, and passengers in wheelchairs or with strollers can roll directly onto or out of the vehicle, rather than up or down a ramp.

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[7] Lane Transit District staff, as cited in *From Buses to BRT: Case Studies of Incremental BRT Projects in North America*

[8] For Fiscal Year 2009-10, according to information provided by LTD staff

[9] *Line 1R Service and Reliability Study Draft Report*, AC Transit, January 2010

East Bay BRT (Planned), AC Transit

AC Transit's East Bay Bus Rapid Transit (EBBRT) project is a $178 million effort to create a roughly 9.5-mile, fully featured BRT line between the Downtown Oakland and San Leandro BART Stations.

As currently planned, the line would feature bus-only lanes and bus stops in the center of the street along most of its alignment within the City of Oakland, primarily via International Boulevard, and for a short distance in San Leandro. Over half of the route would consist of these median transit ways, and stops in these segments would feature raised platforms and ticket machines allowing for level boarding of buses through all doors. The line is scheduled to open in 2016.

These features would significantly improve travel times and reliability. Modeling found that an earlier design that was somewhat longer and featured a somewhat greater length of bus-only lanes could reduce overall delay by 18 percent and result in nearly 7,000 additional transit trips per day. This improvement in travel time is especially notable given that the new line would include about half-again as many stops as an existing rapid bus line in the corridor.

Figure 1-9 Planned East Bay BRT on International Blvd (Conceptual Design)

Because stops would be more closely spaced than on a typical BRT line -- about one-third of a mile apart on average -- the new service could replace both the existing Line 1R rapid and Line 1 local service in the corridor. Because it would take less time for buses to complete each trip, AC Transit would be able provide significantly more service at little additional cost, and because buses would be less likely to fall behind schedule and "bunch" together, the agency could more reliably operate them on tightly spaced headways. As a result, buses are currently planned to run every 5 minutes all day on weekdays, compared to every 12 minutes on Line 1R and every 15 to 20 minutes on Line 1, further reducing overall travel times. And while the resulting 33 to 50 percent increase in service would increase the agency's overall operating costs, increased ridership would result in reduced subsidies and greater cost-effectiveness -- a potential reduction in the agency's cost per boarding of almost a full dollar, according to one analysis.

In addition to their features designed to reduce delay at stops -- level boarding (which could especially reduce the time required for wheelchairs to load and unload) and ticket vending machines -- EBBRT stops would offer a higher level of amenity, including expanded shelters, more seating, more visible signs and maps. As they would be on islands apart from the sidewalk, the stops would more closely resemble light rail stations than traditional bus stops.

In segments where they would not operate in a median transit way or in curbside bus lanes, BRT buses would continue to operate much as existing Line 1R rapid buses do, relying on traffic signal priority, wide stop spacing and low-floor buses to provide greater speed and reliability than on typical local services.

Stockton Metro Express (Rapid)

Stockton has an urbanized area population of about 350,000 and the annual San Joaquin Regional Transit District, or RTD ridership, in 2008, was about 4.8 million annual boardings[10].

The first route in Stockton's Metro Express system, Route 40 (additional routes are under construction and planned), runs from Downtown north past two college campuses (the University of the Pacific and San Joaquin Delta College) and two major shopping centers (Weberstown and Sherwood Malls). Most of the route is along major arterials (Pacific Avenue and the one-way couplet of North El Dorado and Center Streets), and stops are on average more than a mile apart.

Route 40 is a "rapid" line without bus-only lanes – yet within three years of introduction, it has almost tripled ridership in the corridor, from fewer than 1,000 daily boardings on three local routes serving the alignment to about 2,700 daily boardings[11].

According to RTD staff, productivity now stands at about 42 passengers per hour, and the service's farebox recovery ratio is close to 50 percent. Route 40 is relatively fast for a bus route operating in traffic: average scheduled one-way travel time during peak periods is 23 minutes, over roughly a 5.7 mile route, for an average speed including stops of nearly 15 miles per hour. This can be attributed to several factors, including low-floor buses, traffic signal priority, and a system of prepaid boarding allowing simultaneous boarding through all doors.

Boarding through all doors may be the most notable feature because it is a relatively rare attribute for a rapid bus line. While ticket vending machines (TVMs) can be somewhat costly (the Transit Cooperative Research Program's *Report 118: Bus Rapid Transit Practitioner's Guide*, gives an average cost of $65,000 per TVM), a "proof-of-payment" or honor system can reduce average dwell time per boarding from between 3.6 and 4.3 seconds (for passengers paying cash fares) to between 2.25 and 2.75 seconds. On a relatively high-ridership service, this can represent a significant savings: for example, if just one second was saved per passenger, but 60 passengers were to board over the course of a trip, it would amount to a savings of one minute per trip. Metro Express is also notable for its relatively elaborate and highly visible stops, with double-canopied

Figure 1-10 Ticket Validation Machine -- Stockton

Image Source: San Joaquin RTD

[10] National Transit Database

[11] Presentation by Paul Rapp, Marketing and Communications Manager for RTD

shelters offering benches as well as distinctive "lean rails." These high-profile facilities contribute to a branding strategy that also includes distinctly designed buses.

Los Angeles Metro Rapid

Figure 1-11 Metro Rapid Kiosk

Image Source: Flickr user "fredcamino" (used under Creative Commons license: http://creativecommons.org/licenses/by-sa/2.0/)

County Metropolitan Transportation Authority's (MTA) Metro Rapid demonstrate that buses can be made significantly faster and more attractive to potential riders at relatively little cost using methods relevant to cities of all sizes.

The Metro Rapid program was a pioneering effort in North American rapid bus service. Its first two lines, in the Wilshire/Whittier and Ventura corridors, were rolled out in the year 2000. Today, the network encompasses 25 lines spanning roughly 440 miles.

This rapid deployment has been made possible by a relatively simple approach emphasizing eight no- or low-cost attributes[12]:

- Frequent service
- Traffic signal priority
- Headway-based schedules
- Simple routes
- Widely-spaced stops
- Integration with local routes
- Low-floor buses
- Distinct branding

[12] The primary source for information in this case study is *From Buses to BRT: Case Studies of Incremental BRT Projects in North America,* by John Niles and Lisa Callghan Jerram for the Mineta Transportation Institute, 2010.

Of the attributes listed above, only two incur notable cost, according to MTA:

- Signal priority or "Intelligent Transportation Systems" (ITS) treatments cost approximately $100,000 per mile to implement.
- Metro Rapid stops, with varying amenities, cost about $50,000 apiece. While all Rapid buses are low-floor models, with higher-capacity buses used on some lines, Metro has purchased vehicles through its regular procurement process, so Rapid buses are, in effect, ordinary buses distinguished by their color-coded (red) livery featuring prominent logos.
- The total cost to implement Metro Rapid has averaged about $240,000 per mile.

The Metro Rapid program grew out of a late-1990s study that found that MTA buses spent roughly half their travel time stopped, either at stops or at red lights. The simplest way to speed buses is to have them make fewer stops, and Rapid stops are approximately 0.7 miles apart on average, compared to 0.3 miles on limited-stop routes and 0.2 miles on local routes. Another way is to implement "headway-based" scheduling under which riders are simply told that buses will arrive at regular intervals (e.g., "every 10 minutes"), and drivers need not worry about slowing down to avoid running ahead of schedule. Finally, in the Rapid system buses running behind scheduled headways are granted ten-second extensions and ten-second advances on green cycles at signals.

The Metro Rapid program is as notable for what it does *not* include as for what it does. Most importantly, little has been done to reduce dwell times at stops: with limited space available on congested urban sidewalks, and in order to reduce costs, MTA has not provided raised platforms or ticket vending machines at stops (although stops are branded with Rapid signage, and some stops feature enhanced amenities). Likewise, Rapid buses operate in traffic (although MTA has experimented with and hopes to permanently install bus-only lanes on its busiest corridor, Wilshire).

Nonetheless, the Rapid system has achieved impressive gains in speed and ridership. Rapid buses are on average about 25 percent faster than local buses, and between 2000 and 2007 ridership in Rapid corridors, including both Rapid and local lines, increased by about 20 percent. Studies conducted on the first two lines (Wilshire/Whittier and Ventura) shortly after their debut found that about one-third of riders were new to transit, and that one-third of the improvements in speed could be attributed to signal priority. The other improvements can be attributed to fewer stops, far-side stop locations, low-floor buses, headway-based schedules, and a coordinated management effort by field supervisors and central control.

The system's low cost has also allowed it to be expanded primarily using federal Congestion Mitigation and Air Quality (CMAQ) funding rather than more restrictive Federal Transit Administration (FTA) Small Starts program grants. Operating costs, meanwhile, are relatively low at $2.51 per boarding[13].

[13] Based on Fiscal Year 2010 budget and 3rd Quarter FY09-10 data, as provided by MTA staff

San Pablo Rapid, AC Transit

The San Pablo Rapid (AC Transit Line 72R) is a 14-mile "rapid bus" line (with buses operating in mixed-flow traffic) on a four-lane roadway (2 lanes in each direction). The rapid service began operation in June 2003 and runs along San Pablo Avenue covering two counties and seven cities; San Pablo, Richmond, El Cerrito, Albany, Berkeley, Emeryville, Oakland. The 72R operates from Monday through Friday from 6:00 am to 7:00 pm. The service operates on 12 minute headways.

Planning for BRT service along the San Pablo Avenue Corridor began in 1995 as a coordinated effort between the cities bisected by this corridor and AC Transit as a way to improve the economic vitality, mobility, accessibility, and quality of this corridor. At the time the corridor was served by three bus routes; the 72, 72L, and 73. The 72 and 73 provided local service while the 72L provided limited service. AC Transit made the decision to improve the 72L which is now the 72R (Rapid).

Key attributes of the San Pablo Rapid are:

- There are 26 bus stops over the 14 mile segment and each stop is spaced approximately 0.54 miles apart.
  - Each stop is equipped with a shelter or kiosk as well as NextBus real-time bus arrival data, schedule, map, bench, trash bin and lighting.
- The service employs transit signal prioritization at intersections, Automatic Vehicle Locator technology, and Automatic Passenger Counters.
  - Compared to the previous "limited" bus service (72L), the 72R has reduced the travel time from one end of the corridor to the other by 12 minutes which is equivalent to a 17% reduction in travel time as compared to the 72L and 21% compared to local service (72 and 73).
- The total capital cost for the project was approximately $3.2 million or $228,571 per mile.[14]
  - The cost for the 72R was lower than is typical for in-street mixed traffic alignments due to the fact that AC Transit already had the necessary vehicles and did not have any right-of-way acquisition costs.
  - Funding for this project came from Contra Costa and Alameda County allocated federal funds as well as a federal budget earmark.

[14] The San Pablo Rapid BRT Project Evaluation funded by the Federal Transit Administration. June 2006.

Ridership increased on the San Pablo corridor following the implementation of Rapid Bus Service:

- An analysis of ridership before and after the implementation of the 72R showed that ridership on the new rapid route increased by 212% as compared to the 72L. However data collected suggests that a percentage of this increase was due to the diversion of existing riders from other routes rather than new riders as ridership decreased by 35% on the 72 and 73, while 40 to 50 percent of 72R riders stated that they had used other routes before the implementation of the 72R.
- **Net Ridership on the San Pablo corridor increased by 8.5% after the implementation of the rapid bus service.**

2. EXISTING TRANSIT SERVICE & RIDERSHIP

This section describes existing and forecasted future levels of transit ridership in Alameda based on:

- Existing transit ridership and recent (2000-10) trends affecting transit demand
- Origin & destination patterns for transit trips beginning or ending in Alameda
- Future transit ridership based on buildout of the allowable land uses as identified in the Alameda *General Plan*

EXISTING SERVICE

AC Transit: Existing Service to Alameda

Approximately 86 percent of typical daily transit trips in Alameda are served by the Alameda-Contra Costa Transit Agency (AC Transit).

- Figure 2-1 provides a summary table describing the terminuses and general operating frequencies ("headways") of each of the seven regular AC Transit lines serving Alameda.
- Figure 2-2 provides a map of existing AC Transit routes serving Alameda. Along each route, the quarter-mile zone is shown.

Figure 2-1 Existing AC Transit Lines Serving Alameda & Service Frequency

Line	Destinations and/or Terminuses		Headways (minutes)		
			Weekday Peak Periods	*Weekday Off-peak Periods*	*Weekend Service*
LOCAL BUS LINES					
20	Oakland Airport	Fruitvale BART & East Oakland	30	30	30
21	Oakland City Center	Fruitvale BART	30	30	30
31	MacArthur BART & Oakland City Center	Alameda Point	30	30	30
51A	Rockridge BART Station & Oakland City Center	Fruitvale BART	10	10	15
TRANSBAY BUS LINES					
O	Fruitvale BART Station	San Francisco Transbay Terminal	10-12	60	60
OX	Fruitvale BART Station	San Francisco Transbay Terminal	9-13	--	--
W	Fruitvale BART Station	San Francisco Transbay Terminal	10-30	--	--

Figure 2-2 Existing AC Transit Route Map

Nelson|Nygaard consulting associates V1 1.24.12

EXISTING RIDERSHIP

Existing transit ridership consists of approximately 15,900 to 16,200 average weekday transit trips generated by Alameda land uses including:

- 13,700 average weekday riders on AC Transit local and Transbay bus lines (plus up to an additional 300 riders on School Tripper lines serving Alameda)
- 2,200 average weekday riders on the two ferry lines and two BART Station shuttle bus lines that directly serve Alameda:
  - Oakland Alameda Ferry (approximately 1,200 weekday riders to/from Alameda)
  - Harbor Bay Ferry (approximately 500 weekday riders)
  - Harbor Bay Shuttle (approximately 300 weekday riders)
  - Estuary Crossing Shuttle (approximately 200 weekday riders)

Existing ridership includes up to an estimated 5,000 daily boardings that are made for trips to or from the BART system via transfer in Oakland, with most transfers occurring at the Oakland City Center / 12th Street BART Station. Therefore, the current level of 16,000 average weekday transit trips generates up to 21,000 transit boardings, factoring in the transfers to/from the BART system.

AC Transit: Year 2012 Ridership

Figure 2-3 provides a summary of average weekday ridership, and boarding patterns for Alameda-generated trips, on each regular AC Transit bus line serving Alameda, based on Spring 2012 boarding and alighting data. In addition, estimated average weekday ridership of approximately 300 daily boardings on AC Transit school bus lines serving Alameda is included in the average weekday ridership.

Based on spring 2012 ridership data, current ridership consists of:

- **13,700 average weekday boardings** generated by trips to, from, or within Alameda ("Alameda-generated boardings"), including approximately:
  - 7,932 average weekday boardings in Alameda on local and transbay lines, including:
    - Approximately 5,900 passengers traveling to Oakland or San Francisco
    - Approximately 2,000 boardings for trips entirely within Alameda
  - 5,839 average weekday boardings in Oakland or San Francisco for passenger trips terminating in Alameda
  - Trips beginning or ending in Oakland include transfers to BART lines (estimated at up to 5,000 total, including 2,500 Alameda boardings and 2,500 return trips), primarily generated by San Francisco-bound commuters

- Line 51A serves approximately half of average weekday Alameda-generated boardings on just a single line that operates just one to two blocks west of the Lincoln Avenue study corridor
  - Over 7,000 Alameda-generated average weekday boardings occur on the 51A line, including 4,000 boardings in Alameda and an estimated 3,000 boardings in Oakland for passengers exiting in Alameda.
  - Total average weekday boardings on the entire 51A line are over 10,000 per day. Prior to "bifurcation" of the 51 and 51A lines in 2009, the combined 51/51A line carried 20,000 daily passengers, including ridership on the current Line 51 segment between Rockridge BART Station and Downtown Berkeley.
- Lines serving Alameda average 40 passengers per hour of revenue service, exceeding the AC Transit systemwide average of 34 passengers per revenue hour, with the following two lines exceeding 40 passengers per revenue hour:
  - Line 51A (serving 55 passengers per revenue hour with 10-minute headways)
  - Line 20 (serving 41 passenger per revenue hour with 30-minute headways)
- The remaining lines serving Alameda operate with levels of transit demand that serve less than the AC Transit systemwide average of 34 passengers per revenue hour:
  - Line 31 (serving 27 passengers per revenue hour with 30-minute headways)
  - Line 21 (serving 31 passengers per revenue with 30-minute headways)
  - Transbay Lines O, OX and W (serving 23 to 24 passengers per revenue hour with approximately 10-minute peak headways)

In addition to the above: AC Transit also serves up to an additional 300 weekday passengers on School Tripper bus lines (note: school bus lines not included in Figure 2-3)

Figure 2-3 Current Average Weekday Ridership – AC Transit Lines Serving Alameda

AC Transit -- Avg Weekday Ridership -- Spring 2012												
Lines Serving Alameda												
				Alameda boardings			Oakland & SF boardings				
East Bay Lines	Weekday Revenue Hours	Passengers per Revenue Hour	Estimated Annual Operating Cost (millions)	*Internal Alameda Trips*	*To Oakland or SF*	Total Alameda Boardings	*To Alameda (estimated based on exit data)*	*Non-Alameda Trips*	Total non-Alameda boardings	Weekday Alameda Ridership	Total Weekday Boarding by Line
20 OAK Airport-Harbor Bay-Fruitvale	74.6	41	$3.8	*473*	*937*	1,410	*831*	*811*	1,642	2,241	3,052
21 Oakland City Ctr - Fruitvale	60.9	31	$3.1	*419*	*257*	676	*346*	*853*	1,199	1,022	1,875
31 MacArthur-Oakland City Ctr--Alameda Pt	65.3	27	$3.3	*308*	*346*	654	*374*	*766*	1,140	1,028	1,794
51A Rockridge-Oakland City Ctr-Fruitvale	187.5	55	$9.6	*711*	*3,223*	3,934	*3,090*	*3,207*	6,297	7,024	10,231
Subtotal Local Lines	**388**	**44**	**$19.8**	***1,911***	***4,763***	**6,674**	***4,641***	***5,637***	**10,278**	**11,315**	**16,952**
Transbay Lines											
O	62.5	24	$2.9	*168*	*660*	828	*578*	*118*	696	1,406	1,524
OX	21.2	24	$0.9	*0*	*224*	224	*295*	*0*	295	519	519
W	20.3	23	$0.9	*0*	*212*	212	*263*	*0*	263	475	475
Subtotal Transbay Lines	**104**	**24**	**$4.7**	***168***	***1,096***	**1,264**	***1,136***	***118***	**1,254**	**2,400**	**2,518**
Total (Lines Serving Alameda)	**492**	**40**	**$24.5**	*2,079*	*5,859*	**7,938**	*5,777*	*5,755*	**11,532**	**13,715**	**19,470**
AC Transit (System Avg)	**5,212**	**34**	**$309**								**176,602**

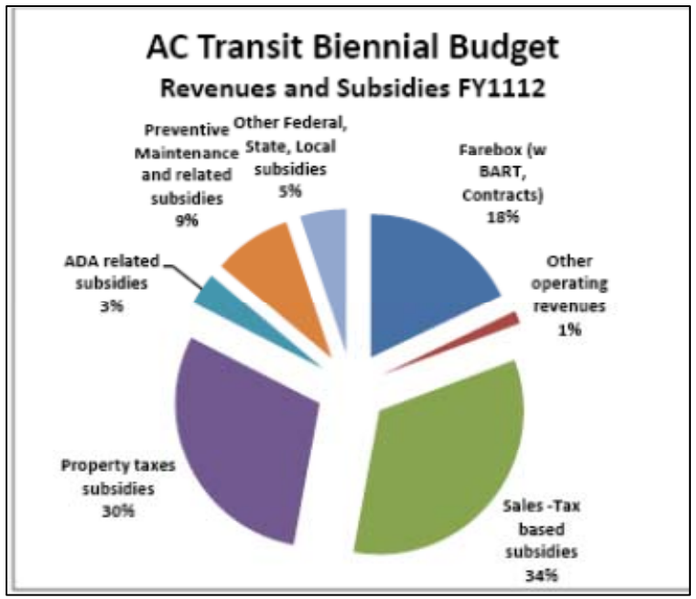
Source: Nelson\Nyggard, Based on Spring 2012 Boarding Data provided by AC Transit . (Operational Cost estimate based on AC Transit Adopted Biennial Budget 2011-12 and 2012-13)

AC Transit: System Operations

AC Transit serves over 190,000 average daily weekday transit riders, and approximately 60 million annual riders including:

- 170,000 daily riders on local bus lines, including Lines 20, 21, 31 and 51A that serve Alameda
- 18,000 daily riders on Transbay bus routes, including Lines O, OX and W that serve Alameda
- 6,000 daily riders on School Tripper service including several lines serving Alameda

Figure 2-4 AC Transit Operational Funding Sources

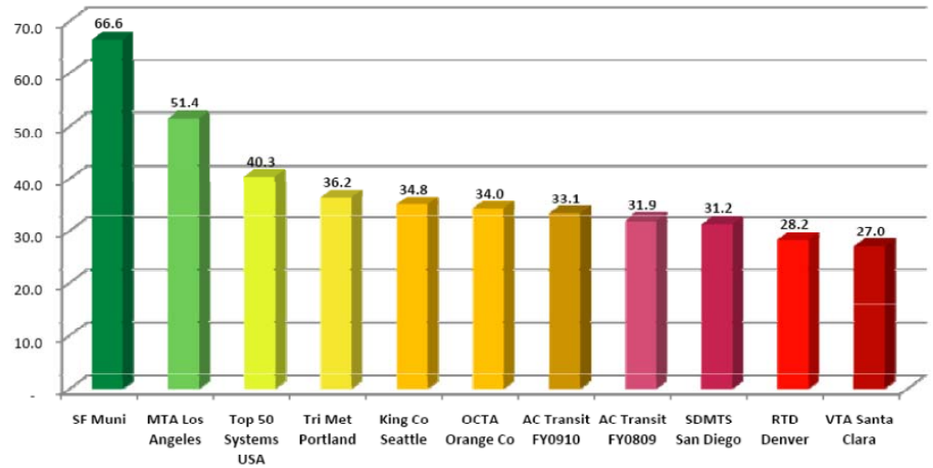


Approximately two-thirds of AC Transit operational funding is provided via local property tax and sales tax revenue, as shown on Figure 2-4.

AC Transit has faced significant budget constraints in recent years, particularly as a result of the decline in property and sales tax revenue that accompanied the 2008-12 recession. This included a decline in the population of employed residents within the region that reduced the number of fare-paying daily passengers.

- Fiscal year 2011 budget is $309 million (total cost of agency operations and management)
- **Average Net Cost per Rider (systemwide) for AC Transit service is estimated to be approximately $4.00 to $4.50 per boarding** based on the system-wide average fare return. The estimated "net cost" is based on operating cost minus farebox recovery:
  - **Operating Cost:** the system-wide operational cost for Fiscal Year 2011 is $309 million (total cost of agency operations and management). Based on service hours (1.8 million annual service hours), and ridership (60 million annual boardings), the gross cost per rider (excluding revenue from passenger fares) is estimated to be approximately $5.25 per boarding.
  - **Farebox Recovery:** revenue generated directly by passengers was estimated at $0.86 per boarding in 2010. AC Transit's 2011-13 budget anticipated an increase in farebox revenue to $60 million, based on an increase to $1.00 in revenue per boarding, to offset recent budget reductions

Figure 2-5 Passengers per Revenue Hour (Comparison of Major Transit Agencies)



Source: AC Transit, Adopted Biennial Budget 2011-12 and 2012-13

NET COST OF ALAMEDA SERVICE

As noted above, the system-wide net cost per rider estimate is based on average levels of ridership on the AC Transit stem.

- Passengers per revenue hour are a key indicator of transit line performance.
  - **AC Transit averaged 33 passengers per revenue hour, system-wide, in Fiscal Year 2009-10, and 34 passengers per revenue hour in Spring 2012.**
  - As shown on Figure 2-5, this ridership level is comparable with transit systems in Seattle, Portland and San Diego
- Several Alameda lines generate an above-average levels of ridership compared to other lines on the AC Transit system, thus reducing the net cost per rider on those lines:
  - **Line 51A serves 55 passengers per revenue hour, reducing the "net cost per rider" on that line to an estimated $2.50 per boarding.**
  - Line 20 also performs above-average, serving over 40 passengers per revenue hour.
- Although the Transbay lines serving Alameda operate with below-average ridership levels on an hourly basis compared to local lines, the higher fares charged for Transbay service result in a higher level of farebox revenue.
  - Fares on the Transbay lines are twice as high as the base fare on local lines, and four times as high as the senior and youth fare on local lines. No discounted or youth fares are offered on Transbay lines. Therefore, the farebox revenue rate per rider is several times higher than on a local line.

Net cost of providing existing service to Alameda is estimated at approximately $14.3 million annually, roughly $3.50 per Alameda-generated boarding, based on the operating cost minus fare return :

- **Annual operating cost of providing Alameda service: estimated at $17 million**, based on "pro-rated" $13.3 million share of local line boardings on Lines 20, 21, 31, and 51A that cost an estimated $19.8 million annually to operate, plus the estimated $4.7 million cost to operate the Transbay lines that serve Alameda.
- **Estimated farebox revenue from Alameda-generated boardings of approximately $3.7 millio**n, reflecting the AC Transit average farebox revenue rate of $0.86 applied to 4.1 million boardings, plus an estimated $0.2 million in additional farebox revenue on Transbay lines that reflect the higher-than-average share of Transbay boardings generated by Alameda passengers, compared to the system-wide average.

ORIGIN & DESTINATION PATTERNS

This section below provides an overview of key attributes of existing transit demand in Alameda. The United States Census Bureau collects employment and travel mode data, including origins/destinations for "journey-to-work" trips to/from and within the City of Alameda, including trips generated by employed Alameda residents and by non-residents employed in Alameda.

- The bulk of daily Alameda transit demand is currently generated by home-to-work trips generated by Alameda residents:
  - Approximately 15 percent of Alameda's 32,000 employed Alameda residents use transit as their primary means of travel to and from work, based on Year 2010 United States Census Bureau estimates provided in the *American Community Survey* data set. This represents approximately 8,500 to 9,400 daily transit boardings.
  - Year 2000 U.S. Census data, which was based on 36,000 employed Alameda residents, had found an even higher rate of transit ridership among Alameda ridership, approximately 16 percent This represented approximately 9,400 to 10,400 daily transit boardings.
- The rate of transit ridership to and from Alameda job locations is much lower:
  - Year 2000 U.S. Census data found that just five percent of 24,000 workers employed in Alameda used transit as their primary means of travel to work, just 1,200 workers including 300 Alameda residents, generating an estimated 2,000 to 2,400 average daily transit boardings.
  - More recent Year 2010 U.S. Census Bureau indicates an increase in transit ridership to 6 percent to/from Alameda jobs (and a nearly 8 percent transit ridership rate by non-residents traveling to Alameda jobs). In addition, the number of jobs within Alameda increased from 24,000 to 28,000, an increase of 4,000 jobs, despite the drop in the number of employed Alameda residents. This resulted in an increase in the population of transit riders from 1,200 (2000) to 1,900 (2010), generating an increase of up to 1,400 daily boardings, and an estimated total of 3,500 to 3,900 average weekday transit boardings generated by Alameda employment locations.

Work Trips to/from Alameda Homes

Figure 2-6 provides a summary of Year 2000 Census journey-to-work data for Alameda residences, including:

- Destination pattern (distribution of job locations for Alameda residents)
- Transit mode share based on Census journey-to-work data
- Distribution of transit demand

Figure 2-6 Travel Modes & Place of Work for Employed Alameda Residents

Place of Work	Distribution of Job Locations for Alameda Residents	Transit Mode Share	Distribution of Transit Demand (Home to Work Trips)
Alameda	**25%**	**3%**	**5%**
Albany	0%	0%	0%
Berkeley	4%	4%	4%
Emeryville	2%	1%	1%
Oakland	**25%**	**14%**	**14%**
Alameda Co. (south of Oakland)	14%	1%	5%
Contra Costa Co.	4%	3%	1%
Marin County	1%	0%	0%
San Francisco	**19%**	**58%**	**69%**
San Mateo Co.	3%	3%	1%
Santa Clara Co.	3%	4%	1%
Solano Co.	0%	0%	0%
Other	0%	0%	0%
TOTAL	**100%**	***16%***	**100%**

Source: United States Census, Year 2000, Journey to Work Data

As shown on Figure 2-6, work-commute transit trips generated by Alameda residents were primarily made by those Alameda residents that work in San Francisco or Oakland, consistent with the Year 2012 ridership data.

Work Trips to/from Alameda Jobs

Figure 2-7 summarizes the rate of transit usage among non-residential land uses in Alameda, including commuters from cities outside of Alameda, based on U.S. Census Journey to Work data.

Figure 2-7 Alameda Jobs: Rate of Transit Ridership by Place of Residence

Place of Residence	Pct of Alameda Jobholders	Transit Mode Share	Share of Transit Trips to/from Alameda Jobs
City of Alameda	**39%**	**5%**	**23%**
Albany	0.5%	3%	0%
Berkeley	2%	6%	3%
Emeryville	0.1%	40%	1%
Oakland	**15%**	**12%**	**34%**
Piedmont	0.1%	6%	0%
Alameda County (south of Oakland)	**18%**	**4%**	**12%**
Contra Costa Co.	**12%**	**6%**	**12%**
Marin County	1%	0%	0%
San Francisco	**4%**	**15%**	**12%**
San Mateo Co.	2%	1%	1%
Santa Clara Co.	3%	0%	0%
Solano Co.	2%	4%	1%
Other	1%	0%	0%
TOTAL	**100%**	**5%**	**100%**

Source: United States Census, Year 2000, Journey to Work Data

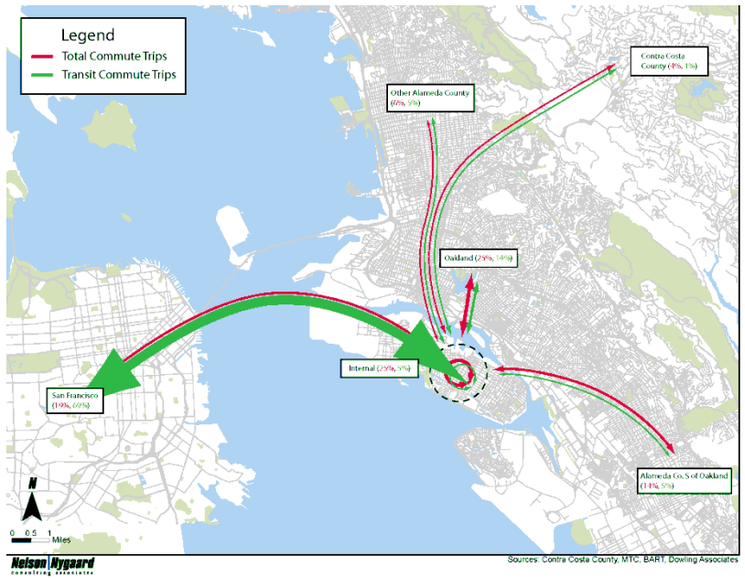
As shown on Figure 2-7:

- Non-residential land uses in Alameda generate a lower rate of transit demand among traditional "journey to work" trips, compared to residential land uses.
- The rate of transit use, to/from Alameda employment locations, varies by place or residence:
  - 15 percent of transit commuters to Alameda job locations were made by residents of San Francisco, despite the fact that just four percent of Alameda jobs were held by San Francisco residents
  - Oakland residents represented 12 percent of transit ridership to Alameda jobs in 2000, and 15 percent of total work trips. Based on ABAG housing projections that anticipate a significant portion of East Bay population growth will be accommodated by anticipated levels of residential development in Oakland, the portion of Alameda jobs held by Oakland residents is likely to increase further, prior to General Plan buildout.
  - Among Alameda residents that work within Alameda, just 3 percent use transit. Instead, nearly three times as many residents walk to work within the island (9 percent of internal Alameda work-commute trips).

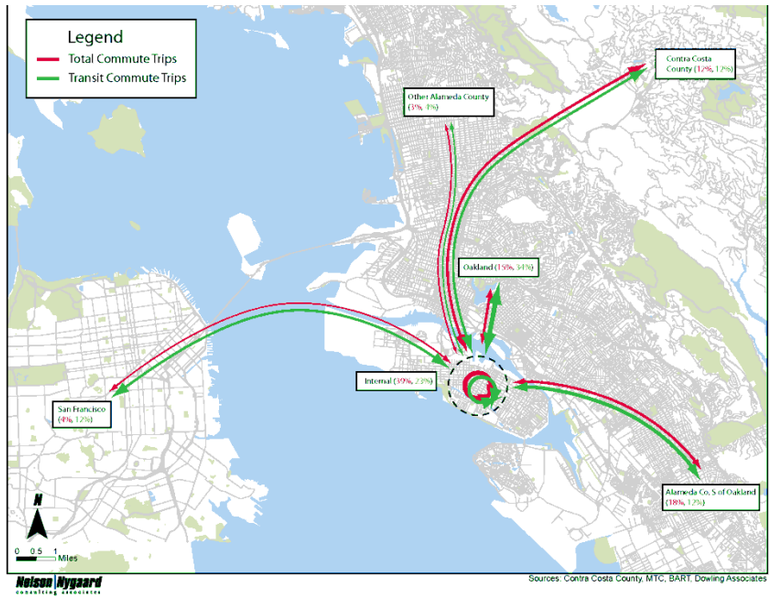
Figure 2-8 provides a graphic comparison of the differing travel mode preferences among work-commute trips based on origin and destination.

Figure 2-9 provides sample of comparative data from the Year 2010 U.S. Census Bureau *American Community Survey* that highlights recent trends concerning the daily in-flow and out-flow of workers, particularly an increase in the number of jobs in Alameda, and an increase in the number of transit riders among Alameda job-holders. This occurred despite a decline in the population of employed Alameda residents between 2000 and 2010 that may reflect the 2008 economic downturn as well as potentially an increase in the portion of retirees among the 2010 population.

Figure 2-8 Origin & Destination Patterns for Home-to-Work Transit Trips



Alameda residents



Alameda jobs

Source: United States Census Bureau

Figure 2-9 Employment & Travel Mode Trends 2000-2010

Employed Alameda Residents

	Total	Drive Alone	Carpool	Transit	Bicycle	Walk	Other	Work at Home
2000	**37,327**	23,532	4,452	**5,870**	519	988	459	1,507
2010	**32,468**	20,881	3,159	**4,696**	412	1247	307	1,766

Jobs in Alameda

	Total	Drive Alone	Carpool	Transit	Bicycle	Walk	Other	Work at Home
2000	**24,950**	17,260	2,930	**1,370**	495	1,060	330	1,507
2010	**27,831**	19,339	2,024	**1,964**	697	1,576	465	1,766

Commute Trends

	Employed Residents			Alameda Jobs			Total Workers (including non-residents working in Alameda)		
	Total	Work in Alameda	Work outside Alameda	Total	Held by Residents	Held by Non-residents	Total	Internal Alameda	**Workers Crossing Estuary**
2000	**37,327**	9,731	27,597	**24,950**	9,731	15,220	**52,547**	9,731	**42,816**
2010	**32,468**	4,643	27,825	**27,831**	4,643	23,188	**55,656**	4,643	**51,013**

Transit Commuters (Home-to-Work)

	Total Transit Commuters	Estuary & Bay Crossings via Transit			Internal Alameda Transit Commuters
		Total	Alameda Residents (out to work)	Non-residents (in to work)	
2000	6,925	6,610	5,555	1,055	315
2010	6,510	6,359	4,546	1,814	150

Source: U.S. Census 2000 and U.S. Census Bureau *American Community Survey* 2010.

3. FUTURE TRANSIT RIDERSHIP

This section describes forecasted future levels of transit ridership in Alameda based on buildout of the allowable land uses as identified in the Alameda *General Plan*.

BASELINE FUTURE DEMAND

Future Baseline transit ridership, based on current rates of transit ridership generated by Alameda land use types, would increase on buildout of the General Plan by 2035 as summarized on Figure 3-1:

- The Future Baseline ridership forecast is based on anticipated buildout of allowable land uses, as described in the Alameda *General Plan* that will include commercial development that will increase the number of jobs in Alameda by approximately 60 percent, to 43,000 by General Plan buildout (year 2035).
- The forecasted level of transit ridership would represent an increase in weekday ridership of approximately 37 percent compared with existing (year 2012) transit ridership, and a net increase of approximately 6,000 daily transit riders.
- The Future Baseline ridership forecast includes a baseline forecast of future transit demand to and from Alameda Point, estimated at approximately 3,000 riders as described further in this section. Since existing land uses at Alameda Point currently generate 400 daily transit trips (200 boardings and 200 return trips), this would represent a net increase of 2,600 transit riders at that single redevelopment site.

Figure 2-1 summarizes the order-of-magnitude increase in transit ridership that would result from buildout of the General Plan land uses, based on current levels of transit demand. As explained below, two categories of weekday ridership are shown:

  - **Peak Weekday** ridership reflects potential ridership demand on typical mid-week "work day" and "school day" conditions, excluding summer and winter periods in which travel is reduced during work and school vacation periods. Traffic demand models and traffic impact studies also typically focus on this "peak weekday" period, focusing on peak mid-week traffic conditions (Tuesday, Wednesday or Thursday) for purposes of assessing potential "worst-case" traffic conditions.
  - **Average Weekday** ridership reflects typical ridership over an entire year, not limited to peak, mid-week conditions. This is consistent with transit agency reporting of annual and weekday ridership, which is typically based on 250 or 255 annual weekdays, and 110 or 115 weekend days. Annual transit ridership is often estimated based on Average Weekday ridership multiplied by 300 days.

Figure 3-1 Future Baseline Transit Ridership

Forecasted Increase in Baseline Citywide Transit Demand (2010-2035)

Alameda Population & Jobs (see note 1)						Alameda Baseline Transit Demand Trip Rates (note 4)			Daily Transit Trips	
Year	Population	Dwelling Units (DU)	Total Jobs (note 2)	Employed Residents (note 1)	Non-Resident Employees (note 1)	Resident home-to-work transit mode share	Non-work transit trips per DU	Non-resident home-to-work mode share	**Peak Weekday Ridership (note 5)**	**Average Weekday Ridership (note 6)**
2000	72,200	32,000	23,000	36,000	15,000	0.157	0.18	0.069	19,100	16,800
2010	73,800	32,300	27,000	32,000	23,500	0.145	0.16	0.078	18,100	15,900
2035	80,000	35,000	43,000	43,000	35,500	0.157	0.16	0.080	24,800	21,800
2010-2035 Net Increase										
Increase	**6,200**	**2,700**	**16,000**	**11,000**	**12,000**				**6,700**	**5,900**
Pct change	*8%*	*8%*	*59%*	*34%*	*51%*				*37%*	*37%*

Notes:

(1) Year 2035 forecast of dwelling units, jobs & employed residents based on Alameda General Plan.

(2) Excludes residents working at home.

(3) Based on U.S. Census data, place of residence for Alameda jobholders in 2000 and 2010.

(4) Baseline transit demand rates for Alameda derived from U.S. Census data and Alameda County total rate per dwelling.

(5) Peak Weekday transit demand based on peak travel patterns evaluated for travel demand modeling purposes, consistent with

ITE trip rate methodology which focuses on peak, mid-week conditions and excludes summer & winter vacation periods.

(6) Average Weekday transit demand based on 255 annual weekdays, consistent with transit ridership data that is not limited to peak, mid-week ridership demand. Average Weekday Demand is estimated at 88% of Peak Weekday Demand.

POTENTIAL ADDITIONAL FUTURE DEMAND

Enhanced BRT and RBS service, and/or similar measures to increase speed and reduce headways, in combination with continued implementation of transportation demand management (TDM) measures as new development occurs, could further increase the level of transit ridership beyond the amount identified in the Future Baseline ridership forecast.

- Enhanced Transit Service such as the proposed BRT or RBS service could generate an additional 1,000 to 2,000 weekday riders based on a 10 to 20 percent increase in transit demand on the selected BRT/RBS corridors, based on typical levels of increased transit ridership that result from BRT/RBS projects
- Continued Implementation of Citywide TDM Measures could further increase the transit mode share for non-residents, commuting to new job sites in Alameda, from the current rate of just five to seven percent (based on Year 2000 and 2010 Census data) to a transit ridership rate for work trips similar to that of Alameda residents. For example, achieving a 15 percent transit mode share for commuters traveling to 18,000 new jobs in Alameda, by General Plan buildout in 2035, would generate an additional 2,500 to 3,000 weekday transit riders.
- Urban Design Factors also play a role, particularly the extent to which future development is design with transit and pedestrian access in mind.

Therefore, based on the ridership increase potential summarized above, an additional 1,000 to 5,000 future daily transit riders (in addition to the additional 6,000 riders generated by baseline growth described in Figure 3-1) could feasibly be generated at General Plan buildout with implementation of BRT/RBS or other service enhancements and/or continued implementation of strong TDM measures.

To be conservative, the evaluation of potential transit ridership described in the remainder of this section is based on Future Baseline level of transit demand, not on the potential additional transit demand described above.

ALAMEDA POINT REDEVELOPMENT

The former Alameda Naval Air Station is a Priority Development Area (PDA) as per the Association of Bay Area Governments' designation. The proposed redevelopment plan for Alameda Point has not been precisely confirmed, but per the direction received from the City, this analysis assumed a level of development derived from the Alameda Point *Station Area Plan*, "Transit Plus PDC Scenario." Based on that direction, the buildout assumption is as follows:

- Residential development consisting of 2,000 housing units (mix of single-family and multi-family units)
- Commercial development to provide 8,800 jobs within Alameda Point

Based on those buildout assumptions, a preliminary estimate of trip generation was prepared based on ITE trip generation rates. Since the precise mix of commercial land uses has not been determined, the ITE rate for "Business Park" development types was used to forecast AM, PM and Daily trip generation for the commercial portion of the development.

Trip Generation Forecast

Figure 3-2 provides a baseline trip generation forecast for Alameda Point redevelopment, which accounts for potential transit trips, as well as "internal trips" within Alameda Point. In the following section, mode split data and citywide model outputs will be presented to prepare an estimate of potential transit trips as a subset of the trips summarized below.

Figure 3-2 Alameda Point: Baseline Trip Generation Forecast

	Trip Rate Source(s):	**Trip Generation Rates (ITE)**			**AM Peak Hour Trips**	**PM Peak Hour Trips**	**Daily Trips**
		AM	PM	Daily			
691 Single-family dwellings	*ITE 210 (Single Family Detached)*	*0.75*	*1.01*	*9.57*	*518*	*698*	*6,613*
1,309 Multi-family dwellings	*ITE 220 (Apartment)*	*0.51*	*0.62*	*6.59*	*668*	*812*	*8,626*
2,000 dwellings					**1,186**	**1,509**	**15,239**
8,800 jobs	*ITE 770 (Business Park)*	**0.45**	**0.39**	**4.04**	**3,960**	**3,432**	**35,552**
Total Trips					**5,146**	**4,941**	**50,791**
Residential share of trips					23%	31%	30%
Commercial share of trips					77%	69%	70%

Source: Nelson\Nygaard 2010

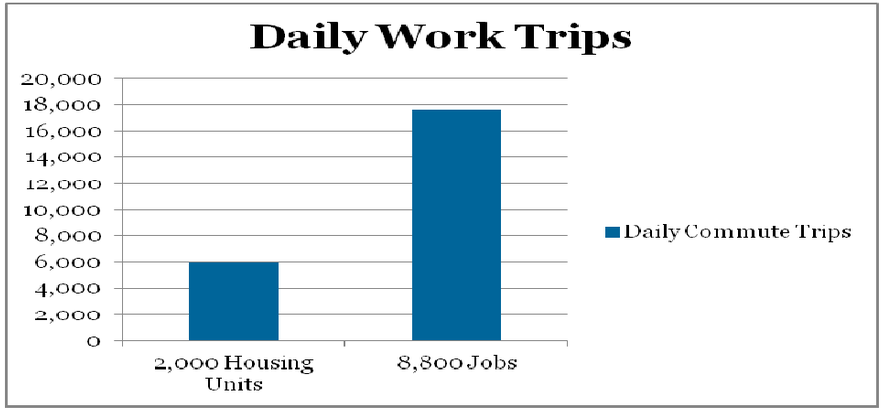
AP Work Trips & Potential Transit Trips

Based on the trip generation forecast as shown on Figure 3-2, the redevelopment of Alameda Point could generate approximately:

- Over 50,000 daily "person trips", including trips internal to Alameda Point , including over 23,000 daily "work" trips generated by 8,800 jobs and 3,000 employed residents at Alameda Point
- **2,000 daily "work" trips via transit (based on Year 2010 rates of 6% home-to-work transit ridership), and over 3,000 total daily transit trips (based on the citywide travel demand model forecast described on the following page).**
- ***Achieving the 15 percent transit mode share goal for Alameda Point jobs, identified by the 2008 Alameda Point Station Area Plan for all work-commute trips, would increase the potential daily transit demand at buildout to 3,600 daily "work trips" via transit (and more than 4,800 daily transit trips).***

Work trips (trips to and from places of employment) typically generate the vast majority of transit trips in the San Francisco Bay Area, including Alameda. As shown in Figure 3-3, approximately three-fourths of the commute trips generated at Alameda Point would be generated by the commercial portion of the development.

Figure 3-3 Alameda Point Work Trip Forecast



Source: Nelson\Nygaard 2010

Comparison with Citywide Model Forecast

The ITE-based trip generation forecast presented above was compared with model outputs provided by Dowling Associates from the City of Alameda's travel demand model (a subset of the Alameda County CMA model). The citywide model provides a forecast of daily "person" trips by all modes of travel, including transit, as well as origins/destinations patterns, to and from Alameda Point at buildout.

Dowling Associates updated the model to include the *2008 Alameda Point Station Area Plan* "Transit Plus PDC" land uses, and also updated to include the transportation network assumptions being currently evaluated. Based on those assumptions, the Alameda Point redevelopment is forecasted to generate:

- 55,000 daily person trips, including 9,000 internal person trips (i.e., trips within Alameda Point) and 46,000 external person trips (i.e., trip to/from destinations outside of Alameda Point)
- 3,100 daily transit trips generated by Alameda Point land uses at full build-out based on the citywide travel demand model forecast

Origin-Destination Pattern for Alameda Point Trips

Based on the origin/destination pattern identified in an earlier *2007 General Plan* citywide model run, the anticipated origin/destination trip distribution pattern for daily "person trips" to and from Alameda Point is as follows:

- Over 83 percent of daily person trips generated by Alameda Point land uses would be entirely within Alameda County including:
  - Internal trips within Alameda Point: 11% of daily person trips
  - Other neighborhoods within the City of Alameda: 27% of daily person trips
  - Oakland:13% of daily person trips
  - Other destinations in Alameda County:32% of daily person trips
- Just 6 percent of daily person trips would be to/from San Francisco, while another 6 percent would be to/from Contra Costa County, and 5 percent would be distributed among other counties

The anticipated distribution of transit trips differs from non-transit trips given the greater concentration of transit trips to/from San Francisco and Oakland:

- San Francisco (33% of daily transit trips)
- Central Oakland – defined as City Center and the MacArthur BART Station / "Pill Hill" area (31% of daily transit trips)
- Other parts of Oakland and Alameda County (21% of daily transit trips)
- City of Alameda (10% of daily transit trips)

- Contra Costa County (4% of daily transit trips)
- All other counties combined (1% of daily transit trips)

Distribution of Future Alameda Point Transit Ridership

As described in the two ridership forecasts summarized above, **the potential redevelopment of Alameda Point would generate approximately 3,000 daily weekday transit trips.** Based on a review of the various forecasts and origin/destination data, the anticipated distribution of Alameda Point transit demand would be as follows:

- 2,200 daily transit trips via Oakland including:
  - 1,800 daily transit trips to/from Oakland City Center and other destinations via BART, including the majority of San Francisco-bound transit trips
  - 400 daily transit trips to/from regional destinations and portions of East Oakland, that could be accommodated via transfer to BART at the Fruitvale or Oakland City Center/ 12th Street Station
- 500 daily transit trips within Alameda, with about half of internal trips potentially terminating on the Webster Street corridor
- 300 daily boardings to/from San Francisco via the Alameda-Oakland Ferry, based on a review anticipated origin & destination patterns for trips to/from San Francisco

The Alameda travel demand model outputs provided by Dowling Associates (*Alameda BRT – Travel Forecasts and Intersection Operations Memorandum*, January 19, 2011) provided a similar distribution for 3,125 daily transit trips generated by proposed Alameda Point land uses. The predicted distribution of transit trips based on the City of Alameda travel demand model is:

- 1,024 daily riders (generated by Alameda Point land uses) predicted by the model to use the proposed Alameda Point to Downtown Oakland/12th Street bus line
- 354 daily riders predicted by the model to use between Alameda Point to Fruitvale BART line
- 628 daily ferry riders between Alameda Point and San Francisco. However, the travel demand model does not incorporate "price sensitivity" into the forecast (and is more likely to assign trips in a direct path of travel)

Additional Ridership with BRT Service

Additional ridership, beyond the typical rates described above, may be generated by the provision of "enhanced" transit service, such as the proposed "Bus Rapid Transit" service to/from Alameda Point. Significant ridership increases have been documented by BRT systems in other cities, with ridership for existing transit lines increasing as much as 50 percent following an upgrade to BRT service.

A portion of such ridership increases generally includes existing transit riders that are diverted from other transit lines. In this case, this could potentially include existing Alameda BART riders that currently drive (or are dropped off) at one of the Oakland BART Stations (potentially diverting the "drive" portion of the trip to use the proposed BRT service to reach the BART Station).

Additional Ridership with Transportation Demand Management

Transit demand to/from Alameda Point will be largely impacted by the effectiveness of planned measures to discourage driving to/from Alameda Point. The Alameda Point *Station Area Plan* (AP SAP) recommended that transportation demand management (TDM) measures be implemented as part of any proposed Alameda Point redevelopment.

TDM programs have a range of transit ridership rates, from below 5 percent to over 20 percent, with parking policies being a key determinant affecting the transit mode share. One particularly relevant example of a successful TDM program in a suburban location that has achieved a 15 to 18 percent transit mode share is the Genentech campus in South San Francisco.

The 2008 Alameda Point *Station Area Plan* identified a goal of achieving a 16 percent transit mode share for all commute trips to/from Alameda Point, consistent with the current residential mode share.

- Achieving this goal requires an increase in transit usage from 5 percent, based on the current mode share for Alameda jobs, to 16 percent, which would generate an additional 1,900 daily transit boardings and alightings for Alameda Point peak-hour work trips at full buildout.

Based on successful TDM programs elsewhere, such an increase can be achieved if the proposed transit service is provided in conjunction with a TDM program that includes pricing strategies to discourage driving, such as parking charges and/or road tolls. Lacking the inclusion of pricing strategies, the TDM program would be unlikely to help achieve this mode share goal.

WEST END RIDERSHIP (BETWEEN MAIN & WEBSTER STREETS)

This section describes the potential additional ridership to/from Downtown Oakland/12th Street BART Station that would be generated by land uses bordering the Atlantic/RAMP and Pacific/Lincoln corridors, within the West End and outside of Alameda Point (east of Main Street and west of Webster Street). This evaluation of potential ridership east of Main Street and west of Webster Street provides a comparison of potential ridership on the two study corridors (excluding Alameda Point).

West Atlantic/RAMP & Pacific/Lincoln Corridors Comparison

Figure 2-13 provides a comparison of existing and future model-based transit demand based on existing and forecasted population and employment, derived from MTC data, within one-fourth and one-half mile of the West Atlantic Avenue/Ralph Appezzato Memorial Parkway (RAMP) and Pacific Avenue/Lincoln Avenue corridors.

This ridership forecast is limited to parcels within one-half mile of each corridor, and therefore does not include the upcoming Alameda Landing (AL) redevelopment(s) to the north of Willie Stargell Avenue that would generate additional West End transit demand, since of the bulk of the AL site is more than one-half mile from the Atlantic/RAMP corridor.

Figure 3-4 Comparison of Transit Demand by Study Corridor (Main to Webster Streets)

Corridor	Atlantic/RAMP (West of Webster)				Pacific/Lincoln (West of Webster)			
	1/4-mile		1/2-mile		1/4-mile		1/2-mile	
Year	2010	2035	2010	2035	2010	2035	2010	2035
Population	5,927	7,309	11,481	14,275	8,294	9,211	14,058	16,160
Employment	1,355	2,874	3,840	7,538	1,296	2,358	3,295	6,234
Transit Trips	505	**622**	736	**915**	526	**584**	865	**994**

Source: Nelson\Nygaard 2010, based on MTC population & employment data.

Existing transit demand within the West End is slightly higher along the Pacific/Lincoln corridor compared to West Atlantic/RAMP:

- Daily demand for 865 daily transit trips within half-mile of Pacific/Lincoln, compared with 736 daily transit trips within half-mile of West Atlantic/RAMP
- The rate of transit demand (transit trips per household or job) is higher along the West Atlantic/RAMP corridor (perhaps due to a larger portion of multi-family residences along RAMP)

Future (Year 2035) land use forecast for the two corridors predicts greater growth in future transit ridership within one-fourth mile of the West Atlantic/RAMP corridor within the West End:

- Daily demand for 995 daily transit trips within half-mile of Pacific/Lincoln, compared with 915 daily transit trips within half-mile of West Atlantic/RAMP
- Current (Year 2012) boarding data indicates just 400 daily transit trips today, about 20 percent lower than the projected 500 daily boarding above, which may reflect the reduction in the number of employed residents, discussed previously, following the 2008 economic downturn

Based on this data, the proposed Alameda Point to Oakland City Center/12th Street BART service could attract approximately 800 daily riders via either the West Atlantic/RAMP or Pacific/Lincoln corridor under Year 2035 conditions

- This includes 400 existing daily West End riders that currently use the AC Transit 31 line, in addition to 400 current (Year 2012) daily transit boardings generated by passengers for trips that begin or end at Alameda Point today.
- Ultimately, the 31 line could be integrated into the planned BRT or RBS option, to reduce the net cost of providing enhanced service, and/or the Line 31 route could be re-aligned to serve another corridor, potentially focused on the northern waterfront, or another corridor to the south to increase the potential to draw additional transit riders, such as Encinal Avenue, depending on which corridor(s) are ultimately preferred for potential BRT or RBS service.

Based on the information summarized above, the Alameda Point to 12th Street service could generate an additional 1,100 daily riders on the segment outside of Alameda Point (between Main Street and the Webster/Posey Tube). This would include some riders diverted from current AC Transit service, as well as potential BART riders that would otherwise drive (or be dropped off) to/from an Oakland BART Station.

The Citywide model run conducted by Dowling Associates (*Alameda BRT – Travel Forecasts and Intersection Operations Memorandum*, January 19, 2011) predicts a higher number of daily riders generated by land uses outside of Alameda Point: over 3,400 daily riders on the proposed BRT line between AP and 12th Street BART. However, the model forecast likely includes some diversion of transit trips from other services, such as AC Transit's 51A and 31 lines to/from Downtown Oakland, including trips serving College of Alameda and Oakland

Chinatown. In addition, the citywide model may assume a higher rate of "employed residents per dwelling unit" than is currently the case in Alameda.

4. CORRIDOR COMPARISON

Preliminary design options for physical improvements were developed and evaluated for each of the two initial study corridors described in Chapter 1 (West Atlantic/RAMP/Clement and Lincoln/Pacific/Tilden), focusing on the study area between Main Street in Alameda (the eastern boundary of the former Alameda Naval Air Station) and two BART stations located in Oakland (Oakland City Center/12th Street Station and Fruitvale Station).

COMPARISON CRITERIA

This chapter provides a comparison of the transit route and physical improvement options that were evaluated as part of this study based on an order-of-magnitude comparison of the following measures of effectiveness:

- Construction cost
- Proximity to higher density development areas
- Travel time & operating cost
- Ridership potential to serve new development
- Right-of-way availability
- Ability to provide public/private partnerships to make cost-effective

STUDY CORRIDOR PARAMETERS

The intent of the study is to compare several physical improvement and transit service options for potential implementation, focusing on the two transit priority corridors identified by the Alameda *General Plan* for potential "exclusive right-of-way" (i.e., designated transit lanes) and enhanced service (see Figure 4-1):

- West Atlantic/Ralph Appezzato Memorial Parkway (RAMP)/Clement
- Pacific/Lincoln/Tilden

Each of the two initial study corridors (see Chapter 1, Figures 1-2 and 1-3) was evaluated based on the two primary transit route options via the following two routes:

- **West End** transit route (Alameda Point to Oakland City Center) via Ralph Appezzato Memorial Parkway (RAMP) or Pacific Avenue transit corridors (with connection to Downtown Oakland via Webster Street and Webster/Posey Tubes)

  - In order to serve the greater number of potential regional transit trips, the recommended terminus for service to/from Downtown Oakland is the 12th Street/Oakland City Center Station. Service to this station would maximize potential ridership by serving employment locations in Downtown Oakland, as well as the AC Transit service hub at 14th & Broadway, in addition to regional BART service.

- **North Alameda** transit route (Alameda Point to Fruitvale BART Station) via the Clement or Lincoln Avenue study corridors (continuing to Oakland via the Fruitvale Bridge to Fruitvale Avenue).

Key physical elements under each alternative include:

- **Half-mile spacing of bus stops** (approximate) to minimize travel time
- **Dedicated bus-only lanes and/or "queue jump" lanes on key segments,** particularly to minimize bus delay approaching the Tube entrance in Alameda
- **Traffic signal enhancements**, including transit-priority and dedicated bus left-turn phases where needed
- **Enhanced bus stops** with level boarding platform to accommodate reduced dwell time
  - Bus stops would include bus shelters, and other amenities such as benches, trash cans, and real-time information.

STRATEGIC ACCESS & TRANSFER POINTS

Key Access & Transfer Points within Alameda

Each of the corridor study options is envisioned to serve the following key transit station and transfer locations within Alameda:

- **ALAMEDA POINT:** Proposed Alameda Point transit center at West Atlantic Avenue & Orion Street or Seaplane Lagoon
  - Potential design options are contingent on street configuration to be confirmed during upcoming (2012-13) *Precise Plan* and Alameda Point rezoning process currently occurring

- **WEBSTER STREET:** West End transfer point at West Atlantic or Pacific
  - Transfer point for AC Transit Lines 20, 31, 51A, O, and OX, as well as Estuary Crossing Shuttle and future service to Alameda Point (see Chapter 2 description of existing service)
  - Potential park & ride location near Webster Street along Mariner Square Drive
  - Proximity to College of Alameda from West Atlantic & Webster

- **PARK STREET:** North Alameda transfer point at Santa Clara (existing) or Lincoln (proposed)
  - Transfer point for AC Transit Lines 20, 21, 51A, O, and OX (see Chapter 2 description of existing service)
  - Existing transfer point provided at Park & Santa Clara
  - Potential relocation to Park & Lincoln (if AC Transit Lines 51A and O relocated from Santa Clara to Lincoln)

Figure 4-1 Proposed West Atlantic & Webster Street Transfer Point (Conceptual Illustration)

Regional Transit Connections

The City of Alameda is in close proximity to several BART locations in Oakland, including the Fruitvale, Coliseum, Lake Merritt, West Oakland and 12th Street stations. Most of these stations are served by at least one connecting AC Transit service. The Harbor Bay Business Park currently provides a connecting shuttle service (from the Coliseum station) to employees and visitors during peak commute hours.

The three stations considered as potential regional-connection points are described below (excluding Coliseum station given the distance from Alameda Point and West End):

Downtown Oakland Stations

The stations that are most likely to be best situated for providing regional transit connections to the West End of Alameda are those stations located in Downtown Oakland.

12th Street Oakland City Center Station

The 12th Street station is a major transfer station for BART trains, providing direct and connecting service to all BART lines. The 12th St station provides curb space and access challenges as it is also a major staging and transfer stop for several AC Transit lines and is located on a major, busy corridor (Broadway) that is impacted by residential and commercial traffic. The City has worked closely with Oakland, AC Transit and BART to address access issues at the station in its preliminary plans for AP shuttles. There are plans for various regional transit enhancements (including queue jumps, BRT lanes and signal priority) along corridors that connect to the 12th Street station that would improve route and scheduling services when implemented.

Lake Merritt Station (LMS)

The Estuary Crossing Shuttle (ECS) currently provides service to/from the Lake Merritt station which was chosen to serve students attending both the College of Alameda and Laney College campuses. In addition, terminating at LMS avoids several of the busier corridors of Downtown Oakland. Direct access to this station is along less-congested streets in Oakland and provides closer and easier access for shuttles serving College of Alameda. The City has worked closely with Oakland, BART and AC Transit on planning a new, expanded bus stop and staging area at LMS that will better serve riders and transit providers. BART plans expanded bicycle parking at the station and there is a major TOD project in the initial stages of development. When BART completes its south bound connections (Warm Springs, Silicon Valley) LMS could have an will be enhanced as a connection to the residents/employees of the South Bay.

Comparison of Downtown Oakland Stations

In comparing the 12th Street and Lake Merritt Stations as a transfer point to/from Alameda Point:

- Lake Merritt Station is less desirable, compared to 12th Street Station, because it is:
  - Served by less frequent peak-hour BART service than 12th Street Station (fewer total trains during peak hours)
  - Is not a hub for AC Transit service (and will not be served by the planned East Bay BRT that will operate on 11th/12th near LMS), and has difficulty with staging and transfer stops for those AC Transit lines that utilize the station
  - Is not located within the employment core of Downtown Oakland near Broadway
- 12th Street Station is the preferred option as a regional-connection point because it is:
  - Served by more frequent BART Service than Lake Merritt Station (particularly with more total trains during peak hours)
  - A key hub for AC Transit bus service, including the San Pablo Rapid and International/Telegraph lines (and planned East Bay BRT service) that do not serve the Lake Merritt Station
  - Located within the core of the Downtown Oakland commercial and governmental center, a destination for a much greater number of trips than Lake Merritt Station (thus maximizing ridership potential)

Fruitvale Station

The Fruitvale Station is the southern terminus for two AC Transit lines serving Alameda, lines 21 and 51A. However, the bulk of Alameda transit ridership is generated by trips to/from downtown Oakland and San Francisco. For that reason: line 51A ridership is much higher at the 12th Street Oakland City Center Station than at the Fruitvale Station. Nonetheless: when BART completes its south bound connections (Warm Springs, Silicon Valley), Fruitvale Station will also serve as a connection to the South Bay. Given that potential: the provision of future BRT or RBS service between Alameda Point and Fruitvale Station was proposed for evaluation as part of this study. However, as will be described later in this report: such South Bay connections to/from Alameda Point could be adequately served via transfer from 12th Street Station with a similar total travel time (see Figure 4-26) given the distance between Fruitvale Station and Alameda Point. Nonetheless, Fruitvale Station provides a key regional access point to/from most other parts of Alameda, including the Civic Center and Northern Waterfront.

PHYSICAL IMPROVEMENT OPTIONS

West End Transit Route: Alameda Pt to Oakland City Center

West End transit route is envisioned to provide a dedicated route for enhanced long-term service between Alameda Point and the Oakland City Center / 12th Street BART Station. This route is currently served via AC Transit Route 31 (see Chapter 2 for description of existing service and map).

West End Service Parameters

Long-term service to Alameda Point, west of Main Street, would terminate at the proposed Alameda Point Transit Center. As proposed in the *Alameda Point Station Area Plan*, redevelopment of Alameda Point will include a centrally located transit hub on West Atlantic Avenue, within walking distance of a majority of future job sites. Based on land use planning that occurred in 2011, the current preferred location for the Alameda Point Transit Center has been identified as the vicinity of West Atlantic and Orion Streets or the Sea Plane Lagoon

Route & Physical Improvement Options

West End alignment options (Main Street to Webster Street) would operate via Pacific/Lincoln or West Atlantic/RAMP study corridors with the following physical improvements:

- **Option W-1-A: Median BRT via Pacific Avenue** with dedicated bus lanes in both directions from the intersection of Pacific Avenue & Main Street to Webster Street (see Figure 4-3), operating in the center travel lanes. This option would require conversion of two existing motor vehicle travel lanes to bus-only operation. Left-turn restrictions for private vehicles would be required at some intersections.
- **Option W-1-B: Side-running BRT via Pacific Avenue** with dedicated bus lanes in both directions from the intersection of Pacific Avenue & Main Street to Webster Street (see Figure 4-3), operating in the curb-wide travel lanes. This option would conflict with private vehicle access to curb-side driveways and on-street parking. Therefore, this option was not evaluated.
- **Option W-1-C:** Side-running RBS via Pacific Avenue with shared travel lanes in both directions.
- **Option W-2-A: Median BRT via Ralph Appezzato Memorial Parkway (RAMP)** with dedicated bus lanes in both directions from West Atlantic Avenue & Main Street to Webster Street (see Figure 4-4), operating in a center-median configuration. Given available right-of-way, the existing eastbound travel lanes could be relocated to accommodate a median transitway on this segment of RAMP without requiring lane removal or left-turn restrictions.

- **Option W-2-B: Side-running BRT/RBS via Ralph Appezzato Memorial Parkway (RAMP)** with dedicated bus lane in eastbound direction only, from West Atlantic Avenue & Main Street to Webster Street (see Figure 4-5). Traffic delay on RAMP is primarily in the eastbound direction. Providing a dedicated bus lane in the eastbound direction only would allow buses to by-pass the eastbound vehicle queue that frequently occurs approaching the signal at Webster Street, while westbound buses are less likely to be delayed.
- **Option W-2-C:** Side-running RBS via Ralph Appezzato Memorial Parkway (RAMP) with shared travel lanes in both directions.

Estuary crossing service to Oakland would be provided under all three study options via the Webster Street corridor (from Pacific or West Atlantic Avenue in Alameda, to 7th Street in Downtown Oakland) be served via Webster Street and Webster/Posey Tubes

- Buses would operate in shared travel lanes with motor vehicles within the Tubes (see Figure 4-8)
- Northbound dedicated bus-only lane is proposed on Webster Street between West Atlantic Avenue and Willie Stargell Avenue (see Figure 4-8)

Figure 4-2 West End Option W-1-A: Pacific Avenue with Median Transitway

Figure 4-3 West End Option W-2-A: RAMP with Median Transitway

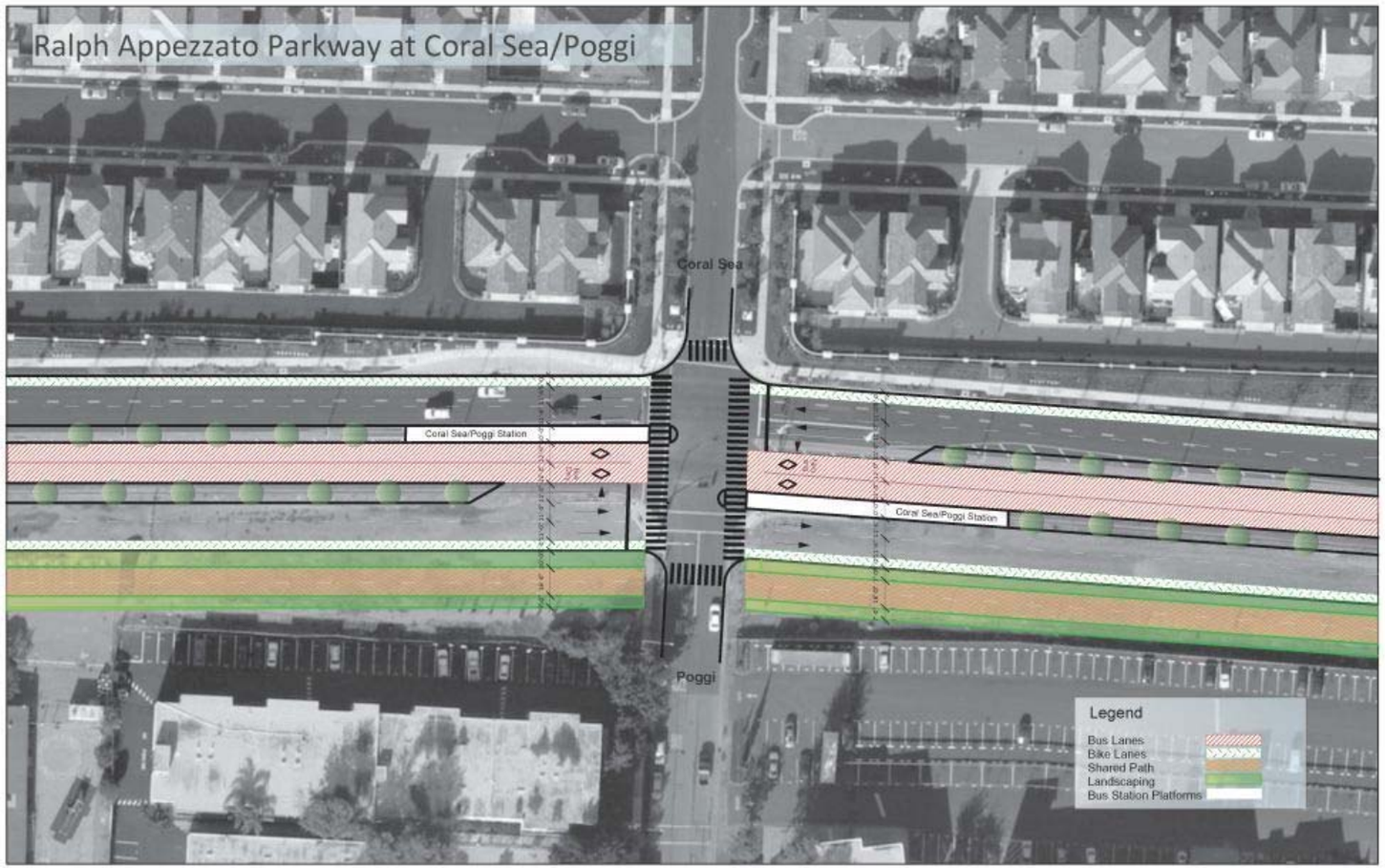
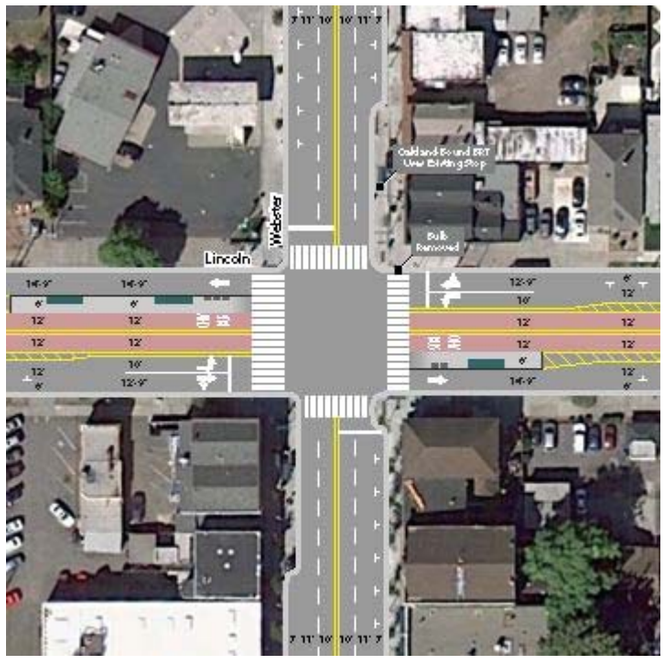


Figure 4-4 West End Option W-2-B: RAMP with EB Transitway & WB Shared Lanes

Figure 4-5 Strategic Transit Point with West End Option W-1-A (Pacific & Webster)

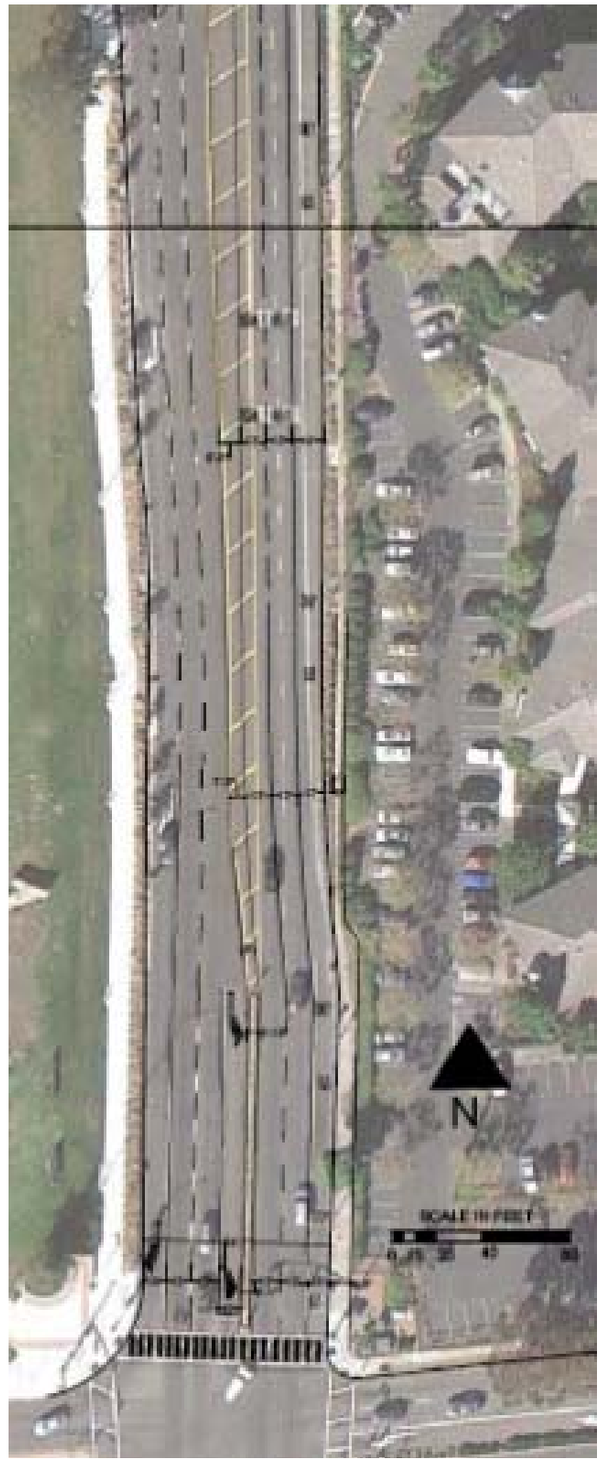


Early concept of potential transit center and strategic transit point at Pacific Avenue & Webster Street under West End Option W-1-A. As envisioned under this concept: an eastbound bus platform on Pacific would serve buses headed towards Fruitvale BART Station, while northbound buses headed towards Oakland City Center would use the northbound stop on Webster Street (northeast corner of intersection). However, the combined frequency of northbound buses on Webster would likely require an increase in the length of the northbound stop, in order to accommodate up to three buses simultaneously.

Figure 4-6 Strategic Transit Point with West End Option W-2-B (West Atlantic & Webster)

Proposed transit center and strategic transit point at West Atlantic Avenue & Webster Street under West End Option W-2-B. With this configuration: eastbound buses would be allocated a separate left-turn signal phase, in order to make the eastbound left-turn from the curb-side stop on Ralph Appezzato Memorial Parkway to northbound Webster Street. In addition, buses arriving from Alameda Point to Oakland would be allocated a separate stop from northbound buses by utilizing the proposed stop as shown on the southwest corner (prior to the separate left-turn phase for buses).

Figure 4-7 Estuary Crossing: Proposed Northbound Bus Queue-Jump Extension

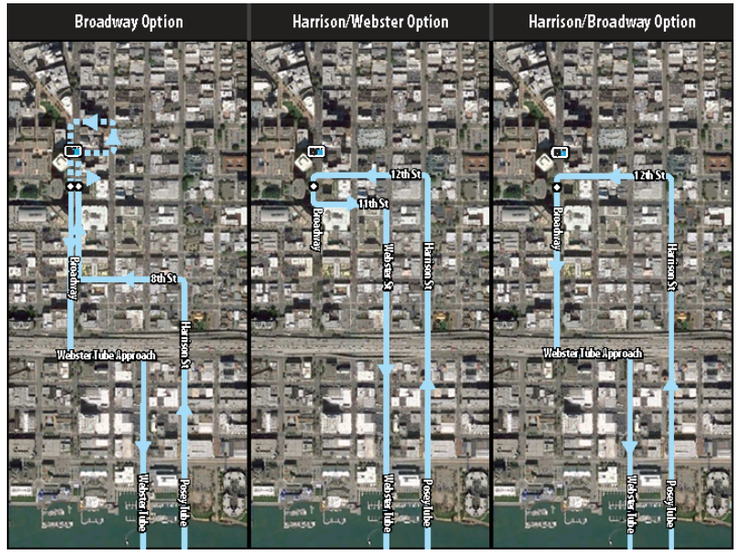


Oakland City Center "Loop" Route Options

Service within Downtown Oakland (to/from Alameda Point) is proposed to operate in a "one-way loop" between the Webster & Posey Tube portals south of 7th Street and 14th & Broadway.

- Based on early discussions with AC Transit and City of Oakland staffs, several preliminary alignments were initially considered as shown on **Figure 4-9 Downtown Oakland: Preliminary Route Options**.
- Following subsequent discussions with AC Transit staff, the Broadway and Harrison/Broadway Options were initially deemed to be potentially infeasible given the significant volume of existing north/south bus service on Broadway. However, AC Transit staff did indicate that use of some segments of Broadway may be allowable, particularly if AC Transit is the ultimate service operator.
- The preliminary Harrison/Webster Option was modified to serve 14th & Broadway (via 14th westbound from Harrison) with a return route via Clay and Broadway.

Figure 4-8 Downtown Oakland: Preliminary Route Options



Based on AC Transit's initial preference for the service route to avoid impacts to existing bus service operating on Broadway, the proposed Downtown Oakland route options were expanded to include an alternate route that would avoid most of Broadway, via a longer loop to Clay Street, as shown on **Figure 4-10, Downtown Oakland: Proposed Harrison/Clay Route Option**.

Preliminary segment descriptions for the proposed Downtown Oakland service via the Harrison/Clay Route Option are provided on Figures 4-11 to 4-14. Buses arriving from Alameda Point would travel in shared (transit/private vehicle) travel lanes on the following streets:

- north on Harrison Street to 14th Street, then
- west on 14th Street to Clay Street, then
- east on 12th Street, then
- south on Broadway, then
- east on 7th Street
- south on Webster Street (to Alameda).

Transit signal enhancements are proposed to facilitate bus left-turn movements at the following intersections:

- Harrison & 14th
- 14th & Clay
- Clay & 12th
- Broadway & 7th

Up to four *enhanced bus stops* are proposed within Oakland:

- 14th & Broadway (Oakland City Hall/Frank Ogawa Plaza and BART Station Drop-off Point)
- 12th & Broadway (Oakland City Center / 12th Street BART Station)
- Oakland Chinatown (2 stops):
- Northbound stop on Harrison Street (potential location to be determined following consultation with Chinatown community)
- Southbound stop (to Alameda) on 7th or Webster Street

Figure 4-9 Downtown Oakland: Proposed Harrison/ Clay Route Option

Proposed one-way via Harrison / 14th / Clay / Broadway / 7th as shown on Figure 4-9 was selected to minimize impacts to existing transit service on Broadway.

Figure 4-10 Downtown Oakland Segment A: Harrison Street

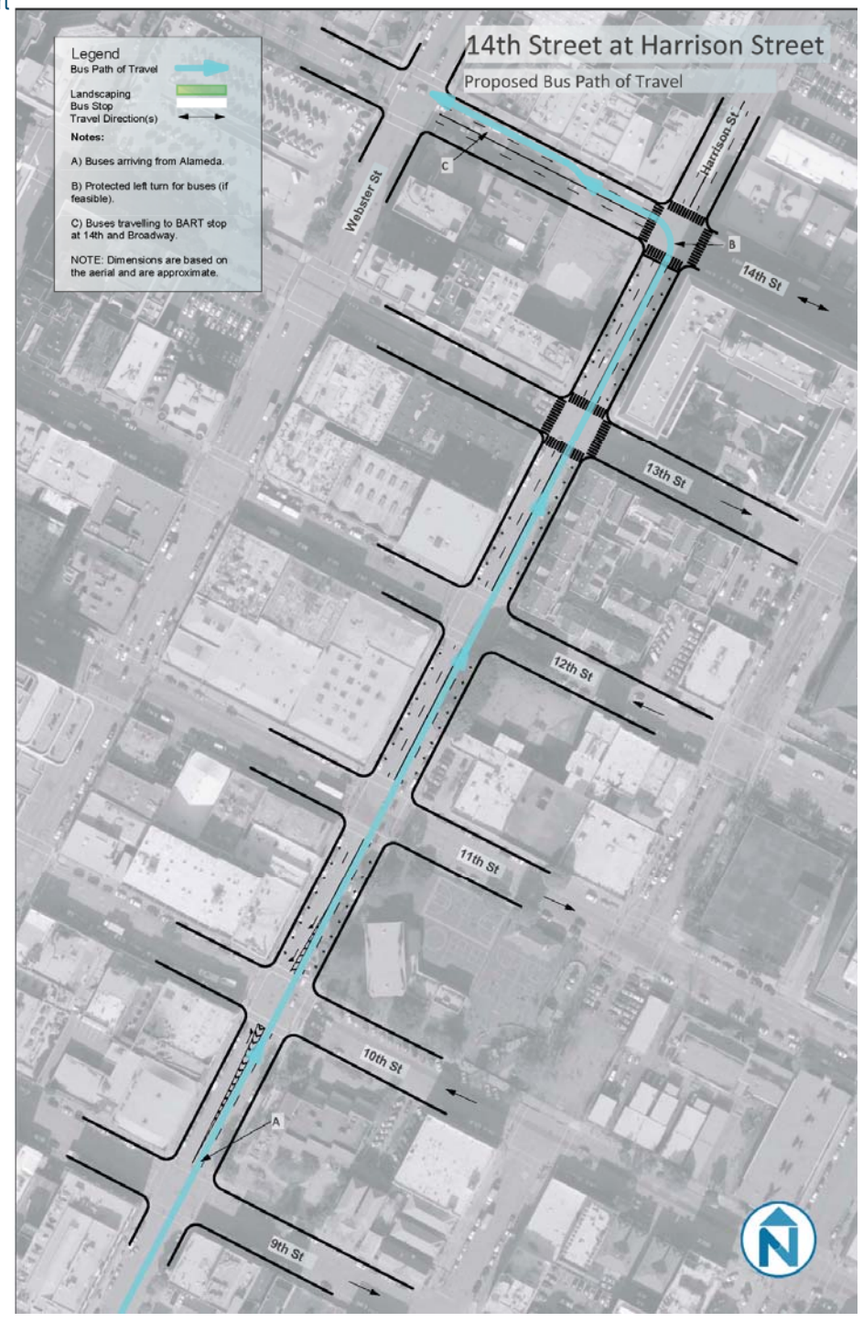


Figure 4-11 Downtown Oakland Segment B: 14th Street

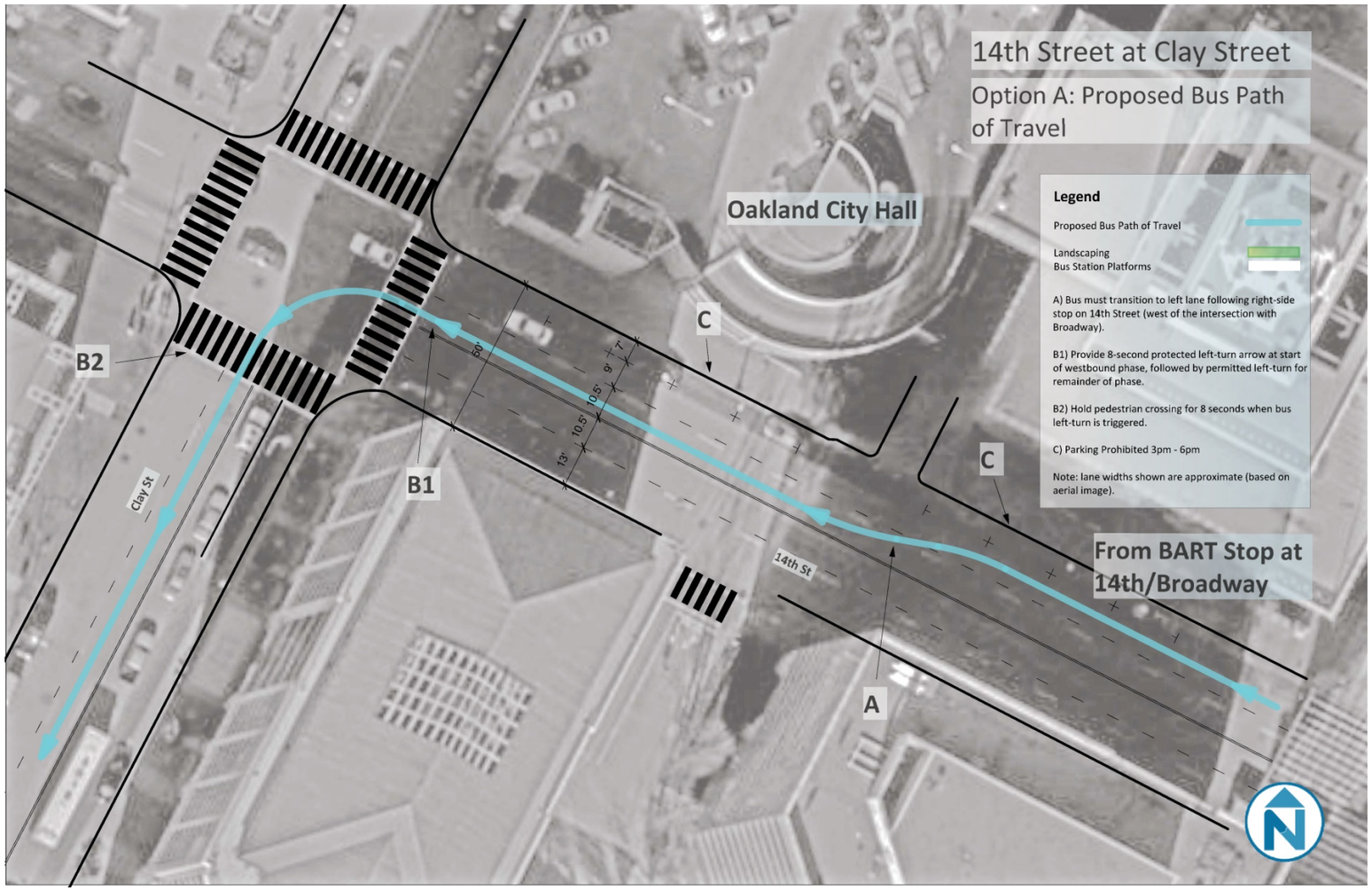


Figure 4-12 Downtown Oakland Segment C: Clay Street & 12th Street

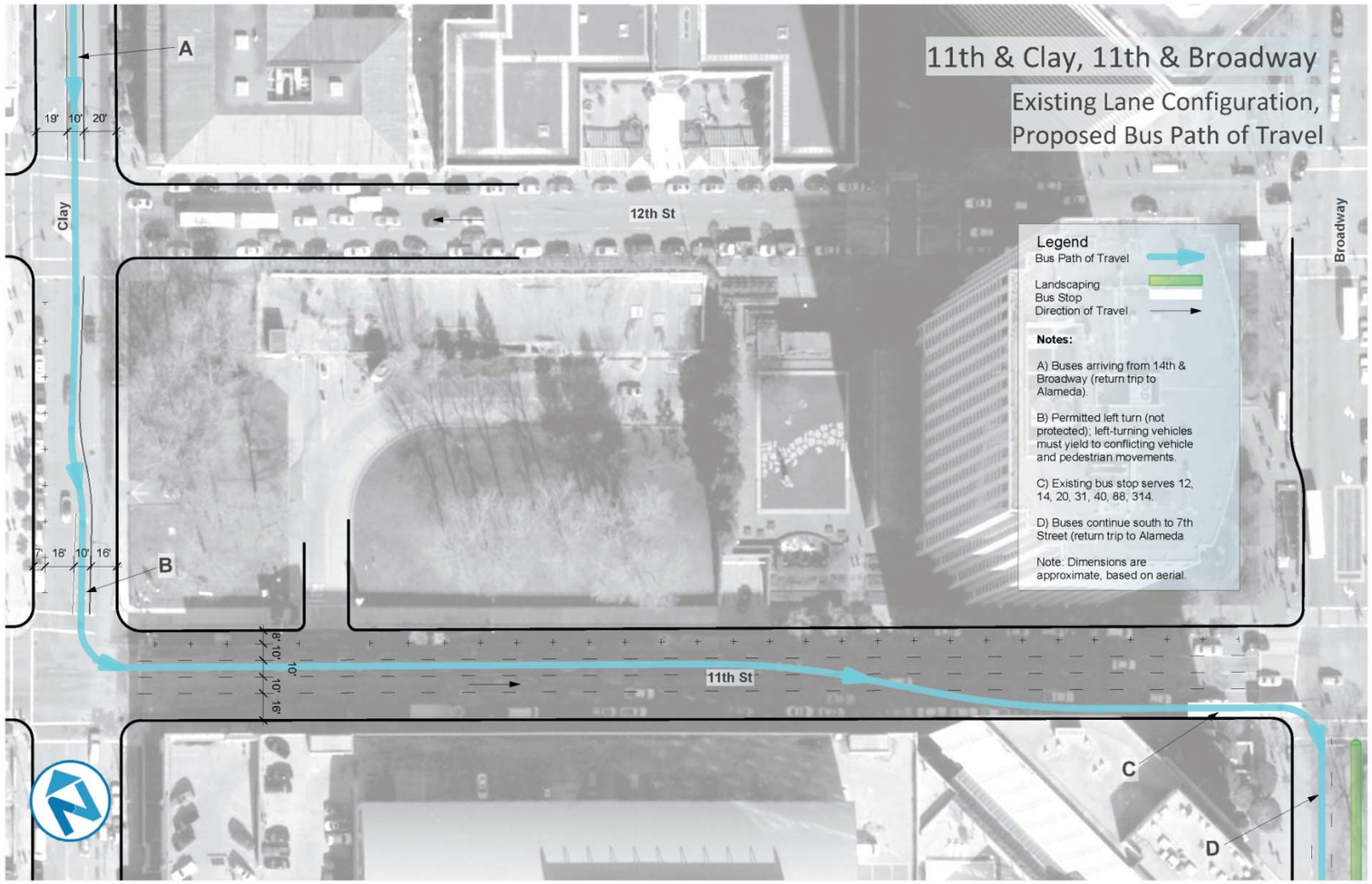
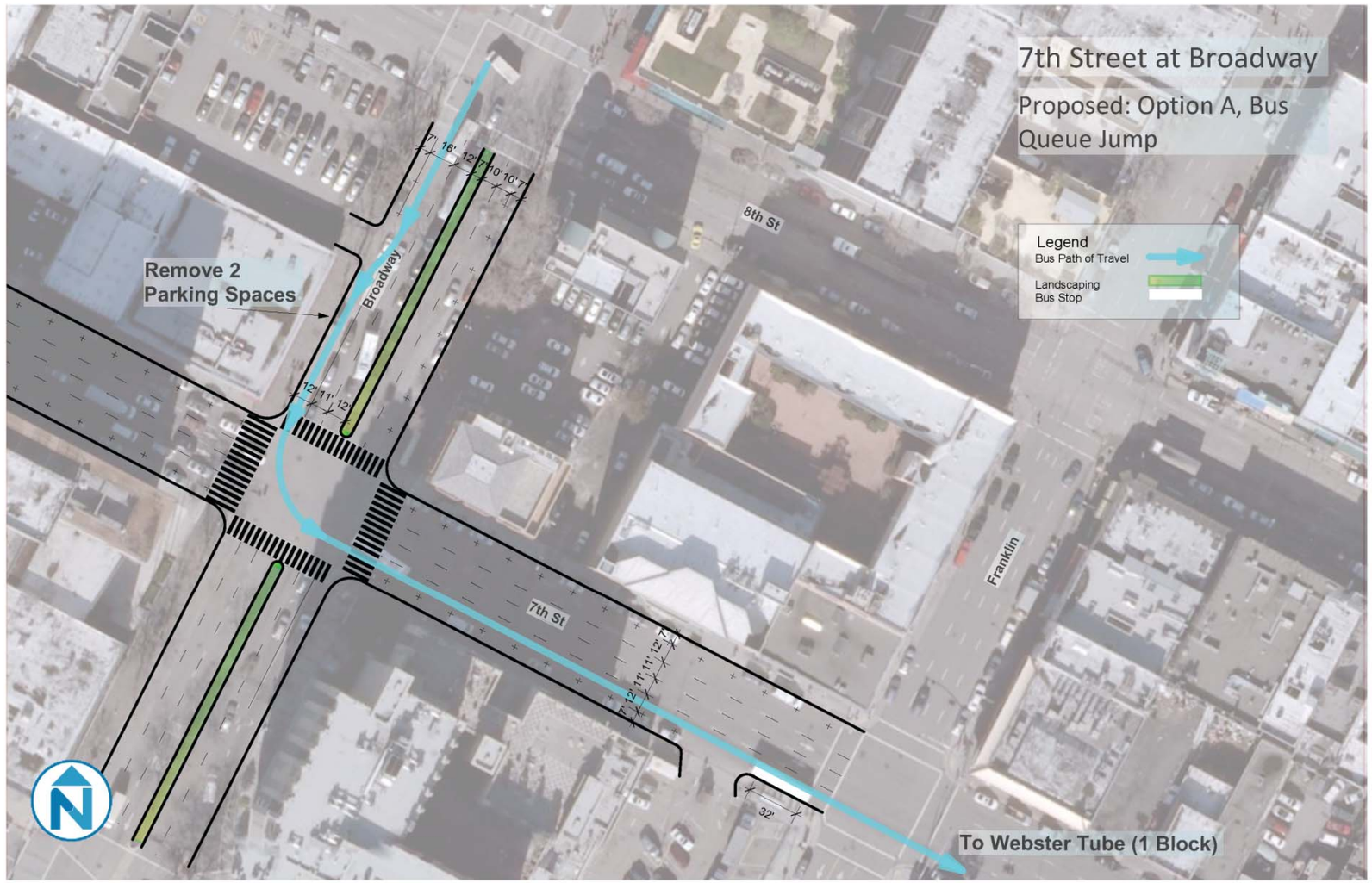


Figure 4-13 Downtown Oakland Segment D: Broadway & 7th Street



NORTH ALAMEDA TRANSIT ROUTE OPTIONS:

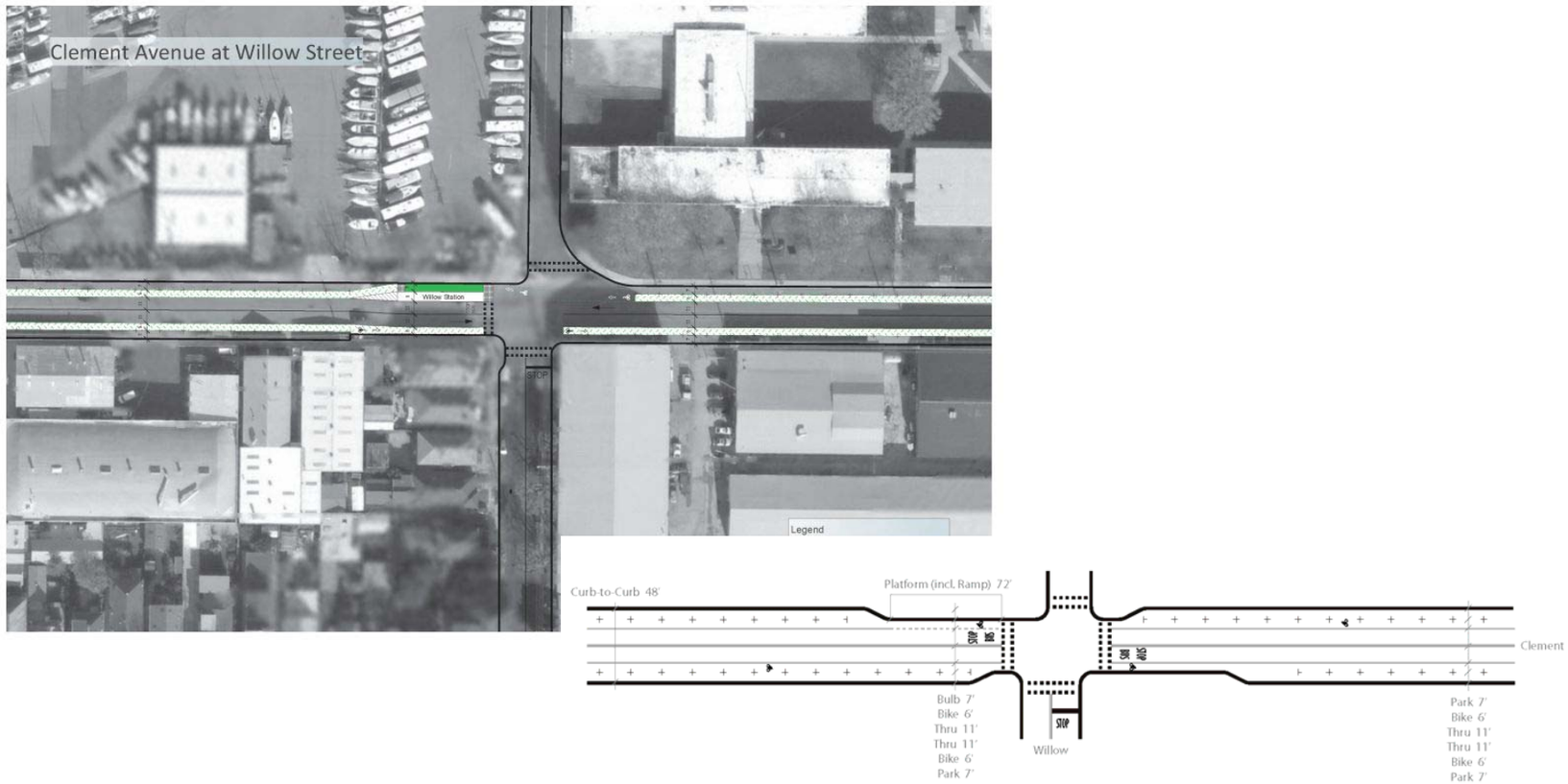
North Alameda transit route is envisioned to provide enhanced long-term service between the West End and Central Alameda, via a North Alameda and the Fruitvale BART Station (served via AC Transit Route 51A that operates on Santa Clara Avenue).

Physical Improvement & Route Options

North Alameda alignment options (for continuing service east of Webster Street to Fruitvale BART Station) via West Atlantic/Clement or Lincoln study corridors:

- **Option N-1-A: West Atlantic / Clement Bus Lanes (Side-running BRT)** with dedicated right-of-way (i.e., bus-only lanes) in both directions on the entire length of West Atlantic and Clement, east of Webster to Tilden Way, as proposed in the *Alameda General Plan*. This option would require removal of on-street parking on segments of Clement Avenue, given the curb-to-curb width of 48 feet, in order to provide space for dedicated "bus-only lanes". For that reason, this option was not evaluated further.
- **Option N-1-B: West Atlantic / Clement Bus Lanes (Median BRT)** with dedicated right-of-way (i.e., bus-only lanes) on West Atlantic and Clement, east of Webster to Tilden Way, as proposed in the *Alameda General Plan*. This option would require removal of on-street parking on segments of Clement Avenue, given the curb-to-curb width of 48 feet, in order to provide space for dedicated "bus-only lanes". In order to provide space for station stops within the median, it would not be possible to provide dedicated 'bus-only lanes" in both directions at station locations. Therefore, segments near center-platform stops on Clement would be limited to just one bus lane near the center-platform. For that reason, this option was not evaluated further.
- **Option N-1-C: West Atlantic / Clement RBS** with shared travel lanes with motor vehicles in both directions on Clement Avenue from Grand to Park Street (see Figure 4-15), in order to maintain on-street parking and provide space for bicycle lanes.
- **Option N-2: Lincoln Avenue Bus Lanes (Median BRT)** with dedicated bus lanes in both directions, as proposed in the *Alameda General Plan,* from Webster to Park Street (see Figure 4-16) and shared travel lanes on Tilden (east of Lincoln & Park) and Fruitvale Avenue. This option would require prohibitions on left-turn movements by private vehicles at most intersections.
- **Option N-3: Lincoln Avenue RBS** with shared travel lanes in both directions (see Figures 4-17 and 4-18). This option would not require restrictions on turning movements by private vehicles.
- **Option N-4: Santa Clara Avenue RBS** with shared travel lanes in both directions east of Webster. This option would focus potential improvements on the existing Santa Clara Avenue priority transit corridor that is already utilized by AC Transit for Route 51A and Transbay service. The General Plan does <u>not</u> designate Santa Clara Avenue for potential "dedicated right-of-way" (i.e., bus-only lanes) given the limited roadway width that cannot accommodate bus-only lanes in addition to bicycle lanes and on-street parking

Figure 4-14 Option N-1-C: Clement Avenue with Shared Travel Lanes & Enhanced Stops

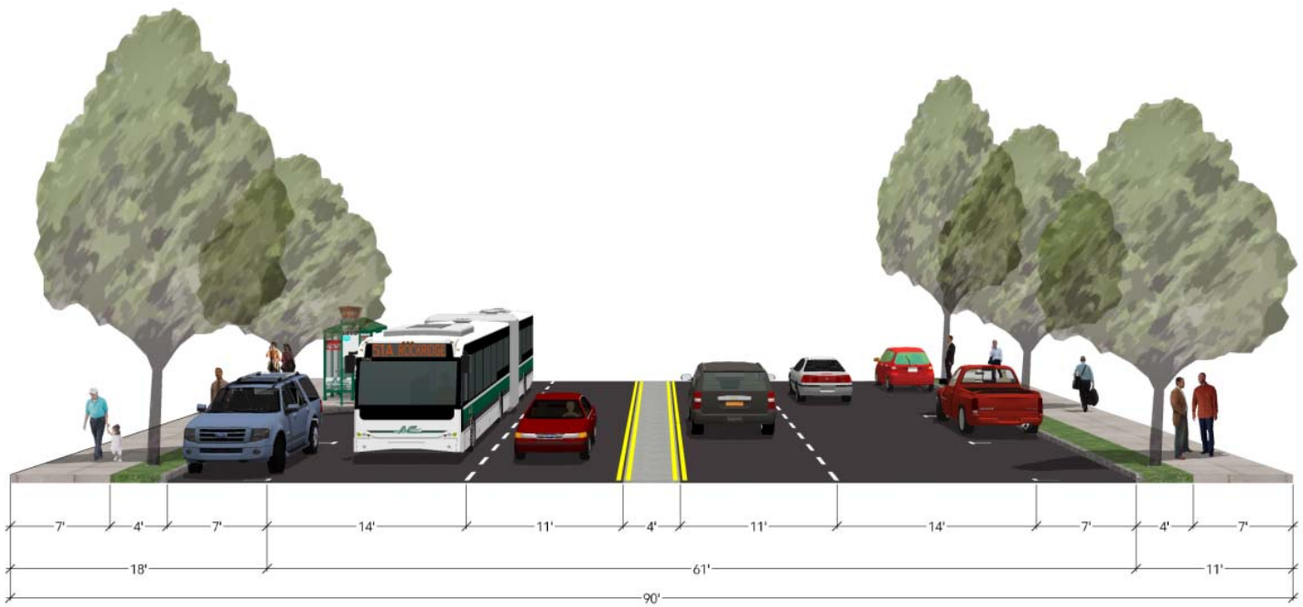


As shown above: the narrow roadway width on Clement Avenue and competing space needs (on-street parking and planned bicycle lanes) precludes provision of dedicated bus lanes.

Figure 4-15 Option N-2: Lincoln Avenue with Median BRT

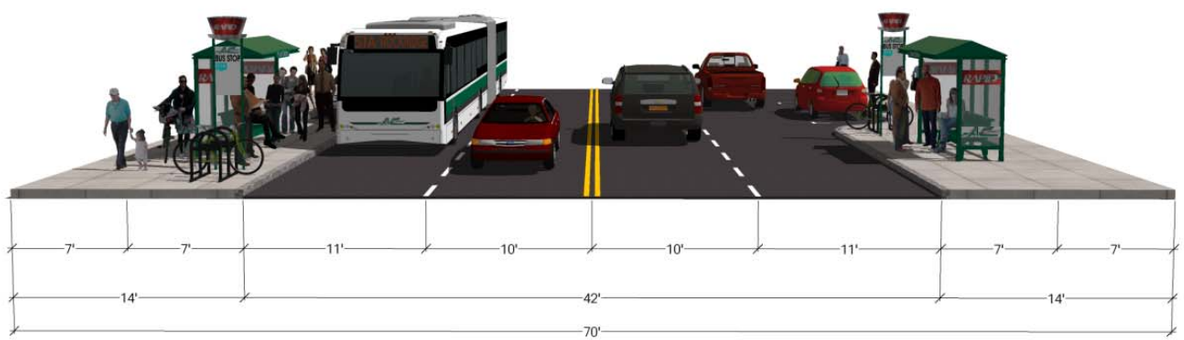
Proposed provision of a dedicated right-of-way on Lincoln Avenue (consistent with the Alameda General Plan) could be accommodated by converting two existing motor vehicle lanes to dedicated bus lanes within a median busway. Left-turn prohibitions would be necessary at most intersections.

Figure 4-16 Option N-3: Lincoln Avenue with Shared Travel Lanes (RBS) – West of Bay St



Existing Cross Section with Proposed RBS (west of Bay Street with 90’ right-of-way). As shown: existing curb-to-curb width modified with 7’ wide bus stop bulbout. (Note: lane dimensions could be further refined by narrowing the existing 4’ striped center-median to provide 15’ travel lanes for buses adjacent to 8’ on-street parking spaces).

Figure 4-17 Option N-3: Lincoln Avenue with Shared Travel Lanes (RBS) – East of Bay St



Existing Cross Section with Proposed RBS (east of Bay Street with 70' right-of-way). As shown: 56' existing curb-to-curb width modified with 7' wide bus stop bulbout.

WEST END CORRIDOR COMPARISON

To compare the West Atlantic and Pacific corridor options, a preliminary estimate of bus travel time was prepared for buses that operate on the three corridors as follows:

Construction Cost Comparison

Figure 4-18 provides an order-of-magnitude construction cost comparison for each of the West End corridor improvement study options.

Figure 4-18 Order-of-Magnitude Cost Comparison (West End Study Options)

Study Option	Description	Preliminary Construction Cost Estimate
West End Option W-1-A via Pacific Ave (Median Transitway)	Physical improvements on 3.5-mile transit corridor via Pacific Avenue including dedicated 1-mile median busway & mixed-flow segments + traffic signal modifications + enhanced bus stops	$30 million
West End Option W-2-A via West Atlantic Ave / Appezzato Pkwy (Median Transitway)	Physical improvements on 3-mile transit corridor via West Atlantic Avenue / RAMP including dedicated 1-mile median busway & mixed-flow segments + traffic signal modifications + enhanced bus stops	$45 million[29]
West End Option W-2-B via West Atlantic Ave / Appezzato Pkwy (Side-running BRT in eastbound-direction only / westbound RBS)	Physical improvements on 3-mile transit corridor including dedicated 1-mile eastbound busway & mixed-flow segments + traffic signal modifications + enhanced bus stops	$20 million

[29] The Median Busway in Option W-2-A would require relocation of existing eastbound traffic levels on Ralph Appezzato Parkway.

Travel Time & Operating Cost Comparison

Figure 4-19 provides a comparison of estimated travel time between Alameda Point and Downtown Oakland under each West End option.

Figure 4-19 Travel Time & Operating Cost Comparison (AP to 12th St BART)

Study Option	One-way Travel Distance	Estimated One-way Travel Time[30]	Ballpark Annual Operating Cost Comparison
Existing Service (Line 31 from Pan Am Way to 12th & Broadway **via Pacific Avenue** & Marina Village with shared travel lanes)	4 miles	21 minutes	$1.7 million (**based on current 30-minute headways** with 2 buses in operation for 18 hours per weekday) **estimated cost of providing 12-minute peak and 15-minute off-peak headways via existing route is $4 million)**
West End Option W-1-A (Proposed BRT/BRT from West Atlantic & Orion to/from 14th & Broadway **via Pacific Ave** with proposed median transitway)	3.6 miles	15 minutes	$2.5 million **(based on proposed 12-minute average peak headways and 15-minute average off-peak headways**, with 2 to 3 buses in operation)
West End Option W-2-A (Proposed BRT/RBS from West Atlantic & Orion to/from 14th & Broadway **via West Atlantic Ave** / Appezzato Pkwy with proposed median transitway & transit signal priority measures)	3.1 miles	12 minutes	$2 million **(based on proposed 12-minute average peak headways and 15-minute average off-peak headways**, with 2 bus in operation during most hours, and 3 buses in operation during peak only)
West End Option W-2-B (Proposed BRT/RBS from West Atlantic & Orion to/from 14th & Broadway **via West Atlantic Ave** / Appezzato Pkwy with eastbound transitway, westbound shared travel lanes & transit signal priority measures**)**	3.1 miles	12 minutes	$2 million **(based on proposed 12-minute average peak headways and 15-minute average off-peak headways**, with 2 bus in operation during most hours, and 3 buses in operation during peak only)

[30] Estimated travel time with proposed improvements is based on a net travel speed of 15 miles per hour (mph). Travel time for existing service is based on AC Transit route schedule, and equates to a net travel speed of 12 mph.

Pacific vs. Atlantic/RAMP

The added distance, and travel time, required to serve the Pacific Avenue corridor with proposed BRT/RBS service between AP and 12th Street BART would result in higher operating costs, which, in turn, could potentially result in loss of potential ridership, in comparison with a BRT/RBS service via West Atlantic Avenue / RAMP.

- The Pacific Avenue route would be 15 percent longer than via West Atlantic, potentially negating the reduced travel time resulting from the BRT/RBS improvements planned for key segments of the route.
- Total travel time via Pacific could be up to 25 percent longer, compared to via West Atlantic, taking into account the increase in distance as well as potential delay on the "mixed-flow" segment of Webster Street
- Increased operating costs due to the added distance and travel time would increase the annual operating cost by 15 to 20 percent (potentially costing an additional $200,000 annually to operate)

Atlantic/RAMP Comparison: Median BRT vs. Side-running BRT/RBS Hybrid

In comparing West End Options W-2-A and W-2-B (both via RAMP):

- Since traffic delay is primarily in the eastbound direction on RAMP (approaching the intersection of West Atlantic & Webster), both options would provide a "queue-jump" for buses traveling in the congested direction.
- By contrast, travel in the westbound direction on RAMP can occur within shared travel lanes with minimal delay. Therefore, the added cost of a median busway under Option W-2-B is unlikely to produce a benefit to westbound buses.

WEST END CORRIDOR COMPARISON

To compare the West Atlantic and Pacific corridor options, a preliminary estimate of bus travel time was prepared for buses that operate on the three corridors as follows:

Construction Cost Comparison

Figure 4-20 provides an order-of-magnitude construction cost comparison for each of the West End corridor improvement study options.

Figure 4-20 Order-of-Magnitude Cost Comparison (West End Study Options)

Study Option	Description	Preliminary Construction Cost Estimate
West End Option W-1-A via Pacific Ave (Median Transitway)	Physical improvements on 3.5-mile transit corridor via Pacific Avenue including dedicated 1-mile median busway & mixed-flow segments + traffic signal modifications + enhanced bus stops	$30 million
West End Option W-2-A via West Atlantic Ave / Appezzato Pkwy (Median Transitway)	Physical improvements on 3-mile transit corridor via West Atlantic Avenue / RAMP including dedicated 1-mile median busway & mixed-flow segments + traffic signal modifications + enhanced bus stops	$45 million[15]
West End Option W-2-B via West Atlantic Ave / Appezzato Pkwy (Side-running BRT in eastbound-direction only / westbound RBS)	Physical improvements on 3-mile transit corridor including dedicated 1-mile eastbound busway & mixed-flow segments + traffic signal modifications + enhanced bus stops	$20 million

[15] The Median Busway in Option W-2-A would require relocation of existing eastbound traffic levels on Ralph Appezzato Parkway.

NORTH ALAMEDA CORRIDOR COMPARISON

To compare the West Atlantic and Pacific corridor options, a preliminary estimate of bus travel time was prepared for buses that operating on the three corridors as follows:

Construction Cost Comparison

Figure 4-21 provides an order-of-magnitude construction cost comparison for each of the North Alameda corridor improvement study options.

Figure 4-21 Order-of-Magnitude Construction Cost Comparison: North Alameda Study Options

Study Option	Description	Preliminary Construction Cost Estimate
Option N-1-C (Clement corridor with shared travel lanes & rapid bus treatments)	Shared Travel Lanes on Clement Avenue	$10 million
Option N-2 (Lincoln Avenue with median transitway)	Median Transitway on Lincoln Avenue	$30 million
Option N-3 (Lincoln Avenue with shared travel lanes & rapid bus treatments)	RBS improvements with shared Travel lanes on Lincoln Avenue	$5 million
Option N-3 (Santa Clara Avenue with rapid bus treatments)	RBS improvements with shared Travel lanes on Santa Clara Avenue	$3 million

Travel Time & Operating Cost Comparison

Figures 4-22 through 4-24 provides a comparison of estimated travel time under each North Alameda study corridor option:

- Figure 4-24 compares travel time between West Atlantic & Webster and Fruitvale BART Station
- Figure 4-25 compares travel time between Alameda Point (assuming a proposed transit center location at West Atlantic & Orion) and Fruitvale BART Station via each of the corridors

Figure 4-22 Travel Time Comparison: West Atlantic & Webster to Fruitvale BART

Study Option	One-way Travel Distance	One-way Travel Time
Existing Service (Santa Clara corridor with shared travel lanes)	3.8 miles	20 minutes
Option N-1-C (Clement corridor with shared travel lanes & rapid bus treatments)	3.2 miles	15 minutes
Option N-2 (Lincoln corridor with median transitway)	3.4 miles	16 minutes
Option N-3 (Lincoln corridor with shared travel lanes & rapid bus treatments)	3.4 miles	16 minutes
Option N-3 (Santa Clara Avenue with rapid bus treatments)	3.8 miles	19 minutes

Option N-3 (RBS improvements on Santa Clara Avenue) would be less likely to produce travel-time benefits because:

- The street width on Santa Clara accommodates just one travel lane in each direction. Therefore:
  - Travel-time reductions would be less likely to be achievable with RBS improvements on Santa Clara.

  - Provision of "bus bulbout" stops is likely infeasible with just one lane in each direction, since such stops allow buses to stop within the travel lane.
- The 1-way travel route via Santa Clara is 0.4 miles longer than on Lincoln.

Figure 4-23 Travel Time Comparison: AP to Fruitvale BART

Study Option	One-way Travel Distance	Estimated One-way Travel Time Comparison	Ballpark Annual Operating Cost Comparison for AP to Fruitvale Service
Option W-2-A or W-2-B + Option N-1 (West Atlantic + Clement)	4.4 miles	19 minutes	$3.0 million
Option W-2-A or W-2-B + Option N-2 or N-3 (West Atlantic + Lincoln)	4.9 miles	21 minutes	$3.3 million
Option W-1 + Option N-1 (Pacific + Clement)	4.5 miles	22 minutes	$3.4 million
Option W-1 + Option N-2 or N-3 (Pacific + Lincoln)	4.9 miles	19 minutes	$3.3 million

Figure 4-24 provides a hypothetical comparison of travel time from AP to a BART train (traveling to/from points south of Fruitvale) via:

- Transfer to BART at Oakland City Center / 12th street Station or
- Transfer to BART at Fruitvale Station (not including the transfer time at one station or the other - which would be relatively equal at either station).

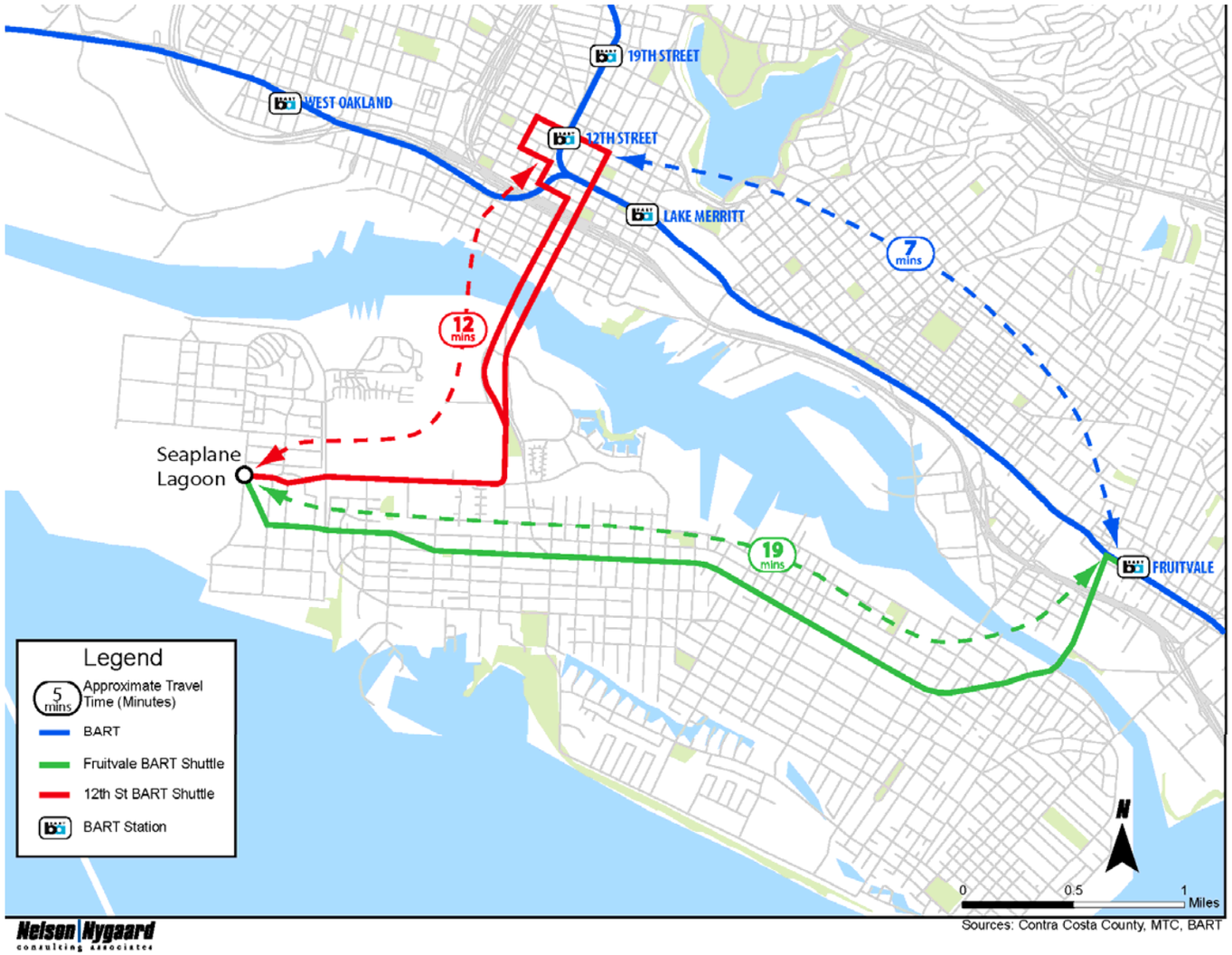
Since BART trains make the trip between 12th Street and Fruitvale Station in just 7 minutes: travelers to/from Alameda Point may not benefit significantly from separate service to/from Fruitvale. Instead, those travelers could stay on BART, and catch a BRT or Rapid Line directly to AP from 12th Street Station.

- Following the 19-minute ride with direct bus service from Alameda Point to Fruitvale BART Station:
  - Total time to board a BART train at Fruitvale would be approximately 25 minutes (assuming a 3-minute transfer period and 3-minute wait for a southbound BART train).
  - Assuming the 12-minute travel time to 12th Street BART, described above for the West Atlantic corridor to 12th Street BRT line,
- Total travel time to Fruitvale BART could be nearly identical, with a timed transfer to southbound BART train at 12th Street Station.

In comparing North Alameda Options W-2-A and W-2-B (both via Lincoln Avenue): since traffic volumes are relatively low (relative to capacity) on Lincoln Avenue, buses are anticipated to be able to meet the travel time goal (15 mph net travel time, and 20 mph travel speed between stops) with or without a dedicated travel lane. Both options would provide a "queue-jump" for buses traveling in the congested direction. By contrast, travel in the westbound direction on RAMP can occur within shared travel lanes with minimal delay. Prevailing motor vehicle speeds on Lincoln Avenue generally exceed 25 mph, and an operational analysis conducted by Dowling Associates (January 2011) indicates that prevailing travel speeds exceeding 20 mph are anticipated to continue based on forecasted future-year traffic volumes.

Therefore, the added cost of a median busway under Option N-3 is unlikely to produce an increased marginal benefit beyond the rapid-bus and signal pre-emption measures that would be provided under Option N-2.

Figure 4-24 Travel Time Comparison: AP to Fruitvale via 12th St BART



Ridership Comparison

Figure 4-27 provides an order-of-magnitude comparison of ridership potential for each of the three North Alameda study corridor options.

Figure 4-25 Order-of-Magnitude Ridership Comparison: North Alameda Study Corridors

Study Option	Existing Ridership[35]	Future Ridership Demand (with current service)	Estimated Additional Net New Ridership Potential (Over Future Baseline) with BRT or Rapid	Ballpark Operating Cost Comparison per Net New Rider
Option N-1-C (Clement corridor with shared travel lanes & rapid bus treatments)	7,000	8,000	2,000	$0.00 (if served by relocated AC Transit Line 51A) or $4.50 (if served by new service from AP to Fruitvale)
Option N-2 (Lincoln Avenue with median transitway)			1,600 (if served by relocated AC Transit Line 51A) to 2,500 (if served by separate line from AP from Fruitvale)	$0.00 (if served by relocated AC Transit Line 51A) or $4.00 (if served by separate line from AP to Fruitvale)
Option N-3 (Lincoln Avenue with shared travel lanes & rapid bus treatments)			1,200 (if served by relocated AC Transit Line 51A) to 2,000 (if served by separate line from AP from Fruitvale)	$0.00 (if served by relocated AC Transit Line 51A) or $5.00 (if served by separate line from AP to Fruitvale)
Option N-3 (Santa Clara Avenue with rapid bus treatments)			N/A (corridor constraints likely to limit physical improvement options on Santa Clara)	N/A

[35] Based on existing AC Transit Line 51A ridership described in Chapter 3.

RECOMMENDED CORRIDORS

Based on the comparison described in the preceding pages, the following two transit corridors are recommended:

West End

West Atlantic Avenue (Ralph Appezzato Memorial Parkway) Corridor is recommended for West End physical improvements as identified under Option W-2-B

- West Atlantic provides a more direct route, compared to Pacific, for serving the bulk of West End transit demand that is generated by trips to/from Downtown Oakland and San Francisco
- Option W-2-B can be implemented at a substantially lower cost than Option W-2-A

North Alameda

Lincoln Avenue study corridor is recommend for further consideration with the West End physical improvements as identified under **Option N-3**

- Close proximity to Santa Clara Avenue allows improvements on Lincoln Avenue to potentially serve AC Transit's existing high-volume bus routes that currently operate on Santa Clara Avenue. However, AC Transit staff has indicated an initial preference to retain the existing service on Santa Clara Avenue.
- Option N-3 can be implemented at a substantially lower cost than Option N-2, and avoids the need to implement left-turn restrictions on Lincoln Avenue

Figure 4-28 highlights the recommended improvement corridors and potential regional transit connections, including connections to proposed bus rapid transit (BRT) corridors on International Boulevard and Telegraph Avenue in Oakland.

Figure 4-26 Recommended Corridors & Potential Regional Connections

5. RECOMMENDED IMPROVEMENTS

ALAMEDA POINT & WEST END

Figure2 4-29 through 4-33 show the recommend alignment under the recommended physical improvement Option W-2-B on Ralph Appezzato Memorial Parkway between Alameda Point (at Main Street) and Webster Street.

Figure 5-1 Ralph Appezzato Memorial Parkway at Main Street

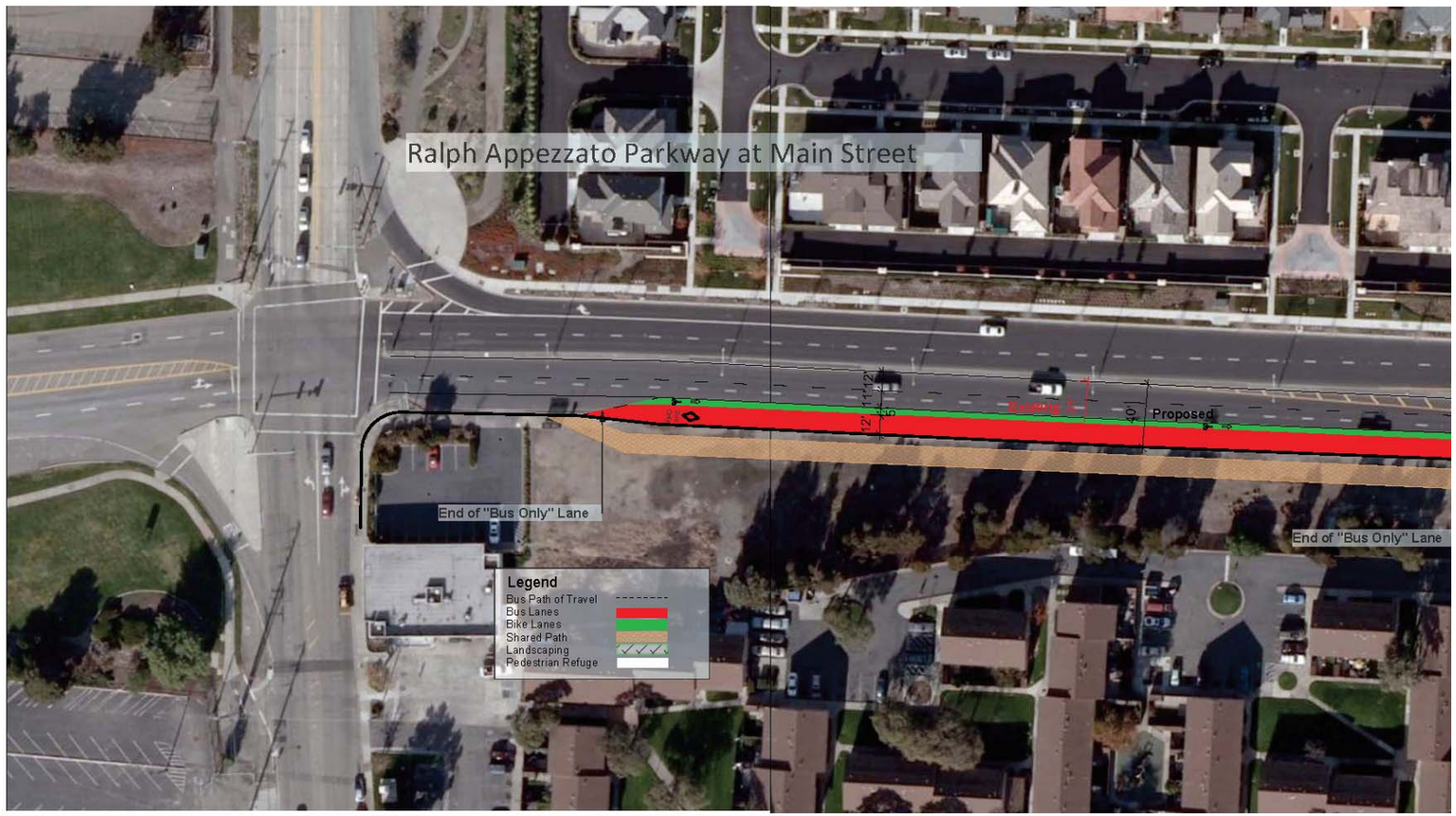


Figure 5-2 Ralph Appezzato Memorial Parkway at 3rd St / Mosley Ave

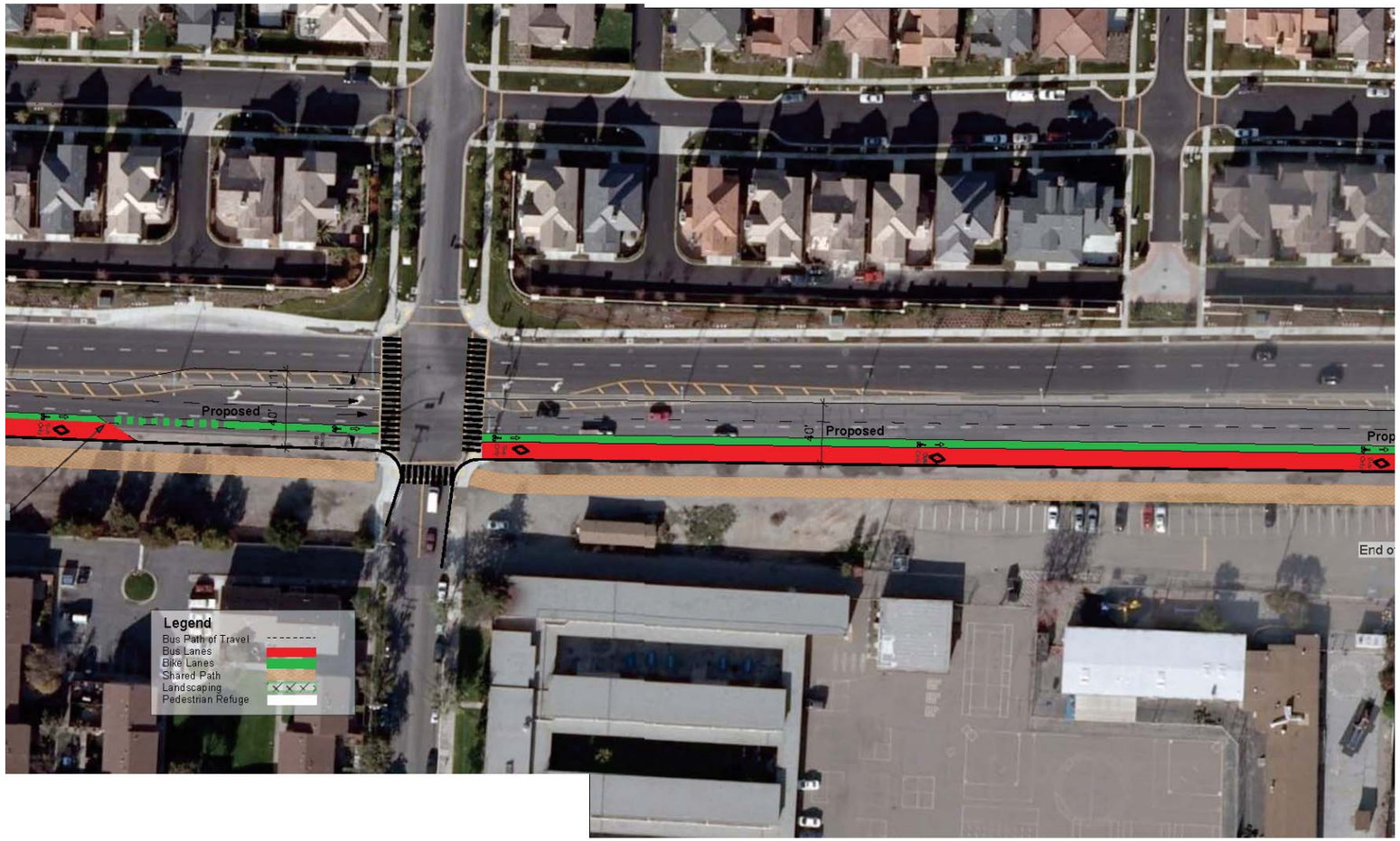


Figure 5-3 Ralph Appezzato Memorial Parkway at Poggi & Coral Sea

Figure 5-4 Ralph Appezzato Memorial Parkway with EB Traffic Signal By-pass

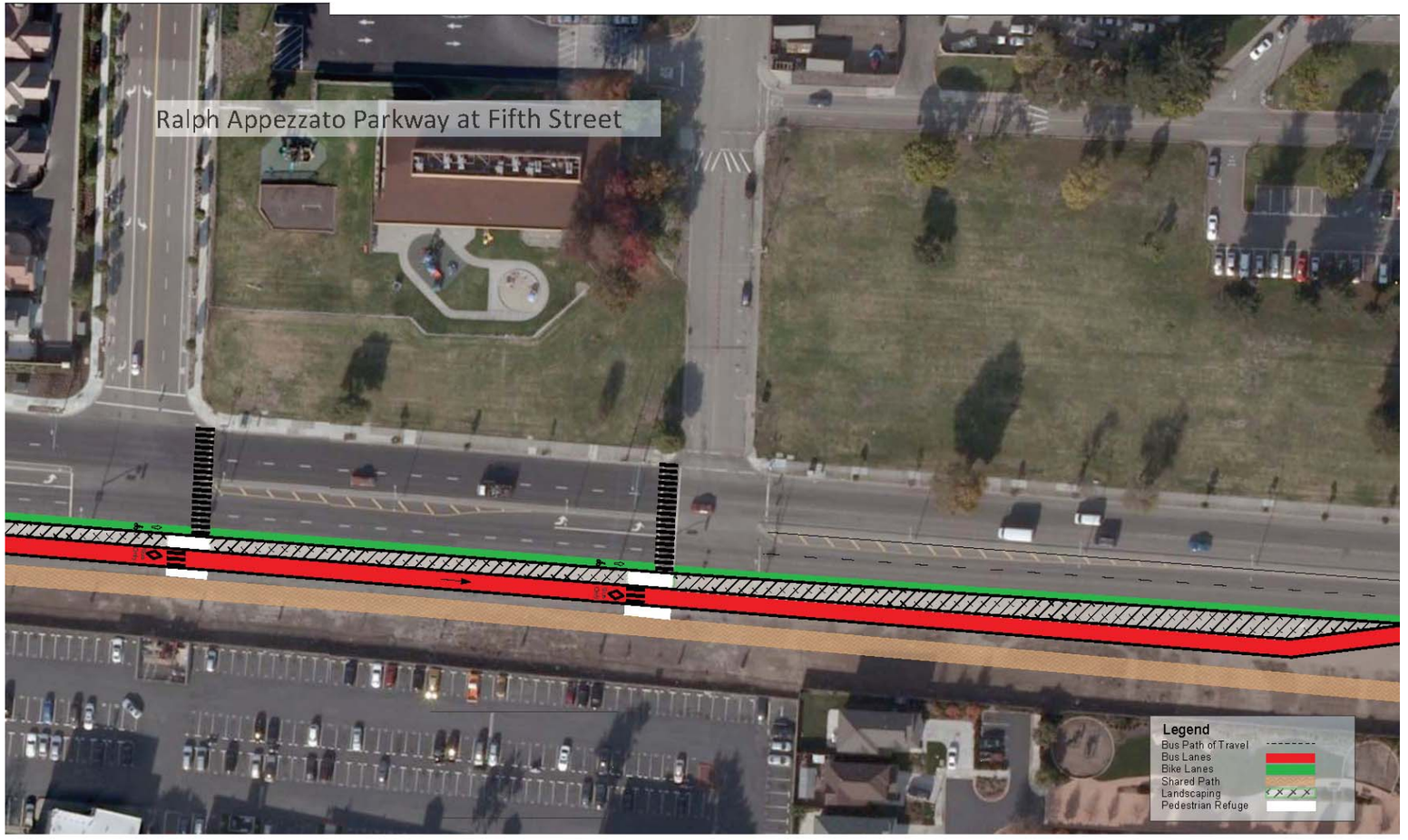
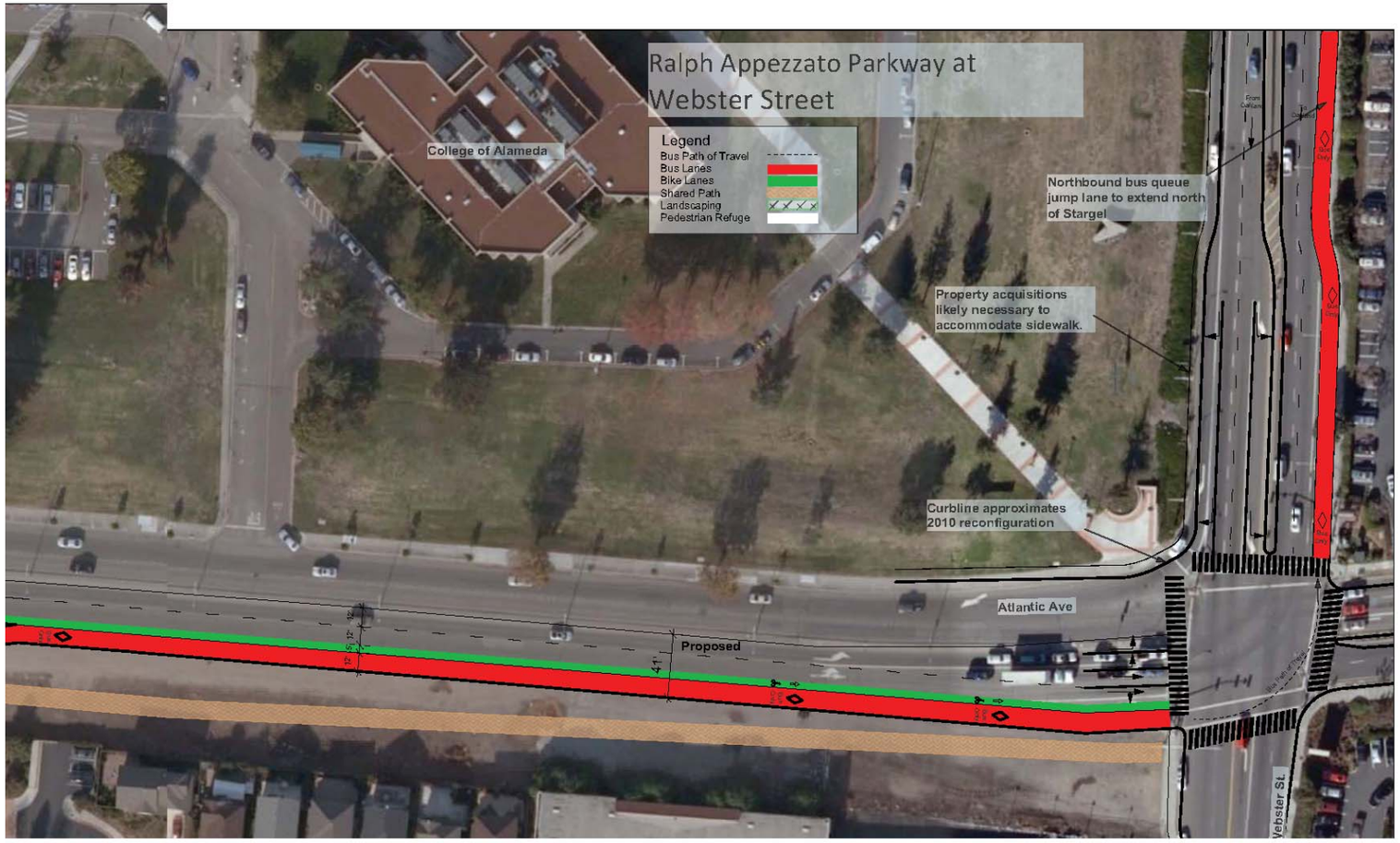


Figure 5-5 Eastbound Queue Jump & Dedicated Bus Left-turn Phase @ Webster St



NORTH ALAMEDA

Lincoln Avenue Rapid Corridor

This section describes the recommended long-term service alignment in North Alameda. Key operational and physical elements of the Proposed Lincoln/Santa Clara as proposed under Option W-3 include:

- **Proposed relocation of existing AC Transit service from Santa Clara Avenue to Lincoln Avenue**
    - AC Transit Line 51A (Rockridge BART – Downtown Oakland – Alameda – Fruitvale BART)
    - AC Transit Line O (Transbay service to San Francisco)
    - Strategic transfer points at Atlantic & Webster (to/from West End) and Lincoln & Park (to/from AC Transit Lines 20 and 21)
- **Half-mile spacing of bus stops** (approximate) to minimize dwell time for buses and maximize travel time benefits

B. AC Transit is planning to undertake a comprehensive **Line 51 corridor study** that could include refining the operational elements associated with potential "Rapid Bus" service as well as continuing local service via Lincoln Avenue relocation

- **Traffic signal enhancements**, including transit-priority and dedicated bus left-turn phases where needed
- **Enhanced bus stops** with level boarding platform to accommodate reduced dwell time
    - Bus stops would include bus shelters, and other amenities such as benches, trashcans, and real-time information (see Figure 5-3)

Proposed Lincoln Rapid: Bus Stop Locations

Figures 5-6 to 5-13 provide preliminary drawings of potential bus stop configurations at the following locations:

- Lincoln & Webster
- Lincoln & 8th
- Lincoln & Sherman
- Lincoln & Grand
- Lincoln & Park
- Tilden Way & Broadway

Figure 5-6 Conceptual Illustration: Proposed Lincoln Rapid Bus Stops

Figure 5-7 Proposed Rapid Stop: Lincoln & Webster

Figure 5-8 Proposed Rapid Stop: Lincoln & 9th

Figure 5-9 Proposed Rapid Stop: Lincoln & Sherman (Bay Station)

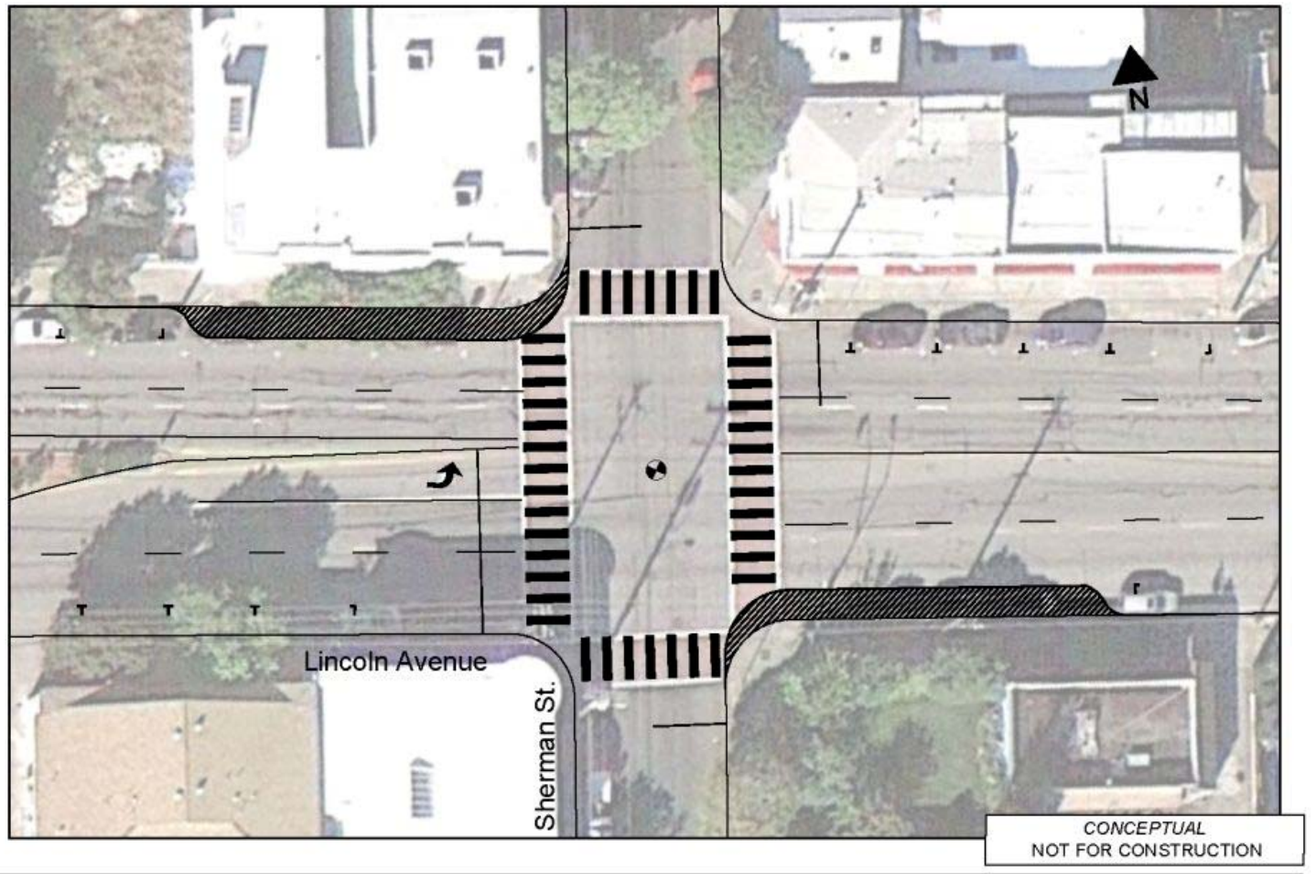


Figure 5-10 Proposed Rapid Stop: Lincoln & Grand

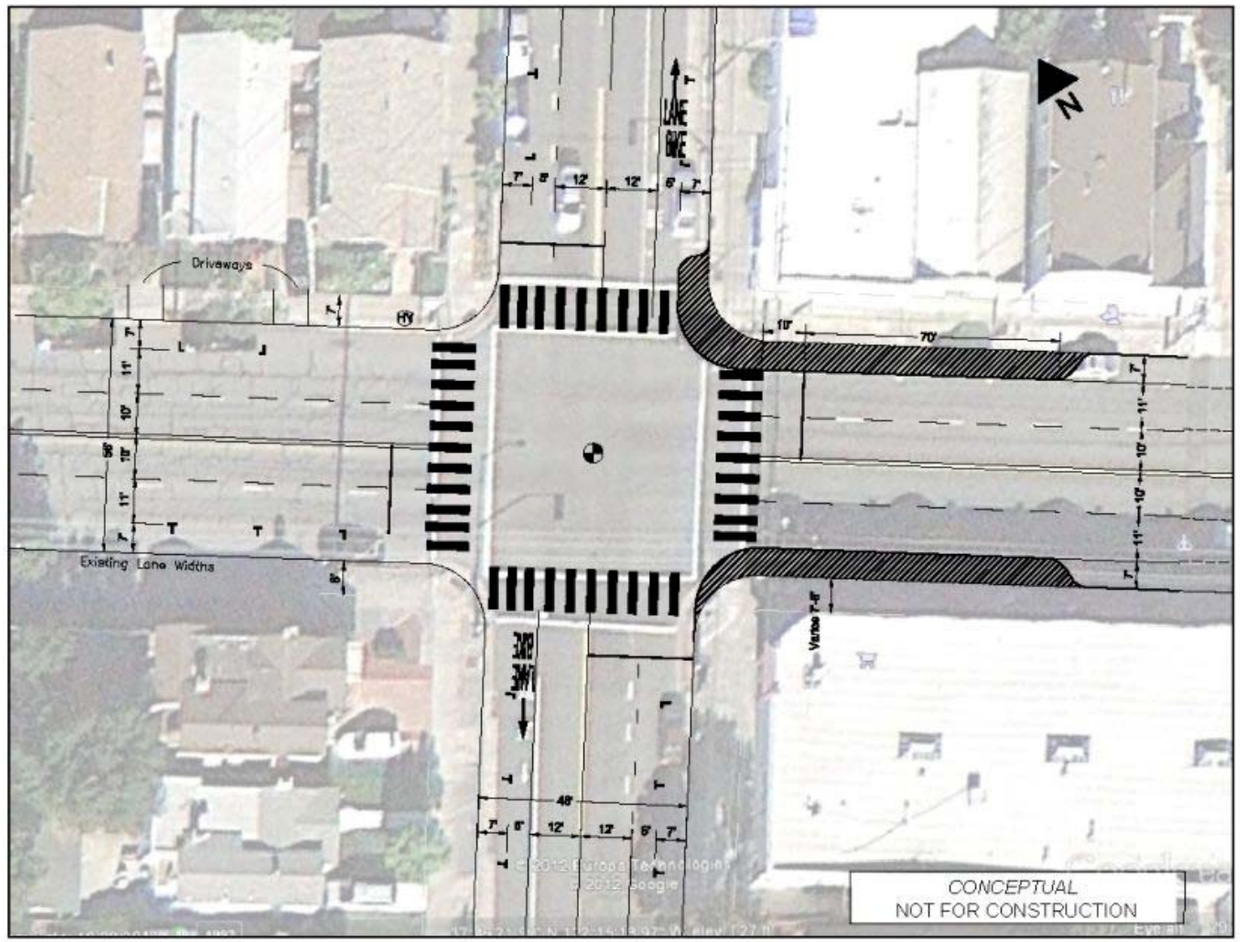
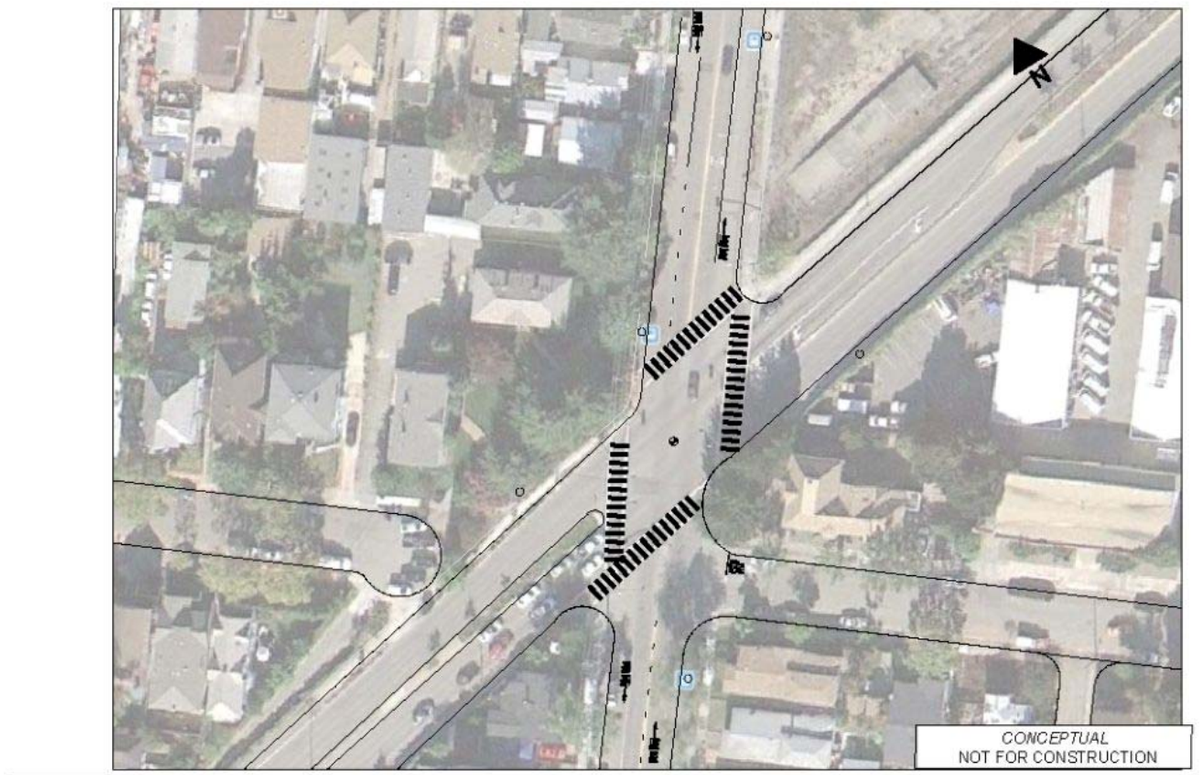


Figure 5-11 Existing Configuration: Lincoln & Park

Figure 5-12 Proposed Transfer Point at Lincoln & Park

Figure 5-13 Proposed Rapid Stop: Tilden & Broadway



Transit Access Concepts: Lincoln / Santa Clara Corridor

In addition to the elements described above, relocating the Santa Clara bus service to Lincoln Avenue would potentially create opportunities to enhance transit access, including improvements pedestrian and bicycle circulation on Santa Clara Avenue and connecting streets, in conjunction with pedestrian improvement corridors identified by the Alameda Pedestrian Master Plan and Safe Routes to School (SRS) program, as highlighted on Figures 5-14 to 5-17.

Figure 5-14 City of Alameda Pedestrian Priority Routes (Santa Clara & Lincoln Corridor)

Figure 5-15 Pedestrian Priority Routes & Proposed Lincoln Rapid Stop Locations

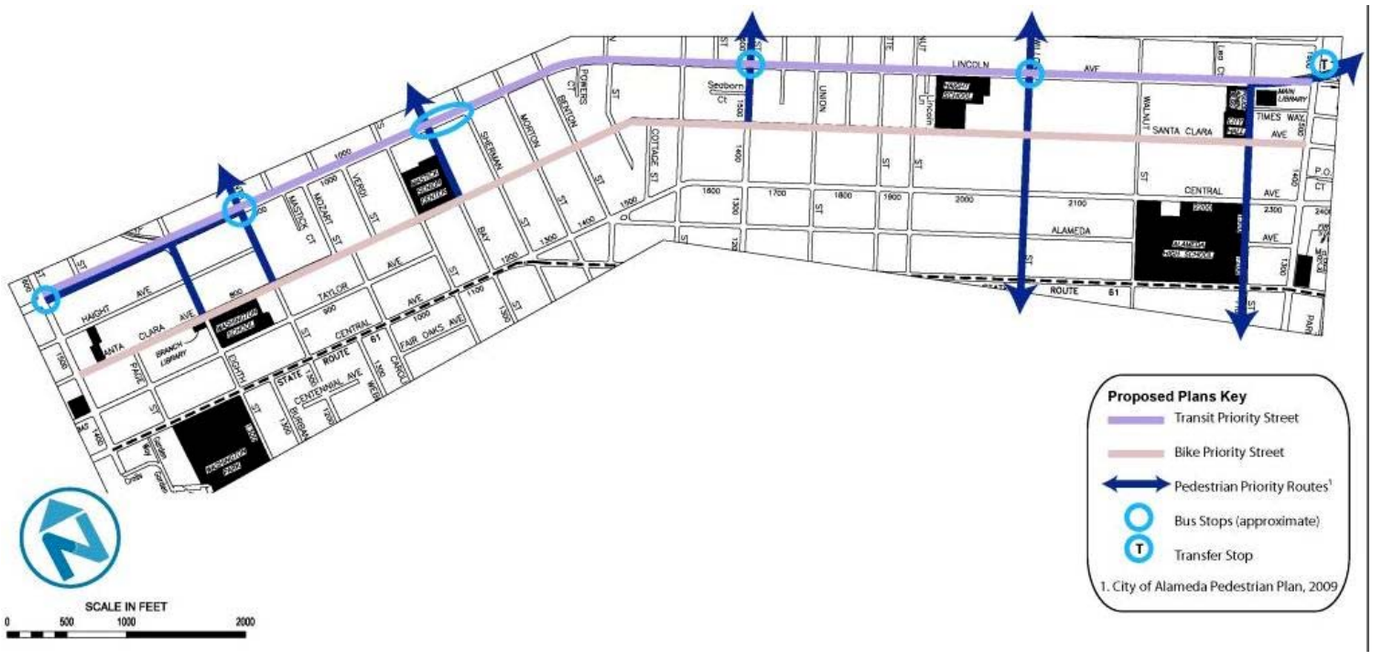


Figure 5-16 Santa Clara Avenue Bicycle Lane Extension East of Grand (Conceptual)

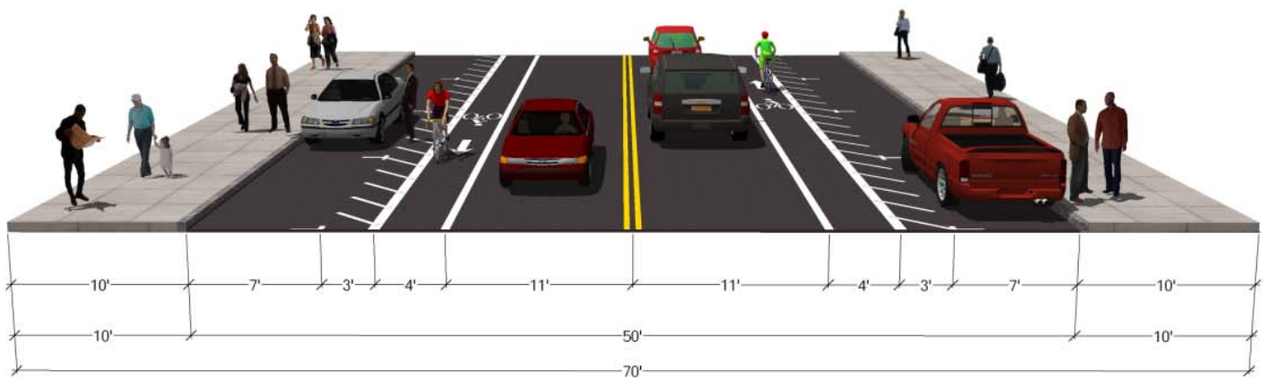


Figure 5-17 Santa Clara & Willow: Bulbout & Bicycle Lane Extension (Conceptual)

6. IMPLEMENTATION & PHASING

Chapters 1-5 of this report describe potential physical improvement options in conjunction with long-term service options on transit-priority corridors, and inclusion of transit amenities, including potential dedicated bus lanes, rapid-bus enhancements and signal improvements, that would enhance shuttle and/or transit operations in the West End of Alameda.

To assist in selecting a preferred corridor option: this chapter describes short-term (2013 to 2015), mid-term (2015-18) and long-term (2018 and beyond) phasing options for potential transit service options.

IMPLEMENTATION TIMEFRAME

Enhanced transit service on transit-priority corridors is a key component of the City's transportation demand management (TDM) strategy related to anticipated development of priority development areas (PDAs) within the City:

- Alameda Point (AP)
- Alameda Landing (AL)
- Northern Waterfront (NW)

The timeline for transit service implementation will be contingent on the timeline for development of the PDAs. Therefore, the precise timeline requires a degree of flexibility. Based on those parameters, the proposed implementation timeframe would be divided into three phases, tentatively identified as follows:

- Phase I: Short-term service (Years 2013-15)
- Phase II: Mid-term service (Years 2015-18)
- Phase III: Long-term service (Years 2018 and beyond)

OVERVIEW OF PHASING CONCEPT

Short-Term Service (2013-15)

Shuttle routes will be determined by several factors, including: the location and timing of development phasing, AC Transit's ability to provide new or amended service, available funding for operations, and the City's input on preferred corridors and operational details. For planning purposes, this report provides two options for short-term service at AP, based on which type of development would occur first.

- IF RESIDENTIAL IS FIRST TO DEVELOP AT AP:
  - Short-term Shuttle, Northern Route via Willie Stargell Avenue:
    - With a private operator: Willie Stargell would seem to be the better short-term option for "Day One" AP service (while long-term service could include transitioning this shuttle route to the north, with service via Mitchell Avenue when that street is extended to Main Street)
    - Today, Willie Stargell Ave offers the shortest travel time between AP and BART (14th & Broadway), potentially 14 minutes each way
    - With two shuttles in operation 20-minute average headways could be achieved.
    - Could be expanded to serve the development sites at AL and combine with the shuttle service required of the developer.
- IF TOWN CENTER OR COMMERCIAL IS FIRST TO DEVELOP AT AP:
  - Short-term Shuttle via West Atlantic Avenue/RAMP (assuming Town Center and/or commercial at AP is first to develop) :
    - AC Transit could operate this shuttle; however, it may require re-routing and potentially bifurcating the existing 31-line to serve a shorter, more direct northerly route. Current service on the 31-line consists of four buses in operation on a 2-hour round-trip route, operating for about 16.5 hours per weekday, providing 66 daily revenue hours of service, which could potentially be divided as follows:
    - 30 daily revenue hours of service to Alameda (12th Street BART to/from Pan Am Way or Atlantic/Orion)
    - 36 daily revenue hours of service to MacArthur BART (to/from 12th Street BART)

Medium-Term Service (2015-17)

-- 3 miles each way / 6 miles round-trip (with Downtown Oakland Loop via Harrison, 14th, Clay, 11th, Broadway, 7th)

-- "Day 1" Alameda route (between Webster and Atlantic/Orion) via RAMP or Stargell Avenue, depending on location of major development

-- "Day 1" service limited to peak commute periods (with future "ramp-up" to include mid-day and off-peak service as AP development occurs)

-- Round-trip travel time: 30 - 36 minutes (15-18 minutes each way) based on 10 to 12 mph net travel speeds

-- Round-trip operating time: 40 minutes (average)

-- Headways: 13 to 20 minutes (peak only)

-- Weekday Service Hours: 14 revenue hours per weekday (with 2 buses in operation for 7 hours, to achieve 20-minute headways); or 21 revenue hours per weekday (with 3 buses in operation for 7 hours, to achieve 13-minute headways)

Long-Term Service (2018 and beyond): BRT service between 12th Street BART & AP

-- 3 miles each way / 6 miles round-trip via Atlantic/RAMP/Webster & Downtown Oakland Loop

-- Goal: 15 mph net operating speed (with queue-jump segments, signal pre-emption and enhanced stops)

-- Round-trip travel time goal: 24 minutes (12 minutes each way)

-- Round-trip operating time goal: 30 minutes average (based on 24 minutes travel time + 6 minutes driver rest & recover). Given the short loop, drivers may be able to complete 2 runs back-to-back in 48 minutes, to be followed by 12 minutes rest & recovery.

-- Headways: 10 minutes (peak); 15 minutes (off-peak)

-- Weekday service hours: 40 revenue hours per weekday, based on the following # of buses in operation:

SHORT-TERM SERVICE CONSIDERATIONS

Service Strategies to Serve Priority Development Areas

Strategic, long-term transit and transportation planning by the City for the former Alameda Naval Air Station have always included mention of direct transit connections to BART stations in Oakland. Several projects in this area specifically list "a BART connecting shuttle" and/or participation in a Transportation Management Association ("TMA") as part of their development requirements. As detailed in previous chapters of this report, enhanced transit service could take several different forms, including direct, multi-modal shuttle/transit service.

While it is generally agreed that enhanced transit service is a key component of West End development, questions remain regarding the details of such service. These include both short and long range implementation and operations of the service (whether by AC Transit or private sector operators); size and type of vehicles; routes and schedules; membership and participation; and potential ridership. This chapter of the report will provide an overview of a potential phasing strategy within the context of the overall study and its recommendations.

Enhanced shuttle operations could: (a) provide the necessary (additional) ridership that would allow AC Transit to expand its current service in the area; (b) Allow AP/AL stakeholders to contract with AC Transit or a private operator to run a new service to connect the West End to BART station(s) in Oakland; or (c) allow for an expansion of the existing City shuttle service (see details below).

Service Considerations

Considerations used in this report to guide the development of route phasing include:

- Development phases and timelines of West End development;
- Length of route;
- Service frequency
- Travel time;
- Hours of operation;
- Connections between transit centers and major destinations;
- Relationship of existing bus services to other modes of transportation; and
- Peak commute hours.

Based on the anticipated short/mid-term needs of PDAs, particularly AP and AL, the recommendations in this chapter are based on operating parameters for those areas. However, this information could be applied toward the development of potential shuttle services in other parts of Alameda, such as NW.

Operator Considerations

Several factors would be taken into consideration when choosing an operator for the transit operations that are envisioned include economics, boardings, routes, and development needs.

During initial phases: a private, contractor-operated (turn-key) shuttle service might be the most cost-effective means of service delivery, especially during early stages of operations and development, when ridership levels would be below the "acceptable" minimum criteria established by most public transit agencies. Nonetheless, AC Transit has expressed an interest in providing services even in the early/formative stages of development

Vehicle Fuel Options

Fuel type of vehicles should be finalized with considerations to availability and reliability of fuel and vehicles, overall cost to operating budget and emission reductions and conforming to CARB mandates. However, there are limited alternative fuel storage and/or fueling options in Alameda.

Route Considerations

Routes should be designed to complement and connect existing transit options to/from Alameda (AC Transit, ferry and BART), while serving the needs of employers, employees, and residents. Routes must be adaptable to the various phases of development.

Funding & Management

Formation of a private and public sector economic partnership would maximize available capital and ensure a sustainable revenue flow for the shuttle program. The creation of a Transportation Management Association (TMA) is required as part of the AL development and could be expanded to include AP.

The City should continue to mandate TDM/TSM fees for all new development projects and expansion of existing development areas. These fees are essential to provide matching funds for available grant funding for shuttle operations.

Routes should complement and augment existing AC Transit service. Long term strategy should include expansion and enhancement of existing AC Transit routes operating closely to development areas and/or the development of acceptable minimum ridership.

Routes should utilize any proposed BRT/RBS route(s) and/or signaling enhancements recommended in this study or enacted by the City.

Route & Phasing Options

Any proposed shuttle route should create a connection between existing modes of mass transportation (BART, AC Transit and ferry) and major West Alameda destinations.

Further route development should be planned and implemented based on actual development phasing at AP with the goal of reducing SOV trips to the greatest extent feasible based on financial constraints. This expansion should raise awareness of the program, expand the geographic area served by the shuttle, increase ridership, enlarge stakeholder and TMA participation, and raise additional private sector operating funds.

Alameda Landing (AL) Shuttle

Current development plans at AL include a Target retail center. The developer is required to provide shuttle service for employees and visitors to/from 12th Street BART during a.m. and p.m. peak hours. Initial ridership projections would likely be below the desirable goals of AC Transit to allowing for use of smaller vehicles and the shuttle is likely to be operated by privately-owned transit provider. This shuttle is required to be operational with the opening of Target, scheduled for October 13, 2013.

AL Shuttle Service Enhancements

Additional phases of the AL development are expected to be completed by June 2014. When ridership is expanded to approximately 30-40 passengers per hour, the shuttle system could be augmented with additional (or larger) vehicles and/or routes in order to continue providing effective and timely services. Utilizing proposed enhanced signaling and corridor improvements, the expanded shuttle service would access the Oakland 12th Street BART station. As the residential development at AL develops, additional routes and vehicles will be needed. As ridership increases, the service may become more attractive to AC Transit and it should be consulted before expanding services through a privately-owned transit operator.

SHORT TERM OPERATIONAL PARAMETERS

Initial Projected Ridership

Based on above operating parameters, the shuttle program's ridership goals would be 8-10% of residents and 15-20% of employees projected within the shuttle service area. Development in the West End will have various phases and it is anticipated that ridership on the shuttle service will be moderate (40-50 passengers per day) during the initial phases and will increase with later phases as more commercial and retail development is completed.

Projected ridership goals (by full build out, including Alameda Point and Alameda Landing;) would be roughly 160 passengers per day, per bus or 75% vehicle capacity. These projections are based on an average of 14 passengers (incoming and/or outgoing) per loop and 12 loops total (6AM peak and 6PM peak) per 20 passenger vehicle.

Note: The Estuary Crossing Shuttle (ECS) has averaged approximately 180 boardings per day in its initial year of operations, including an unusually high number of bicycle riders.

Initial Shuttle Service Operations (Phases 1-2)

Conceptual operating parameters were used in order to establish comparative operating costs.

The 'per day' pricing is based on shuttle operations of eight hours per day, during peak commute times. Anticipated hours of operation are 6:00 a.m. through 9:00 a.m. and again 3:00 p.m. through 7:00 p.m. One hour each day is needed for the legally-mandated pre- and post-vehicle inspection. Industry standard is 252 days of operation per year, excluding holidays and weekends. It is anticipated that service could be expanded and routes adjusted during phases of development at various sites; a mid-day service could be added if that service is deemed viable. Additional funding would be required for expanded services.

A turn-key approach (providing vehicles, drivers, maintenance, fuel and insurance) by the private sector operating option presents the least expensive option. Additionally, minimal administrative needs (by City staff) would be required.

The operations cost analysis is done on an "operator neutral" basis. AC Transit can provide this service if it meets their operational goals. As the local transit agency, AC is better suited to provide service to the City of Alameda. Enhancement (and possible bifurcation) of existing routes could improve transit service to development areas. Costs associated for these service improvements vary based on the level of service. AC Transit has been reluctant to provide projected hourly costs for operating comparisons. Based on information on the AC Transit web site and existing contracts, costs for AC Transit can vary from $80/operating hour (the Broadway Shuttle) to $180/operating hour (revenue report and recent contracts). For the purpose of this report a figure of $150 per operating hour was used.

Contractor Operated

This option presents a viable solution for the City by contracting with a professional transit operator, drivers, vehicles, including back up, maintenance/fuel and insurance costs are all managed by the contractor. As noted, this option is the least expensive for both operating and capital funds; it also requires the lowest administration costs for the City and removes the City from the task of day-to-day transit operations.

Advantages (Provided by contractor)

- Provides "turn-key" services including:
- Fuel (with possible surcharges)
- Maintenance
- Insurance
- Drivers (including back-up)
- Vehicles (including back-up)
- Knowledge of transit operations
- Solidifies operating costs by terms of contract
- Removes City of Alameda from role of operations
- Immediate start-up of operations

Disadvantages

- Less control over operations decisions (staging areas, back up vehicle type)
- Less control over personnel decisions
- Lack of integration with existing AC Transit services
- Possible diversion of passengers from AC Transit

Projected yearly costs (diesel, gasoline, or CNG))

Administration: $25,000

$60/hour at 16 hours/day = $960/day

$960/day at 252 days = $241,920

TOTAL YEARLY OPERATING COSTS

$241,920

+ 25,000 (Administration)

$266,920 for 15 minute headways (two vehicles)

Mile/hour cost Estimates (15 minute headways)

$8.80/mile

$132 per hour

AC Transit as Initial Operator

The pricing below is based on estimated hourly cost for AC Transit of $150 per hour for operations. (See note below regarding lower cost for Broadway Oakland shuttle). This includes personnel, maintenance and fuel. This price does not reflect incremental (only) costs that might be more applicable if AC were to decide that altering existing routes would be feasible.

AC Transit could serve as a contractor for the shuttle service, providing coordination between the service and other AC Transit routes. However, as detailed below, the estimated costs for service would not be competitive with private sector operators.

Advantages

- Uses local public transit provider
- Provide turnkey service

- Solidifies operating costs
- No administrative costs to City

Disadvantages

- More expensive than private shuttle operators during initial phases of operations (with smaller shuttle buses and less-regular service)
- Current private sector shuttles range from $48 to $55 for turn-key service for a 22 passenger shuttle vehicle;
- AC Transit currently provides service on the **B**roadway Oakland shuttle for $85 for 40 foot transit vehicles—though AC Transit has indicated their standard operate rates are $150 to $170 per hour.
- Union contracts limits control over driver selection
- Fuel and vehicle choice limited based on (currently) available fleet vehicles
- Must operate on fixed routes
- Restraints on any changes to operating parameters

Projected Yearly Costs

$150/hour x 16 hours (2 buses) = $2400 X 252 days = $604,800

Mile/hour Cost Estimate for 15 minute headways

120 miles/day at 252 days = 30,240 miles/year: $20/mile

16 hours/day at 252 days = 2,016 hours/year: $300/hour

Operations Conclusion

Operations of any proposed shuttle system in Alameda should take monetary and budget issues into consideration when deciding who will own and maintain vehicles and who will operate the system. Other considerations, such as supporting local, existing transit services, infrastructure development and long term transit goals (as out lined in the City wide transportation plan), must also be taken into account. It is possible that a short term and long term program might be enacted: private sector operations building rider ship in the initial phases, replaced by expansion

and/or enhancement of existing AC Transit services during later phases of development. As noted, AC Transit has expressed a willingness to partner with the City on start-up transit operations in hopes of developing viable ridership which could result in expansion of existing lines/routes (IE the '31') or creation of new routes.

Summary of Phasing Parameters

The long term success of any transit system will be determined by its ability to expand during the various phases of build out, including adjusting routes as new areas of high employment and residential are developed. The cooperation of various entities involved to coordinate their TDM programs will be necessary in order to maximize ridership and mode change of employees and residents of the West End. Additionally, integration of any shuttle system with existing transit options (AC Transit and the ferry) will be essential in order to provide a systemic approach to encouraging mode change.

As plans are finalized for Alameda Point and other Alameda developments, a comprehensive time line should be developed. The time line should include phases of all West End projects; projected number of residents and employees; details and implementation time line of proposed TDM programs and a conceptual plan to coordinate and unify these programs (including the formation of a governing agency). With this information, a sustainable operating strategy, overall time line and operating budget can be formed for the various phases of development.

To this point, the City must determine what its role will be in the shuttle program; options include economic contributions (including writing/leveraging grants and public sector funding), administrative assistance, in kind services or limited–to-no participation.

The most viable source of sustainable operating capital is the private sector. A common mechanism for administering type of funding is through a transportation management association (TMA), consisting of employers, and sometimes municipalities and other stakeholders. A TMA for the West End could potentially oversee the implementation of a TDM program, including a shuttle service, using revenues targeted for such initiatives through development agreements or other entitlement requirements. A private/public partnership is the ideal economic arrangement. City participation in such an effort could provide access to other revenue sources, since many grants are only available to public agencies. In the future, as City revenues increase because of the new development, the City may be in a position to supplement private sector funding with its own resources to improve shuttle headways and service. As more private sector capital becomes available during later phases, the City could lessen any economic contributions.

Regardless of what decisions are made for transit service operations (private sector, AC Transit or some combination) to the Alameda Point and Alameda Landing areas, an aggressive marketing campaign should be planned to increase public perception and participation by residents and employees. A marketing budget should be established to help implement necessary signage, zip-code specific mailing campaigns, a dedicated TDM website, marketing materials and possible branding of the transit service.

Length/Timing of Route/Headways:

A loop route would serve both residents of Alameda and employees and visitors of commercial and retail interest on the West End. By providing residents direct service to BART in the morning and returning with employees (and reversing the pattern during evening peak commute times) a loop route maximizes the opportunity for potential riders.

To ensure reliable service, the length of the loop would need to be approximately 6-9 miles round trip to/from 12th Street BART station in Oakland and be provided by two shuttle vehicles operating concurrently. During the initial development phases it is feasible that service will be provided by only one vehicle, resulting in 30 minutes service until ridership is developed.

The conceptual routes represent options that are within these mileage operating parameters and acceptable service levels (15 minute headways). Adding new service areas that would extend the acceptable operating parameters (over 10-12 miles round trip loop from BART) would necessitate a review of operating costs associated with the expansion of services. This would require a more thorough understanding of exact routes/mileage and number of stops required.

Stops would be determined by need and demand within the service areas. Minimizing the amount of stops helps maintain headways/timing and has been proven to assist in mode change.

Route timing would also need to be coordinated (as much as feasible) with BART (and possibly ferry) schedules as well as work schedules of major employers that the shuttle is serving. To maintain a viable service, it is anticipated that no more than eight stops could be incorporated along the conceptual routes.

The initial parameters for the economic and planning aspects of this report assume headways of 15 minutes, using two vehicles (at Phase II, build-out of AL and AP). Transit studies have shown that services with 15 minute headways are more effective in implementing mode change. This is especially true with inter-modal shuttles since most passengers are transferring from some other mode of mass transit.

Vehicle Fuel Types

A variety of fuel types are available for shuttle type vehicles and buses, including: diesel, compressed natural gas (CNG), biodiesel, electric and hybrid-electric.

For comparative purposes, it is assumed that all vehicles are new, from an original equipment manufacturer, are compliant with the Americans with Disabilities Act ("ADA") requirements, and can accommodate 22 seated passengers. The 22-passenger vehicle is the standard vehicle size used on most shuttle bus operations, providing service with minimum impact (noise, weight, pollution) to the neighborhoods being served. It is also has a smaller turning radius than larger buses which makes it easier to maneuver through residential areas. If passenger load eventually exceeds capacity, additional shuttles could be added or a larger vehicle could be considered.

Diesel

Diesel fuel remains the choice of most private and public sector transit operators. Relatively low priced buses and shuttles are readily available through a number of manufacturers with little or no waiting time. Vehicles are reliable and long lasting. Diesel requires no additional training of drivers or mechanics. Fuel and maintenance are easily available. Cleaner (low sulfur) diesel fuel is readily available and most diesel vehicles can be equipped with tail pipe traps which are relatively inexpensive (and can often be acquired through grants) and have proven effective at reducing particulate emissions by 50-60%.

ALTERNATIVE FUELS

Compressed Natural Gas (CNG)

CNG operations result in lower emissions of both particulate matter and other pollutants, especially nitrogen-oxide. Presently, CNG fuel is approximately 5-10% cheaper than diesel fuel.

CNG vehicles are affordable, readily available through Original Equipment Manufacturers (OEMs), and currently being used in fleets of private sector operators throughout the Bay Area. Many operators have used CNG vehicles for years and have mechanics trained in the maintenance of CNG vehicles. Minimal training (for mechanics or drivers) is required for CNG operations.

As noted, the ECS currently uses a CNG vehicle that was modified in order to create additional storage areas for bicycles. The choice of CNG fuel was based on requirements from the Bay Area Air Quality Management District (the primary funding source for the ECS program). Operations have not been negatively impacted by the choice and use of alternative fuel.

Vehicles must be fueled every day; CNG fuel is available at several locations in Oakland.

Installing a local fueling station in Alameda would address concerns regarding the range of CNG vehicles and allow fueling by other operators of CNG vehicles. The CNG industry has shown a willingness to provide funding for infrastructure and to address community concerns regarding fueling installations.

Biodiesel

General Definition of Biodiesel

Biodiesel is a domestic, renewable fuel for diesel engines derived from natural oils like soybean oil, and which meets the specifications of ASTM D 6751. Biodiesel can be used in any concentration with petroleum-based diesel fuel in existing diesel engines with little or no modification. Biodiesel is not the same thing as raw vegetable oil. It is produced by a chemical process which removes the glycerin from the oil.

Technical Definition for Biodiesel (ASTM D 6751) and Biodiesel Blend:

Biodiesel—A fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the requirements of ASTM D 6751.

Biodiesel Blend—A blend of biodiesel fuel meeting ASTM D 6751 with petroleum-based diesel fuel, designated BXX, where XX represents the volume percentage of biodiesel fuel in the blend.

Currently, very few transit fleets or transportation providers operate on biodiesel; most operations that use biodiesel are privately owned vehicles or pilot programs.

Availability of fuel is a concern with biodiesel operations; as there are limited fueling stations available, none in Alameda. Presently, in the Bay Area, the majority of biodiesel fuel is B20, which consists of 20% bio fuels and 80% standard diesel fuel.

Electric

Zero tail pipe emissions, reduced sound pollution and minimal street waste (oil, transmission and other fluids) are all positive by-products of operating electric vehicles. Additionally, the ongoing need for electric “fuel” would present unique opportunities for a potential partnership with the local municipal utility, Alameda Power and Telecom.

However, the availability and reliability of electric transit vehicles has proven problematic in the United States. The U.S. electric bus industry has, historically, been plagued by under-funded, small manufacturers which have produced prototype vehicles that have failed in daily transit applications. Electric vehicles also have a very limited operating range, approximately 50 miles per charge. Limited speeds (40-45 MPH maximum on most vehicles) and performance on hills (especially on grades greater than 8-10%) are also continuing concerns of electric vehicles.

There are safety and operating risks associated with operating prototype vehicles. Many of the electric vehicles have experienced frequent breakdowns, negatively impacting the programs' performance and ridership. Some sites have experienced fires from overheated batteries and/or charging infrastructure. Prototype vehicles also require extensive training of maintenance staff and drivers. Additionally, replacement of common parts is often difficult and expensive, with long lead times, requiring back-up vehicles to maintain reliable service.

Higher maintenance costs have also negatively impacted electric transit programs. Many parts are not factory standard or "shelf" items causing a greater than normal expense for replacement parts. Additionally, prototype fueling and integration systems have proven difficult and expensive to repair and/or replace. On-board batteries need to be replaced on a regular basis, another additional expense of electric vehicles.

NOTE: In 2005, a manufacturer of electric and hybrid buses (Ebus), held a demonstration of an electric bus (actually a hybrid-electric vehicle which operated in an all-electric mode) in Alameda; one loop between City Hall and the BART 12th Street station consumed almost 20% of the vehicle's available "fuel". When contacted later, EBus stated that "given the proposed operating parameters, an all electric bus would not be applicable". This decision was based on concerns regarding available "fuel" for the length of the conceptual route (BART/12th Street to West End), coupled with the number of loops proposed and speed required through the Webster and Posey tubes. Higher speeds are difficult for electric vehicles to obtain and also extract significantly more power from fuel storage units.

Hybrid Electric

Hybrid electric vehicles combine electric and conventional (generally, diesel or internal combustion engines) power sources in vehicles. Various types of fuel (gasoline, diesel, propane, CNG) can be used to propel the engines. Vehicle emissions and fuel consumption vary with type of fuel, though most hybrids have lower fuel consumption and reduced emissions than diesel. Most hybrids also have additional fuel storage capacity through a series of on board batteries.

Hybrid electric vehicles have established a more favorable reputation in the industry than all-electric vehicles, as they require less maintenance and provide more reliable service. Many of the operational constraints of all-electric vehicles – such as the limited range, speed, and ability to handle grades – are not applicable to hybrids. The limited range of all electric vehicles is overcome with on-board charging capabilities; in some cases, overnight "grid" (also known as plug-in or "trickle") charging is still required.

Large OEM's such as Gillig are producing various models of hybrid electric vehicles and have provided the necessary training and factory authorized service to ensure the continued success of hybrid operations in the Bay Area.

Motivated by fuel savings and environmental concerns, public and private transit operators have begun replacing older diesel vehicles with hybrid electric vehicles. In recent years, diesel-hybrid vehicles have become the over whelming choice of most transit agencies, including AC Transit.

Several Bay Area pilot projects are being conducted using various fuels (hydrogen, propane and others) and different fuel storage options (advanced battery technology and capacitors). AC Transit is currently operating a hydrogen fuel cell (hybrid) pilot program consisting of several proto type (40 foot) transit buses.

Conclusions and Recommendations on Fuel Type

Diesel Fuel

Diesel fuel is the overwhelming choice of shuttle vehicle operators. Many have replaced older diesel vehicles with newer, lower emissions models. Convenience of fueling locations and availability of OEM vehicles and industry standard parts also help make diesel the preferred fuel of a majority of operators. AC Transit and other agencies have incorporated hybrid diesel vehicles into their existing fleets. Hybrid technology allows for continued use of a preferred fuel type (diesel) while increasing the miles per gallon by use of alternative power sources, when applicable. Additionally, newer technology buses are equipped with particulate traps and can use low sulfur diesel fuel.

Compressed Natural Gas (CNG)

CNG vehicles have already proven favorable for shuttle operations in Alameda. CNG vehicles can provide services with minimal "down time" from mechanical failures, and offer lower vehicle emissions than diesel. The limited range of the vehicles would not impact the core service for any proposed routes in Alameda. An inconvenience associated with CNG is that daily fueling would be required, and the existing fueling stations are not local. A long-term strategy should include consideration of CNG fueling stations in Alameda, preferably in the West End, for both new shuttle vehicles and other CNG vehicles operating in Alameda.

BioDiesel

With cooperation from the biodiesel industry for infrastructure development, operation of biodiesel vehicles is possible and would support the City's environmental goals. There is limited research and field experience regarding reliability in daily transit applications.

Electric

Reliability, manufacturer's support, safety, service parameters and restrictions of operating mileage are all major concerns of operating electric shuttles. The currently envisioned BART connector routes and schedules would be a difficult application for all electric vehicles based on fuel consumption and required higher speeds.

Any shuttle program should be designed to expand during various development phases and use of electric vehicles could limit this potential expansion based on limited range.

CONCEPTUAL PHASING PLAN & MAPS

Based on the parameters described above, a conceptual planning plan is shown on Figures 6-1 to 6-4:

- Figure 6-1 shows initial **short-term shuttle service map** (tentatively years 2013-15)
    - Initial AP – 12th Street shuttle service with 20-minute headways using private operator, estimates initial operating cost of approximately $400,000 annually based on operations limited to peak-periods only.
    - To improve travel time, it is recommended that this phase include the cost of a northbound exclusive transit lane along Webster Street from RAMP/Atlantic Avenue to Stargell Avenue.
    - As shown: Figure 6-1 also shows a potential alignment for extension of shuttle service via Stargell (indicated as proposed "West Alameda Shuttle") to connect with Alameda Landing and Target site. As noted earlier: if Alameda Point residential uses develop first, then the initial shuttle could take the form of a connection via Stargell (during early-phase only).
- Figure 6-2 includes improving headways of the AP Rapid Shuttle to between 13 to 20 minute headways and also shows a **medium-term shuttle service** enhancement to the NW area, via extension of shuttle service
    - To improve travel time, it is recommended that this phase include the cost of a queue jump lane for westbound buses on RAMP and then turn left onto Webster Street (northbound).
- Figure 6-3 shows the **Long-term Preferred Option A**, with the following service elements:
    - **Alameda Point Rapid Bus Service (AP-RBS) service via RAMP**
        - As shown: the recommended long-term service would be provided in conjunction with relocation of the existing AC Transit Line 31 Recommended long-term service hours and frequency would be as follows:
            - **AC Transit Line 31 relocated from Pacific to RAMP.** Line 31 currently provides two buses per hour (on segments between Alameda Point and Oakland City Center) with 30-minute headways between 5 am and 11 pm
            - **Additional Shuttles:** provision of one additional shuttle during off-peak service hours would allow for 15-minute off-peak headways. During peak hours (7 to 9 am and 4 to 6 pm): provision of two additional shuttle buses would allow for average headways of 10 minutes.
            - **Long-term Operator:** the provision of combined, long-term service on RAMP (i.e., with Line 31 augmented with additional shuttles) would likely be most feasible with a single operator: AC Transit.

- **Cost:** the estimated cost of operating additional shuttles (to achieve frequencies of 15-minutes off-peak / 10-minutes peak), based on 20 daily service hours for additional shuttles, would be approximately $500,000 (based on $85/hour operating cost by AC Transit for Broadway Shuttle) to $1 million (based on $170/hour overall AC Transit operating cost).

- **West Alameda shuttle service**, extended west from Alameda Landing via the planned long-term construction of Mitchell Avenue

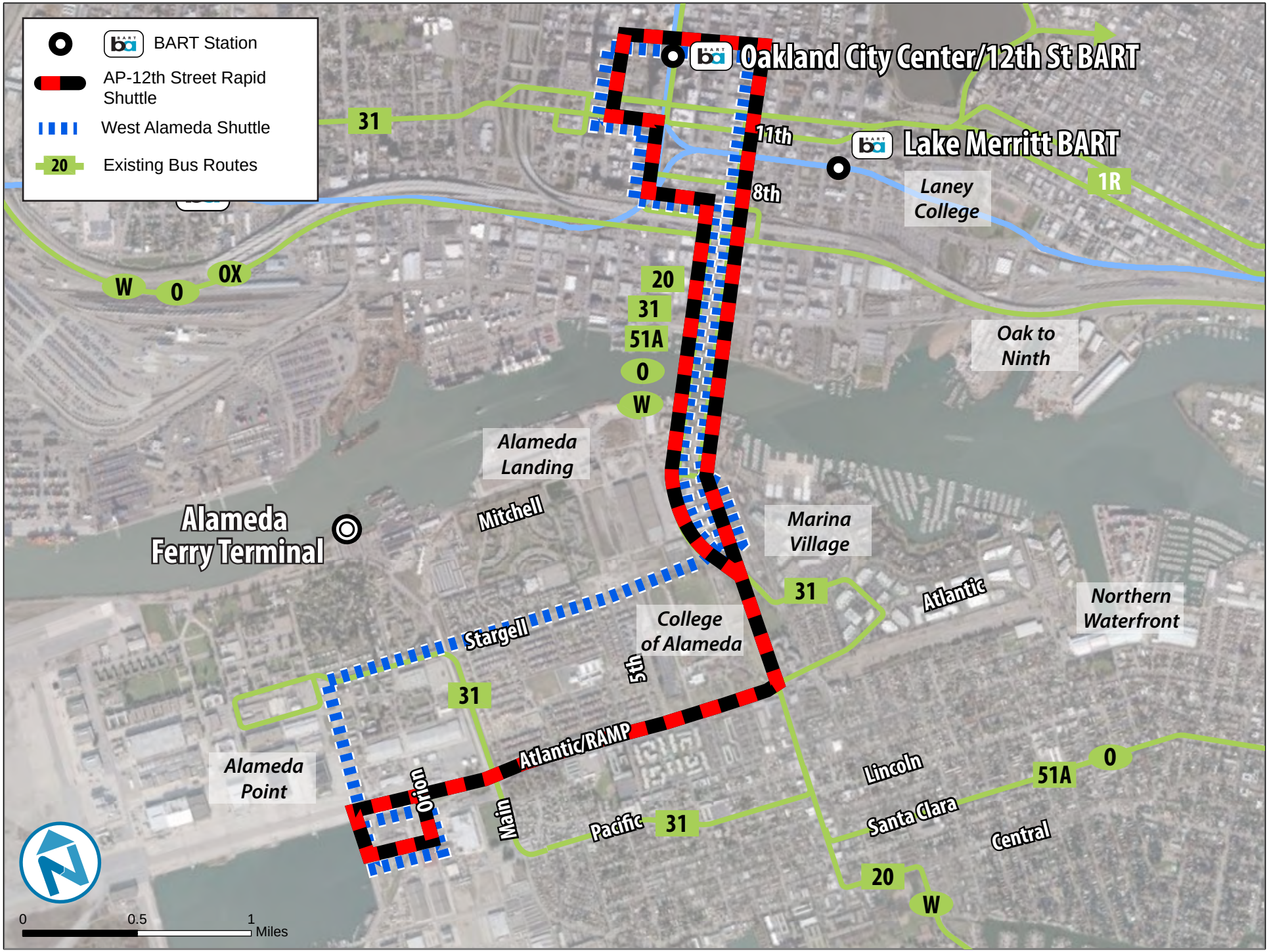
As full development occurs along the NW (Delmonte, Encinal Terminals, Marina Cove II, Boatworks, etc.) establish:

- **Lincoln Corridor Rapid Bus Service (Lincoln RBS)** via Lincoln Avenue (east of Webster), contingent on relocation of AC Transit Lines 51A and O from Santa Clara Avenue to Lincoln Avenue
  - Current frequencies on each AC Transit line would be maintained (and/or enhanced due to travel time reduction via Lincoln)
  - Travel-time reductions would occur due to shorter route, stop enhancements (including "in-lane" stops),
  - Service via Lincoln Avenue would be within walking distance of PDA's on the Northern Waterfront (east of Grand Street in particular)

Long-Term Alternative B

Since relocation of AC Transit lines from Santa Clara Avenue to Lincoln Avenue would require further consideration by AC Transit: Figure 5-4 shows an alternative long-term service option (Alternative B),that would instead provide service to Northern Waterfront PDA's via a separate, privately-operated shuttle service. This option would require operating subsidies for shuttle service (potentially $400,000 annually for peak-only service), while AC Transit would retain service on Santa Clara Avenue.

Estuary Crossing Shuttle: Short-term Service (2013-15)



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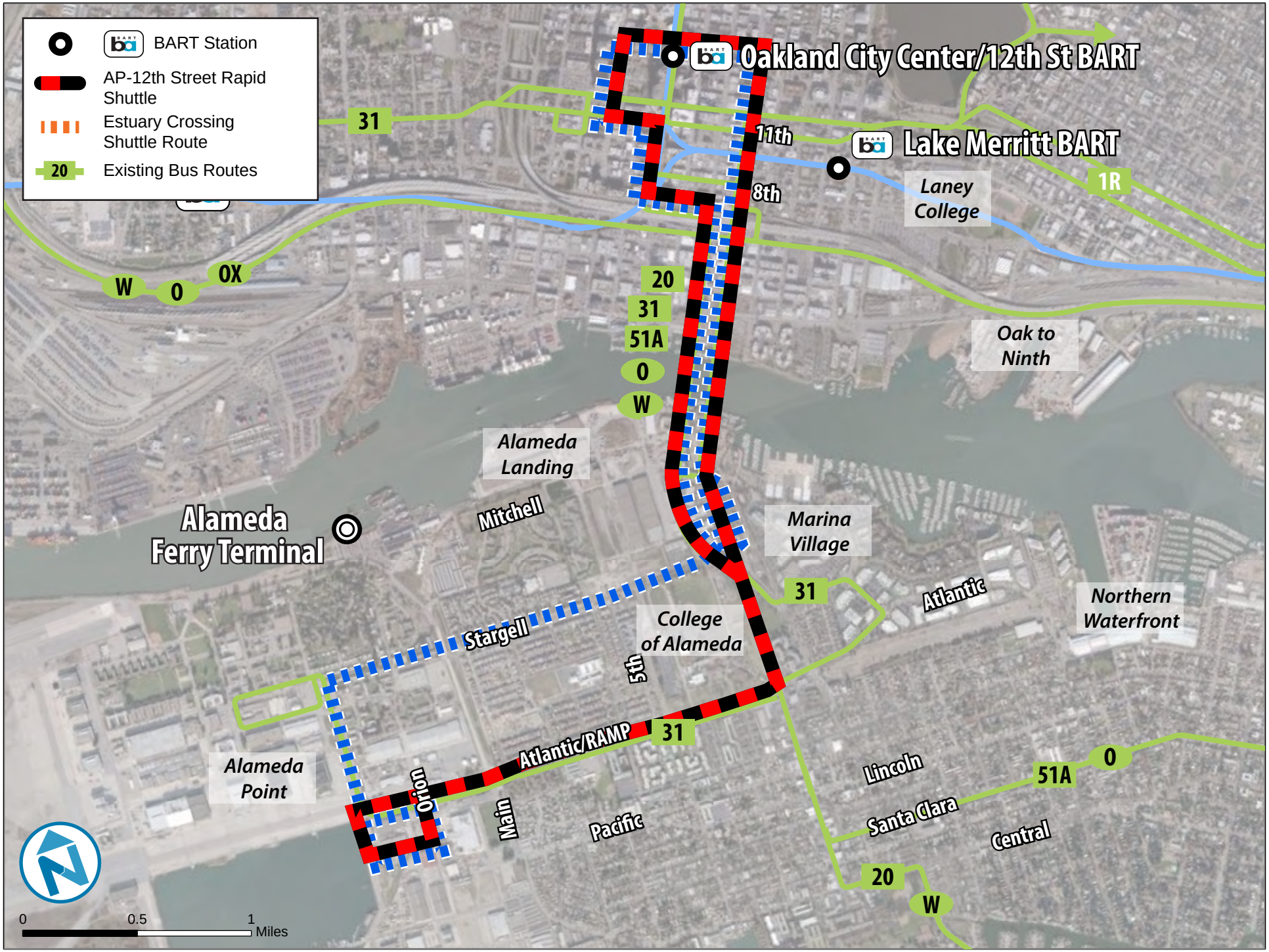
Estuary Crossing Shuttle: Mid-term Service (2015-18)



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Estuary Crossing Shuttle: Long-term (2018 and beyond) - Preferred Option A

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Estuary Crossing Shuttle: Long-term (2018 and Beyond) - Option B

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