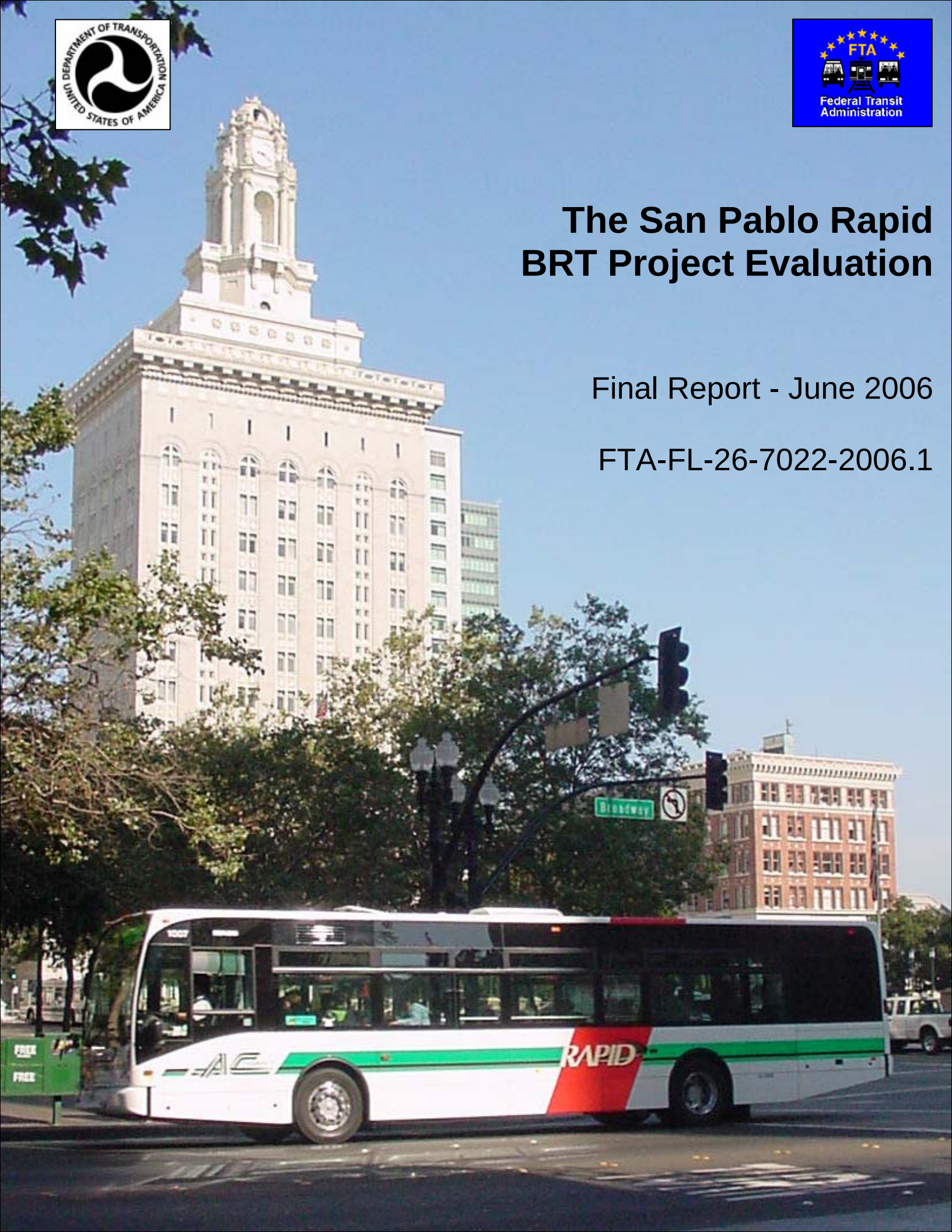

The San Pablo Rapid BRT Project Evaluation

Final Report - June 2006

FTA-FL-26-7022-2006.1

The San Pablo Rapid –
BRT Project Evaluation

Funded by the Federal Transit Administration

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13. ABSTRACT

In June 2003, AC Transit replaced the existing Limited Stop service (72L) on the San Pablo Avenue corridor with a new Bus Rapid Transit service called the "San Pablo Rapid" (72R). The new service runs in mixed traffic along a 14 mile route from Contra Costa College to 2nd Street (Jack London Square) in downtown Oakland. The 72R provided extended service span (6:00 a.m. to 7:00 p.m.) and improved service frequency (continuous 12 minute headways throughout the day). Other travel time saving improvements included (i) reducing the number of stops (stop spacing averaged 0.54 miles), (ii) locating bus stops on the far-side of intersections, (iii) providing Traffic Signal Priority (TSP), (iv) providing queue jump lanes at major intersections, and (v) utilizing Van Hool A330 low-floor buses. A covered shelter is provided at each bus stop.

The total capital cost of the San Pablo Avenue project was approximately $3.2M, equating to $230,000 per mile. This relatively modest capital cost is a result of the fact that (i) the service was designed to utilize existing general purpose travel lanes (thus no expensive busway or exclusive lane infrastructure was required), and (ii) vehicle acquisition was not considered part of the capital cost.

Rapid bus service reduced end-to-end travel times by an average of 12 minutes, equating to a 21 percent reduction compared to the local service and 17 percent compared to the limited stop service. "Travel time on the Rapid Bus" was rated by users as one of the best aspects of the service.

The impact of Rapid Bus implementation on ridership was assessed through a series of three ridechecks, one conducted just before Rapid Bus implementation (May 2003) and two after (March and October 2004). Daily boardings on the Rapid Bus were measured at 6,050 in October 2004, a 212 percent increase compared to the previous limited stop service. However, it should be noted that this significant ridership increase stems at least partially from rider division from other corridor routes and a significant increase in service quantity. Overall, Rapid Bus implementation produced an 8.5 percent ridership increase along the sections of the San Pablo Avenue corridor served by the Rapid Bus.

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METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in)	=	2.5 centimeters (cm)
1 foot (ft)	=	30 centimeters (cm)
1 yard (yd)	=	0.9 meter (m)
1 mile (mi)	=	1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2)	=	6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2)	=	0.09 square meter (m^2)
1 square yard (sq yd, yd^2)	=	0.8 square meter (m^2)
1 square mile (sq mi, mi^2)	=	2.6 square kilometers (km^2)
1 acre = 0.4 hectare (he)	=	4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz)	=	28 grams (gm)
1 pound (lb)	=	0.45 kilogram (kg)
1 short ton = 2,000 pounds (lb)	=	0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp)	=	5 milliliters (ml)
1 tablespoon (tbsp)	=	15 milliliters (ml)
1 fluid ounce (fl oz)	=	30 milliliters (ml)
1 cup (c)	=	0.24 liter (l)
1 pint (pt)	=	0.47 liter (l)
1 quart (qt)	=	0.96 liter (l)
1 gallon (gal)	=	3.8 liters (l)
1 cubic foot (cu ft, ft^3)	=	0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3)	=	0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

[(x-32)(5/9)] °F	=	y °C

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm)	=	0.04 inch (in)
1 centimeter (cm)	=	0.4 inch (in)
1 meter (m)	=	3.3 feet (ft)
1 meter (m)	=	1.1 yards (yd)
1 kilometer (km)	=	0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2)	=	0.16 square inch (sq in, in^2)
1 square meter (m^2)	=	1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2)	=	0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2)	=	1 hectare (ha) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gm)	=	0.036 ounce (oz)
1 kilogram (kg)	=	2.2 pounds (lb)
1 tonne (t)	=	1,000 kilograms (kg)
	=	1.1 short tons

VOLUME (APPROXIMATE)

1 milliliter (ml)	=	0.03 fluid ounce (fl oz)
1 liter (l)	=	2.1 pints (pt)
1 liter (l)	=	1.06 quarts (qt)
1 liter (l)	=	0.26 gallon (gal)
1 cubic meter (m^3)	=	36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3)	=	1.3 cubic yards (cu yd, yd^3)

TEMPERATURE (EXACT)

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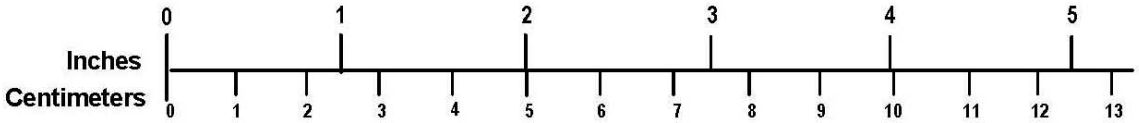
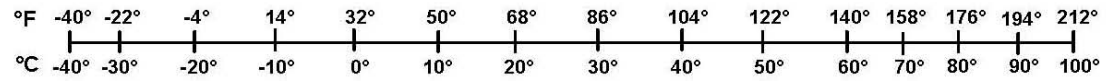
QUICK INCH - CENTIMETER LENGTH CONVERSION



QUICK FAHRENHEIT - CELSIUS TEMPERATURE CONVERSION



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Executive Summary

Project Context

In 1995 coordination among cities along the San Pablo corridor led to the determination that the economic vitality, aesthetics, quality of life, and mobility and accessibility along the corridor needed to be addressed. In an effort to address these issues, a number of goals were adopted, including those drafted by AC Transit. The goals of AC Transit specifically focused on improving transit service and increasing ridership.

Bus service on the San Pablo corridor was provided along three routes, the 72, 72L, and the 73. Both routes 72 and 73 provided local service, while the 72L provided limited stop. The southern terminus of each route was in downtown Oakland. With the concept of enhanced bus service in mind, AC Transit decided to improve service to the 72L, which is now the 72R (Rapid). The enhancements included an increase in frequency, the reduction of travel time through the reduction of stops, and implementation of traffic signal priority at intersections.

Project Description

AC Transit began BRT service on its San Pablo Rapid line on June 30, 2003. The 14 mile long 72 – San Pablo Rapid route runs through seven cities, Oakland, Emeryville, Berkeley, Albany, El Cerrito, Richmond, and San Pablo, and two counties, Alameda and Contra Costa. The Rapid operates in mixed traffic and was developed with 26 stops located at major intersections. These stops are spaced .54 miles apart on average along the length of the corridor. Each stop has a covered shelter or kiosk and is fully ADA accessible. Benches, trash receptacles, lights, maps of AC Transit bus service are some of the amenities provided at each shelter. The cost to ride the Rapid is the same as for a trip on local service ($1.75).

The Rapid operates every day from 6 am to 7 pm on a headway-based schedule of 12 minutes. Eleven Rapid buses operate along the corridor in the morning until the afternoon. During the afternoon and evening hours, 13 buses are in operation.

The Rapid employs several forms of Intelligent Transportation Systems (ITS) to help in the operations and image of the system. The systems include the use of Transit Signal Priority (TSP) along the route, the Automated Vehicle Locator (AVL), Automated Passenger Counters (APC), and real time information displays that are located inside shelters at each stop. All 63 San Pablo Avenue intersections have TSP, yet only the Rapid buses have the capability to trigger the system. The type of priority granted to a transit vehicle is dependent upon each intersection. Two types of priority may be granted and include an early green or an extended green.

System Costs

The total project capital cost was approximately $3.2M (or $228,571/mile). This total cost is relatively low for typical in-street mixed traffic alignments. The main reason the project cost was comparatively low is because the purchase of Van Hool vehicles were

not specific to the Rapid. Some capital costs were split among the implementation of traffic signal/transit priority and on-street improvements, bus arrival information, street furniture, marketing costs, before and after ridership surveys.

System Performance

End-to-end travel times on the San Pablo Rapid vary between 52 minutes in off-peak traffic conditions to 63 minutes in congested conditions. Data collected by Nelson Nygaard and CUTR show that the Rapid Bus service has reduced average end-to-end travel time by 12 minutes, equating to a 21 percent reduction compared to the local service and a 17 percent reduction compared to the superseded limited stop service. This reduction is close to the 20 percent reduction estimated by AC Transit at the outset of the project. Over 80 percent of users perceived the Rapid Bus as faster than the previous service, with almost half of surveyed respondents indicating that the service was at least 15 minutes faster. The absence of a Travel Time Component Analysis meant that a quantitative assessment of the source of travel time savings was not possible. A qualitative assessment estimated that one third of the travel time saving originated from the reduction in stops along the route, while another third came from signal progression improvements along the corridor. One sixth of the travel time savings were estimated to come from Traffic Signal Priority measures along the route and another sixth from the repositioning of the majority of stops to the far-side of intersections.

Reliability problems are limited to the inbound direction in the morning peak and the outbound direction in the afternoon peak. In both cases reliability is negatively affected by high levels of congestion on the corridor. Northbound services have longer running times in both the morning and afternoon. Service reliability has been maintained by providing additional vehicles in the afternoon.

AC Transit has been successful in creating a unique identity for its Rapid Bus service, using “Rapid” branding on buses, shelters and signs. Approximately 90 percent of users stated that the “ease of Rapid Bus identification” was “good” or “very good”. General public perceptions of the Rapid Bus are good, achieving an average rating of 4.2 on a five-point scale (in comparison, AC Transit’s other services received an average rating of 3.7). The high profile branding resulted in “on the street” being the most common method for users to find out about the new service, cited by over 45 percent of respondents to a Nelson Nygaard survey. Advertising / Promotion was the next most common category, accounting for between 20 and 25 percent of responses.

No quantitative before and after data was available for the assessment of safety on the Rapid Bus. Average user perceptions were that safety was “good”, both on the Rapid Bus and at Rapid Bus stops. Comparisons with previous on-board surveys showed that perceived safety on the Rapid Bus is at least as good as safety on other corridor services and the system as a whole, if not better.

Each Van Hool A330 Rapid Bus has a maximum total capacity of 77 passengers. This equates to a one-way peak hour capacity of 385 passengers per hour (77*5), and bi-directional capacity of 770 (77*10). These capacities are sufficient for the majority of

passenger loads experienced throughout the day, with overcrowding limited to a small number of individual runs during the morning and afternoon peak periods. Passenger complaints of overcrowding were minimal.

System Benefits

The impact of Rapid Bus implementation on ridership was assessed through a series of three ridechecks conducted by Nelson Nygaard, in May 2003 (pre-Rapid), March 2004, and October 2004 (post-Rapid)[1]. An analysis of ridership before and after Rapid Bus implementation (on only the sections of San Pablo Avenue now served by the Rapid Bus) found that ridership on the Rapid Bus was much higher than on the superseded limited stop service, with Rapid Bus ridership measured at 6,050 daily boardings in October 2004 versus 1,939 daily boardings on the limited stop service in May 2003, equating to an overall increase of 212.0 percent. However, this significant increase is likely to be at least partially due to the diversion of existing riders from other corridor routes. Evidence of rider diversion comes from the fact that ridership reductions of around 35 percent were observed on the other two corridor routes during the same period (service quantity was also reduced on these two services), while 40 to 50 percent of surveyed Rapid Bus riders stated that they had used other corridor services before Rapid Bus implementation. Overall, total corridor ridership on the sections of San Pablo Avenue served by the Rapid Bus rose from 10,693 in May 2003 (pre-Rapid) to 11,607 in October 2004 (post-Rapid), equating to an increase of 8.5 percent.

The significance of this measured increase in ridership must be considered in relation to the associated increase in service provision along the corridor. The Rapid Bus service featured both greater service frequency and longer service span in comparison to the superseded limited-stop service. Thus, Rapid Bus implementation significantly increased the number of revenue hours on the corridor from 168.7 hours per day in May 2003 to 232.4 hours per day in October 2004 (despite the fact that revenue hours on other corridor routes were slightly reduced during the same period). The result of these large service quantity increases in comparison to relatively modest ridership increases meant that average passengers per revenue hour on the corridor reduced from 63.4 passengers per revenue hour in May 2003 to 49.1 passengers per revenue hour in October 2004. These figures equated to a corridor service elasticity of +0.225, slightly below the average elasticity for mature urban area service quantity changes. Service elasticity for the Rapid Bus compared to the limited stop service was +0.986, but this high value must again be considered in relation to the diversion of passengers from other corridor routes.

Overall, the increase in ridership along San Pablo Avenue is not significant in relation to the associated increase in service quantity. However, regional ridership trends also need to be taken into consideration. From 1998 to 2001, systemwide ridership increased by 13.0 percent. Then, between 2001 and 2003, ridership decreased by 12.7 percent. In 2004, systemwide ridership was measured at 215,466 unlinked trips. This means that

[1] It should be noted that month to month ridership data for the periods before and after Rapid Bus implementation were not available. In the absence of such data, ridechecks were used to assess ridership impact. This “snapshot” approach made it more difficult to draw firm conclusions about ridership impact.

between 2003 and 2004, the period during which the Rapid Bus began operating, systemwide ridership increased by approximately 4.5 percent.

The proportion of Rapid Bus users that previously used a car is around 19 percent in the Nelson Nygaard surveys and around 17 percent in the CUTR survey (11.3 percent drove, 5.3 percent rode with someone). This equates to a reduction of around 1,100 auto trips per day on the corridor, which is significant considering that the San Pablo Avenue corridor runs primarily through low-income areas with relatively little "choice ridership". The fact that approximately 19 percent of Rapid Bus users previously used the car, while 10 to 15 percent came from BART (this was not offered as an option in the CUTR survey), indicates that travel time minimization is paramount even to the transit dependent (Twichell, 2004-06).

Lack of available data has limited the evaluation of other system benefits, which include Operating Cost Efficiency, Land Development, and Environmental Quality.

1. Project Context

1.1 Background

The Alameda-Contra Costa Transit District (AC Transit) has been serving the East Bay of California since 1960. It is the third-largest public bus system in the state, serving 13 cities and adjacent unincorporated areas in Alameda and Contra Costa counties. Its annual ridership is 68.9 million, with 230,000 passengers/weekday. AC Transit provides service along 105 bus lines, totaling 22.6 million miles/year. As of May 2004, AC Transit owned 696 bus vehicles. These include articulated (60 ft.), commuter coaches (45 ft.), standard (40 ft.), feeder (30 ft.), and paratransit vehicles.

In 1995, the cities of Albany, Berkeley, Emeryville and Oakland, along with the Alameda County Congestion Management Agency (CMA), AC Transit, Caltrans, and the Metropolitan Transportation Commission collaborated to create the 1997 San Pablo Avenue Corridor Plan. The purpose of the Plan was to meet the needs and concerns regarding the potential impact of increased development along the Corridor, specifically the affect it would have on the transportation system and on its users. Planning goals and recommendations were determined and adopted for the Plan (San Pablo Avenue Corridor Transit Operations and Improvement Study).

- Enhance economic vitality;
- Enhance quality of life (including neighborhood preservation);
- Enhance aesthetics;
- Address through traffic;
- Improve mobility and accessibility; and
- Minimize environmental impacts of transportation.

To complement these goals, AC Transit adopted four goals of its own.

- Improve service reliability;
- Improve transit experience for passengers;
- Reduce travel times; and
- Increase ridership.

1.2 Corridor Characteristics

Three primary bus routes, the Rapid (72R), 72M, and 72, currently serve the San Pablo Avenue Corridor (see Figure 1.1). Each route provides service to downtown Oakland. Northbound, the 72M splits apart from the other two routes and provides service along MacDonald Avenue southward to Tewksbury Avenue. The 72 travels the length of the corridor along with the Rapid, and then continues northward to the Hilltop Mall where three major employers of Richmond are located (Macys, JCPenney, and Sears). Prior to

the implementation of the Rapid, Routes 72 and 73 were regular local routes that made passenger stops approximately every 800 feet. The 72L was a limited service route that operated only on weekdays during morning and school/afternoon peak commute periods. An analysis of bus speed and delay survey data and on-board passenger survey data allowed the following conclusions:

- Most riders travel short distances within the corridor and generally do not travel the entire length of the corridor;
- The primary use of the bus is for school or work trips, therefore the majority of passenger access the service more than four days a week;
- Delays for passenger boardings accounted for 10 to 20 percent of the overall running time for a bus trip and delays caused by traffic signals accounted for 10 to 25 percent of running time; and
- Existing passengers were satisfied with safety and security while on board the buses and while at bus stops.

An expert panel with knowledge of the bus service and operations came to additional conclusions regarding the bus services. The conclusions suggested that buses ran slower than desired, the long running times of bus routes made it difficult to maintain schedules, and the method of fare payment was complicated and time consuming. In an effort to approach and alleviate these barriers, the decision to implement a Bus Rapid Transit (BRT) system along the corridor was made.

AC Transit began BRT service on its San Pablo Rapid line on June 30, 2003. The 14 mile long 72 – San Pablo Rapid route runs through seven cities, Oakland, Emeryville, Berkeley, Albany, El Cerrito, Richmond, and San Pablo, and two counties, Alameda and Contra Costa. From Oakland to Cutting Boulevard in El Cerrito, the corridor is designated as State Highway 123. From El Cerrito to the northern terminus, the corridor is a local roadway. The corridor is parallel and one-quarter-mile away from I-80. Prior to the construction of the interstate, San Pablo Avenue was the main North-South thoroughfare through five cities.

There are sixty-three signalized intersections along the avenue where the Rapid operates. Average daily traffic (ADT) ranges widely, dependent on the location. The Congestion Management Agency (CMA) provides information regarding traffic loads online.

TABLE 1.1 - Daily Traffic through Intersections along San Pablo Avenue

Location	Daily Traffic Counts
Between 53rd and Stanford Ave., Oakland	7,992
South of Ashby Rd. (SR13), Oakland	12,333
South of University Avenue, Berkeley	23,252
South of Gilman Street, Berkeley	21,757
South of Marin Avenue, Albany	16,769
South of Central Avenue, Albany	23,933
South of Potrero, El Cerrito	17,998
South of Cutting Blvd., El Cerrito	21,315

The San Pablo Rapid had been designed to operate 20 percent faster than the previous Limited service in the same corridor, and originally envisioned a 25 percent increase in ridership. Its key components include:

- Reducing stops from 45 to 27, for an average stop spacing of .54 miles
- Moving about 90 percent of the stops to the far side of the intersection to allow Rapid buses to take advantage of signal priority (extended or early greens)
- Headway based scheduling
- Supporting the installation of traffic signal interconnection along the entire length of San Pablo Avenue, working in conjunction with the CMA
- Installing transit priority along the entire corridor, again working with CMA's SMART Corridors project. 3M's Opticom system was utilized
- Installing several queue jump lanes, as well as generating streamlined routing
- Branding the service with a Rapid logo and decals on buses, shelters, maps and schedules
- Inaugurating the service with new Van Hool European buses, which incorporate three doors on 40-foot coaches, simplified wheelchair loading through the middle door, and feature modern styling
- Installing new Rapid bus shelters and kiosks along the route
- Providing NextBus electronic bus arrival information in the shelters and kiosks, so riders will have real time bus arrival information, rather than written schedules.

The result of several years of cooperative planning between AC Transit, the CMA, and local jurisdictions, the Rapid was implemented over 18 months with a combination of Alameda County and Contra Costa County-allocated federal funds, as well as a federal budget earmark and Federal Transit Administration support.

In addition to the San Pablo Rapid and other possible Rapid corridors, AC Transit is currently in the early environmental stages of a major BRT Corridor project along International Boulevard and Telegraph Avenue, from the City of San Leandro through Oakland and terminating at the Berkeley campus of the University of California. This project proposes exclusive lanes, major stations rather than shelters, proof of payment, as well as current Rapid amenities.

2. Project Description

The Rapid combines a number of rapid transit elements that create a unique and identifiable system. The purpose of this section is to provide a detailed description of the major BRT elements that are characteristic of the system as they are presented in the Characteristics of Bus Rapid Transit for Decision-Making (CBRT) report (2004).

- Running Ways
- Stations
- Vehicles
- Fare Collection
- Intelligent Transportation Systems (ITS)
- Service and Operations Plan

FIGURE 2.1 – The Rapid Vehicle at the intersection of San Pablo Ave. and 17th St.

2.1 Running Ways

The Rapid serves as a complementary service to the local AC Transit routes (72, 72L, and 73) which operate along the San Pablo corridor that runs parallel to I-80 (see Figure 2.1). It also operates on Broadway in downtown Oakland. The Rapid operates in mixed traffic and was developed with 26 stops located at major intersections. These stops are spaced .54 miles apart on average along the length of the corridor, as illustrated in Figure 2.2. The southern terminus for the Rapid is Jack London Square located in downtown Oakland. The northern terminus is located at Contra Costa College in San Pablo. The

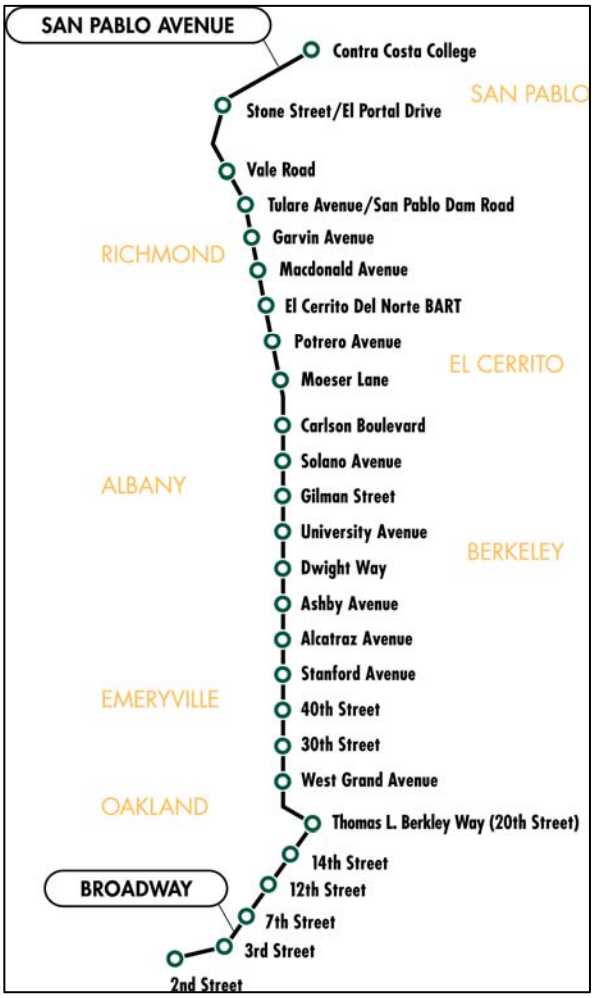
transit corridor is 14 miles long and runs through seven cities including Oakland, Emeryville, Berkley, Albany, El Cerrito, Richmond, and San Pablo.

2.2 Stops

AC Transit, the predominant transit property for Alameda and Contra Costa County, has authority regarding bus stops. There are 27 Rapid stops spaced approximately .54 miles apart in each direction. Originally, 26 stops were designated for the Rapid, but an additional trip generator was identified. The additional stop that was added was at VanNess between Stone Street and Vale Road. Every stop is located at the far side of the intersections to decrease the overall travel time. In 2004 a stop at Avenia de la Fuente was added. Figure 2.2 shows the original 26 stops. From the south to the north, each stop is located at a major intersection along the San Pablo corridor:

- Jack London Square (Oakland)
- 3rd Street (Oakland)
- 7th Street (Oakland)
- 12th Street (Oakland)
- 14th Street (Oakland)
- Thomas L. Berkley Way/20th Street (Oakland)
- Grand Avenue (Oakland)
- 30th Street (Oakland)
- 40th Street (Oakland)
- Stanford Avenue (Emeryville)
- Alcatraz Avenue (Emeryville)
- Ashby Avenue (Emeryville)
- Dwight Way (Emeryville)
- University Avenue (Berkley)
- Gilman Street (Berkley)
- Solano Avenue (Albany)
- Carlson Blvd. (Albany)
- Moeser Avenue (Albany)
- Potrero Avenue (El Cerrito)
- El Cerrito Del Norte BART (El Cerrito)
- Macdonald Avenue (El Cerrito)
- Garvin Avenue (Richmond)
- Tulare Avenue/San Pablo Dam Road (Richmond)
- Vale Road (Richmond)
- Stone Street/El Portal Drive (Richmond)
- Contra Costa College (San Pablo)

FIGURE 2.2 - Rapid Stops



The determination for shelter locations was based on the desire to maintain a distance between stops at an average of one-half mile in order to ensure the rapid nature of a BRT system. Additional factors were considered such as the number of boardings at each stop. The locations of major transfer points were also a major determinant for stop locations.

Stops that are located in downtown Oakland have easy access to the Bay Area Rapid Transit system (BART). BART provides train service throughout the bay area, and connects Oakland to San Francisco. The El Cerrito Del Norte and Del Norte stations in El Cerrito are also within close proximity to Rapid stops. Rapid stops are shared with local service as well.

Each stop has a covered shelter (see Figure 2.3), the size being dependent on the service demand or physical constraints that characterize each stop. Each Rapid stop is fully ADA accessible. The shelters have glass panels of which a decal of the Rapid logo is placed, making the shelter identifiable as a Rapid stop. The cover of the shelter is also glass, allowing daylight to illuminate the inside of the shelter during the day. There are four different sized shelters that are typically found along the route. A dome shelter measures 22 x 5 feet. Sidewalk dome roof shelters, which need to be located on a narrow (er) right of way, are 18 x 2.5 feet. Non-ad shelters, which have equal side panels since there is not a need for an advertisement area, are 13 by 2.5 feet. Ad shelters, which have a larger side panel to accommodate the advertisement that is displayed are 12 x 5 feet and are the standard shelter used by the City of Oakland.

Each shelter has a bench for transit patrons to sit while they wait for the bus to arrive. The shelters are also equipped with trash receptacles, lights, maps of AC Transit bus service, including a specific map of the Rapid, and information regarding fare costs.

FIGURE 2.3 - Rapid Shelter

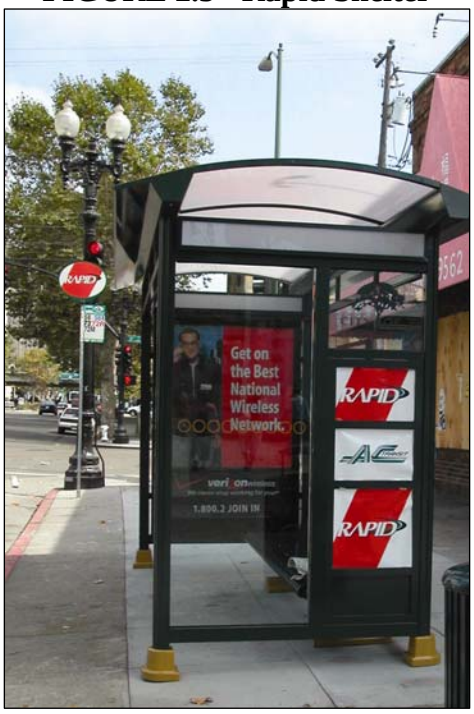
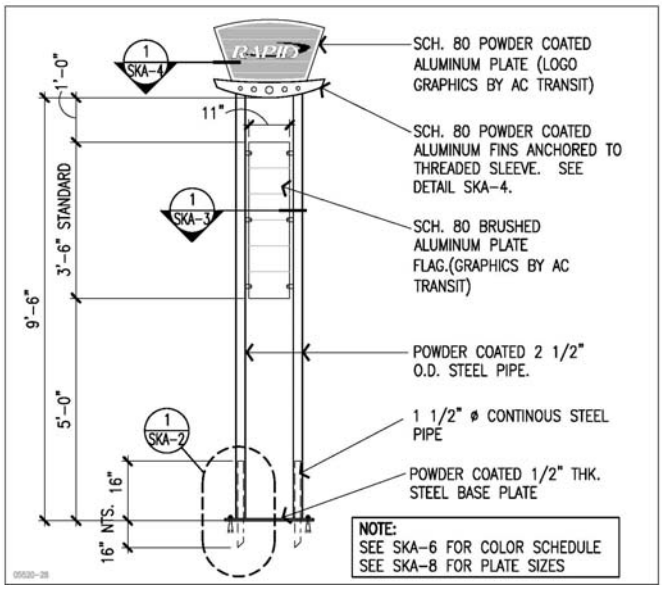


FIGURE 2.4 - Information provided at shelters

Real time information regarding the arrival time of the next two buses is also provided at 44 of the stops. The information is displayed on an LED screen at the back top of the shelter and is provided by Next Bus. Each shelter was determined to cost approximately $30,000.

Initially, lollipop signs were posted at each of the stops to show the designation to the Rapid. After posting the signs, however, it was determined that they were mis-proportioned. An architectural firm was hired to redesign the sign. The new signs cost $1,000 each and should be installed in the spring of 2006. Below is an image of pole that will be installed.

FIGURE 2.5 - Updated Rapid Pole

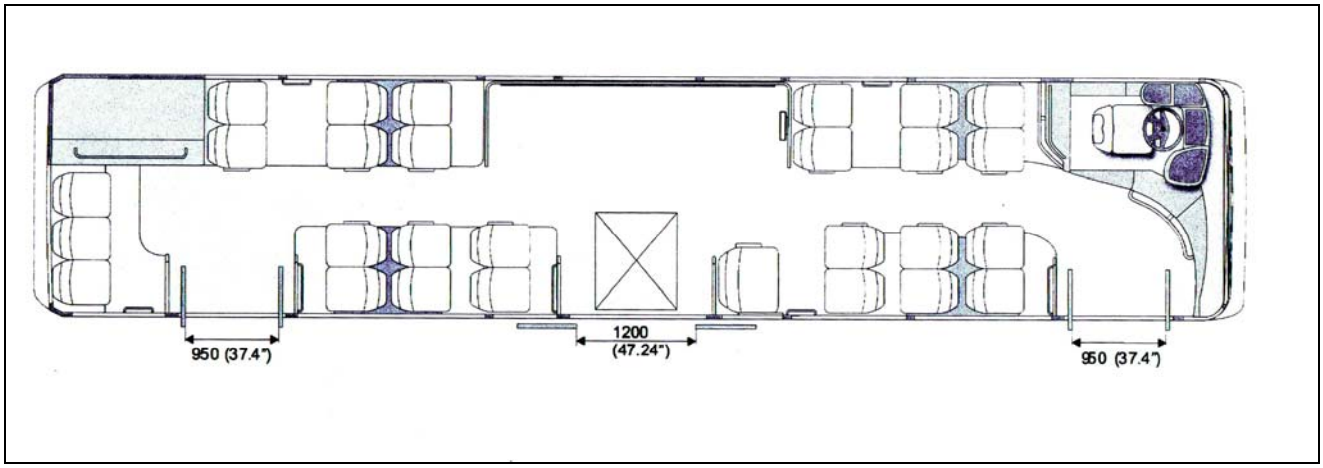


2.3 Vehicles

The Rapid uses the Van Hool A 330 vehicle, which is manufactured by Van Hool in Belgium. The vehicle, as shown in Figure 2.6., is low floor and is 40 ft. in length, with a width of 102 in. and a height of 122 in. The engine is a Cummins ISL 280 HP. The vehicle has three doors. The front door opens inward. The middle door opens by sliding along the exterior of the bus. The seating capacity on board the vehicle is 32. Total capacity is 77. A large standing area is located at the second door. For standees, numerous stanchions have been provided, including poles, "lean-to" railings, and hanging straps. Interior signage feature large line maps that indicate stops by name (Figure 2.7). Four flip down seats are located at the wheelchair securement area.

On the exterior of the vehicle, a bicycle rack that can accommodate two bicycles is located on the front of the bus. Electric open-assist doors with touch sensitive exterior controls are provided at the second and third doors. LED multi-color destination signs are visible on the front and sides of the vehicle. Information is displayed in red and green. Wheelchair accessibility is through the middle door, which provides easy access to the securement area inside (see Figure 2.7). This door has a greater width than the other doors.

FIGURE 2.6 - Vehicle Configuration



AC Transit will eventually have 180 vehicles of these vehicles. The vehicles are not used specifically for the Rapid service. The cost of each vehicle was $320,000. AC Transit had sent maintenance personnel and some bus operators over to Belgium to receive training. One person employed at AC Transit spent a year overseas for extensive training.

FIGURE 2.7 – Interior Signage

FIGURE 2.8 - Wheelchair Ramp

2.4 Fare Collection

AC Transit employs an on-board fare system of which exact change is required. The farebox is located near the front door of the vehicle. The base adult cash fare to ride the Rapid is $1.75. AC Transit also offers a 10-ride and a 31-day transit pass. The cost for the 10-ride pass is $17.50. The 31-day transit pass is offered for $70. Transfers to other bus routes cost $.25. The same fare structure is applied to the Rapid as to other bus services offered by AC Transit.

2.5 Intelligent Transportation Systems

The Rapid employs several forms of Intelligent Transportation Systems (ITS) to help in the operations and image of the system. The systems include the use of Transit Signal Priority (TSP) along the route, the Automated Vehicle Locator (AVL), Automated Passenger Counters (APC), and real time information displays that are located inside shelters at most stops.

Transit Signal Priority (TSP)

Coordination among different agencies within the AC Transit service area was necessary to implement the use of transit signal priority. The Alameda County Congestion Management Agency (CMA) is the lead agency for East Bay SMART Corridors Program. The SMART Corridor program is responsible for signal upgrades that include the construction, signal coordination, and transit signal prioritization software development. SMART Corridors is a coalition of 25 parties from state, federal and regional agencies, transit and emergency services groups and includes 14 communities in Alameda and Contra Costa counties. The program is intended to plan and implement a multimodal advanced transportation management system along the I-880 and San Pablo Avenue (I-80) corridors. These corridors are the two worst congested roadways within the region. The multimodal program supports emergency and transit services as well as other modes of transportation.

The City of Oakland Public Works Department is responsible for signal coordination and re-timing, as well as the installation of signal priority at each intersection within its jurisdiction. Caltrans, the State Department of Transportation, owns the right-of-way on half of the San Pablo corridor and a majority of the signals. AC Transit had to coordinate with Caltrans for the installation of the signal priority system as well.

The transit signal priority system is a headway based system for transit vehicles. Once activated by a transit vehicle, the signal priority cannot be activated again for another 10 minute time period. All 63 San Pablo Avenue intersections have TSP, yet only the Rapid buses have the capability to trigger the system. The type of priority granted to a transit vehicle is dependent upon each intersection. Two types of priority may be granted and include an early green, (a signal switches from a red light to a green light to keep the

vehicle from waiting at an intersection for the signal to change), or an extended green (delays the signal change from green to red by a designated amount of time). The optical detectors are 3M's Opticom Transit Signal Priority System, and are used for Emergency Vehicle Preemption (EVP) as well.

Communications

All Rapid vehicles are equipped with APC sensors and AVL. The AVL is based on a Geographic Point System (GPS) that had been installed on each of the buses. The GPS installment on each bus is also used to generate real time information at equipped stops. Next Bus is used to provide this information, and displays the arrival time for the next two vehicles (see Figures 2.9 and 2.10 below). Forty-four of the stops have real time information displays.

Twenty video cameras have been installed at a number of intersections along the San Pablo Avenue corridor (see Figure 2.11). Although these cameras were not installed as an element of the Rapid system, their presence on the corridor may be useful to AC Transit. Real time video images received at the intersections are available on the internet which is accessible to the public. The purpose of these cameras is to not only allow Central Dispatch at AC Transit and local jurisdictions and their agencies the ability to monitor the traffic in their area and other jurisdictions as well, but to also allow the public to monitor the traffic.

FIGURE 2.9 - Real Time Information Display

FIGURE 2.10 - Real Time Information Display (Close-Up)

FIGURE 2.11 - Video Camera at an Intersection

2.6 Service and Operations

The Rapid operates every day from 6 am to 7 pm on a headway-based schedule of 12 minutes. The 72 local services also operate along the corridor 24 hours a day. During peak operating periods, combined corridor headways are as low as seven minutes. There are opportunities to transfer to BART along the corridor as well.

Eleven Rapid buses operate along the corridor in the morning until the afternoon. During the afternoon and evening hours, 13 buses are in operation. In the morning hours, end-to-end travel time in the southbound direction is approximately 50 minutes. Northbound travel time is approximately 55 minutes. In the afternoon, end-to-end travel time in the southbound direction is about 60 minutes. End-to-end travel time in the northbound direction is approximately 67 minutes. It is speculated that northbound travel on San

Pablo is slower in both the am and pm peak hours due to both a traditional and reverse commute.

Bus operator assignments for the Rapid are based on AC Transit's quarterly sign-ups, where each operator may sign up for a particular schedule that they desire. Routes are picked by seniority. Operators on the Rapid do not wear a uniform that is unique to the route. A training course was provided for the start-up of the system, and was repeated after one year, in order to account for driver turnover. One of the issues that have been noted, however, is the reluctance among drivers to maneuver the vehicle out of the curb lane and into the travel lane.

2.7 Marketing

Increased marketing efforts for the San Pablo Rapid Bus corridor in Oakland, CA are likely influences of the system's success. The marketing, which used a variety of outlets, is a notable model for transit agencies trying to sell their system to the community.

A portion of federal funds for the Rapid was designated for marketing. With the determined amount, AC Transit was able to hire a marketing professional to assist the marketing team, and produce numerous items that were distributed in Oakland to build public interest.

The marketing team focused on five goals:

- Increase the number of choice riders
- Increase the number of transfer riders
- Increase ridership
- Develop business partners
- Increase the number of vendors along the corridor

The Rapid logo was developed to differentiate the service from local service. AC Transit purchased red hats, pins, and shirts imprinted with the logo and began to distribute them amongst employees and the public. These items were also distributed during an internal launch event meant to encourage internal support and interest among planners and operators of AC Transit. Balloons and refreshments were provided as part of the festivities.

Four months after service began, an external launch event was held. The event was a "Whistle Stop" tour, with the Rapid buses stopping along the corridor in each city to present plaques in appreciation for their participation. A band was hired for the event, and a cake designed to look like a Rapid Bus was prepared for the celebration.

Media outlets were used to market the Rapid as well. A commercial with the theme, "Live Your Life in the Fast Lane" aired on local cable stations for a couple of months. Advertisements for the Rapid were shown in movie theaters prior to movie show times

during the months of November and December of 2002. The approximate cost for the production of the commercial was $10,000, and costs for the movie advertisements were minimal.

In an effort to build ridership, door hangers with free tickets attached along perforated lines were placed in locations within ¼ mile of the route, targeting residents that lived nearby. Given the multilingual population of the area, one side of a hanger was in English, and the other side had information in both Spanish and Chinese.

A business partner plan was also developed to encourage local businesses to promote the Rapid. The business partner plan is structured to allow businesses to choose their level of participation for a one-year period. Three commitment levels were available for interested businesses, the Gazelle, Antelope, and Cheetah. The Gazelle offered businesses a listing on the AC Transit webpage, 100 free tickets for employees and customers, 10 lapel pins, 2 t-shirts, and 2 hats. In return, businesses were asked to display Rapid brochures and posters in the workplace, wear the Rapid apparel once a month, and encourage the use of the system. The Antelope and Cheetah plans, which cost $500 and $1,000, respectively, offered businesses additional perks, such as the posting of business bios on the AC Transit webpage and links to the business website, an opportunity to advertise on the NextBus electronic signs at Rapid stops, and additional tickets, t-shirts and hats. Advertising for upcoming services or route changes have been the primary type of advertising on NextBus displays, though local businesses have occasionally used the sign to advertise.

2.8 Lessons Learned

This section provides an overview of lessons learned during the planning and implementation process of the Rapid. During interviews held with staff from AC Transit, information regarding particular experiences that were notable were discussed and are included.

Relationships with Local Utilities

In order to provide real time information at stops through NextBus, shelters and electrical power are required. To gain access to the local utility, it was necessary to trench to the nearest utility connection and complete a permitting process as well. In addition, the installation of electrical meters on the outside of each shelter was necessary. Since the City of Oakland has a different shelter provider (AdShell) an appeal to the State Public Utilities Commission had to be filed. Due to the length of these processes, real time information was not available at the Rapid shelters until one year after service began. In retrospect, AC Transit staff believes that it would have been beneficial to begin this process in the early stages of implementation.

Innovative Marketing is Important

Marketing efforts that were employed to facilitate information regarding the Rapid are considered extremely helpful. While unable to assign a value to the marketing methods in terms of their effectiveness, it is believed that two were very beneficial. The first method is understood to be the commercial that was aired on television. AC Transit produced a relatively inexpensive commercial and spent $10,000 for it to air on cable. The agency believed that it was worth the expenditure to ensure that their commercial would be seen by television viewers that often watch cable channels than network channels. The ability to target viewing areas in the nearby vicinity of the route is also considered useful as well.

The other effort that appeared to have had a great effect on the marketing of the Rapid was the use of multilingual handouts for the dissemination of information. The Bay Area is characteristic of being very multicultural. The percent of foreign born persons in Alameda County is 19 percent, compared 11.1 percent in the US. The percent of foreign born persons in Contra Costa County is significantly larger, at 27.2. The percent of persons in Alameda and Contra Costa counties that speak a language other than English at home are 26 and 36.8 percent, respectively. The national percentage is 17.9 percent. Providing information materials in different languages was an essential effort in order to ensure residents along the corridor were properly informed regarding the Rapid service.

A Good Construction Partner is a Great Asset

The third lesson learned by AC Transit during implementation is the importance of having a good construction partner. The San Pablo corridor is characteristic of being a mature area, and updates to street equipment, providing signal priority, traffic control boxes, and other infrastructure prior to service offered on the Rapid was necessary. The relationship that AC Transit had with their construction partner (Congestion Management Agency) allowed for relative ease in implementation.

3. System Costs

The costs of the Rapid are split among the following elements:

- Traffic Signal/Transit Priority/On-Street Improvements
- Bus Arrival Information
- Street Furniture (shelters and other amenities)
- Emitters (for Opticom)
- Before and After Ridership Surveys
- Marketing Costs
- Initial Operations

Table 3.1 provides a capital cost summary of the Rapid by element. The total project capital cost was approximately $3.2M (or $228,571/mile). This total cost is relatively low for typical in-street mixed traffic alignments. The main reason the project cost was comparatively low is because the purchase of Van Hool vehicles were not specific to the Rapid. The vehicles are used on other routes operated by AC Transit. In addition, AC Transit did not incur any right-of-way acquisition costs.

The most expensive project element was the purchase and implementation of traffic signal priority equipment, along with on-street improvements. One contract with the CMA was created to cover implementation of signal priority and a queue jump along the corridor from Contra Costa College to the intersection of San Pablo and 22nd Avenue. The second contract was with the City of Oakland for signal improvements and artwork for shelters. The implementation of bus arrival information was the second most expensive element of the project, at $412,850. This amount included the cost for the system that was currently installed as well as the Next Bus package which included the necessary hardware, communications and software.

The total cost for each shelter was $30,000. The shelter itself cost approximately $11,000, however, additional funds were needed for power connections in order to operate Next Bus, and street furniture, such as benches. The original Rapid poles and flags cost $28,760. The 50 poles that will replace the originals will be installed in the spring of 2006 and cost $1,000 each.

A significant amount of money was also spent on marketing efforts for the Rapid, at $146,000. The design and development of the Rapid logo was the most costly, followed by the production of items such as route maps, door hangers, and other informational material.

TABLE 3.1 - Capital Costs

			Obligated
Traffic Signal/Transit Priority/On-Street Improvements			
(a) CMA Contract - Signal Priority from Contra Costa College to San Pablo/20th			623,980.00
Amendment 1 - Queue Jump Lane at Del Norte			126,000.00
Amendment 2 - Interim Signal Coordination on Broadway			182,020.00
(b) Oakland Contract - Signal Improvements Telegraph/20th to Broadway/3rd			793,800.00
Amendment 1 - Rapid Bus Artwork, Electrical, Misc for Adshel Shelters			**56,231.64**
Amendment 2 - Additional funds for CMA oversight			0.00
(c) Bus Pad, 2 @ $20,000 EA, in City of San Pablo (previously 1 bus pad only)			**42,116.41**
~~(d) Bus Island on northbound farside 20th/Broadway (deleted)~~			0.00
(e) Resurface Portion of Knott Avenue			35,000.00
(f) APC Purchase ($1,750 one time setup, plus $11400 for Mat'ls plus 20 units x $8100/unit)			0.00
Subtotal			1,859,148.05
Bus Arrival Information			
(a) purchase of currently installed system			78,800.00
(b) NextBus Bus Arrival Information System - Package purchase of hardware, communications, & software			330,800.00
Amendment 1 to Nextbus - Electrical & Misc for Oakland Bus Arrival			3,250.00
Amendment 2 to NextBus - Change Order for Oakland Shelter Work			0.00
Subtotal			412,850.00
Street Furniture; Shelters & Other Amenities			
(a) 50 shelters @ up to $30,000 ea for add-ons, power connections, etc.			
Lamar			566,596.00
Amendment 1 - Emeryville Driveway, Dwight Bench, Ashby Curb			9,940.00
(b) Rapid Poles & Flags			28,760.00
(c) AC Transit Portion of Bus Selter Electrical Installation Costs (27 x $5000)			0.00
Subtotal			605,296.00
Emitters (to activate Opticom at intersections)			
(a) Buy and install 20 units, on Rapid buses only (Purchase Order P01238)			21,541.75
(b) Buy & Install 5 additional units			5,385.44
Before & After Ridership Surveys			
(a) 100 percent surveys on 72/72L(R)/73			75,000.00
(b) Follow-up 2004 Survey			40,000.00
Capitalize Marketing Costs			
(a) Design and Development of Rapid Logo			77,000.00
(b) Rapid Bus Graphics/Wrap			0.00
(c) Various production items inc. Route maps, handouts, etc.			23,000.00
(d) Contractors			46,000.00
(e) Materials and Fare Reimbursement			0.00
Subtotal			146,000.00
Operations			
(a) Supervisors Salaries and Benefits for 2 years ($714,000 less $130K for cameras)			0.00
(b) Video Cameras (20 Units x $6500)			0.00
(c) Reimburesment for free 1-day passes			0.00
(d) Four Laptops w/ wireless connection costs for 2 years			21,698.08
			0.00
Travel			9,931.00
Contingency	a) Original	791,657.00	
	b) Allocated	425,800.00	
	c) 10/14/02	365,857.00	
	d) 9/22/03 add $50K	618,598.80	0.00
		Totals	3,196,850.32

Note: Costs in bold indicate changes from previous budget

Source: AC Transit, 2005

4. System Performance

The CBRT document identified five key BRT system performance attributes; (1) Travel Time, (2) Reliability, (3) Image and Identity, (4) Passenger Safety and Security, and (5) System Capacity. Each of these is discussed below.

4.1 Travel Time

Several performance indicators have been developed to assess the impact of BRT systems on corridor travel time (CBRT, 2004):

- Maximum (Peak hour) End-to-End Travel Time: Average weekday travel time required to complete a one-way trip from the beginning to the end of the route during peak hours
- Uncongested End-to-End Travel Time: Average weekday travel time required to complete a one-way trip from the beginning to the end of the route during off-peak hours
- Minutes Per Mile: Average obtained by dividing average route time by route distance
- Maximum Time on Local Line (peak hour): end-to-end travel time on the local line running along the same alignment as the BRT line
- Travel time reduction: Percentage difference between average peak hour route time on local service versus BRT service

Two separate travel time studies, using the performance indicators highlighted above, have been conducted on the San Pablo Rapid service. The results of these studies are summarized below.

4.1.1 AC Transit Travel Time Study

An initial evaluation of total travel time on the San Pablo Rapid was conducted by AC Transit in 2003 (CBRT, 2004). These results are summarized below:

TABLE 4.1 – Impact of the Rapid Bus on Total Travel Time*

Travel Time Measure	Value
Maximum (Peak hour) End to End Travel Time	63 mins
Uncongested End-to-End Travel Time	52 mins
Minutes per mile (peak hour)	4.49
Minutes per mile (uncongested)	3.70
Travel Time reduction (compared to Local)	21%
Travel Time reduction (compared to Limited Stop)	17%

* Source: Diaz, R. B., et al. (2004). *Characteristics of Bus Rapid Transit for Decision-Making.*

The table shows that the Rapid Bus completed the route from Contra Costa College to 2nd Avenue in 63 minutes during peak hour traffic conditions and 52 minutes in uncongested conditions. This 11 minute difference in travel time over the 14 mile route means that traffic congestion is responsible for an average delay of 47 seconds per mile, which illustrates the severity of traffic congestion problems along the corridor. It can be seen that average end-to-end travel times were reduced by 21 percent in relation to the local service and 17 percent in relation to the superceded limited-stop service.

4.1.2 Nelson Nygaard Travel Time Study

Consultants Nelson Nygaard were commissioned by AC Transit to conduct a "before and after" assessment of the San Pablo Rapid. Data collection for the study was conducted in three phases; May 2003 (pre-Rapid), March 2004, and October 2004. Travel time data and ridership data was collected, in addition to an on-board survey of Rapid users. Route travel times were assessed by employing temporary surveyors to record start and arrival times on almost every weekday run of the different routes serving the corridor.

Total route running time for the 72L was measured at 70 minutes in May 2003. Running time for the same route on the 72R was measured at 58 minutes in March 2004, and remained at 58 minutes in the October 2004 assessment, despite the fact that a new stop was added at San Pablo & Van Ness (Nelson Nygaard, 2005). This 12 minute time saving equated to a 17 percent reduction in running time, the same figure obtained in the prior AC Transit travel time assessment.

When compared to travel times on local routes, the 72R's time savings were even more dramatic. For example, traveling from Del Norte BART to San Pablo & 40th Street takes an average of 28 minutes on the 72R and 38 minutes on the 72, or a 26% difference in travel times. Another example shows that the 72R travels from Broadway & 14th Street in downtown Oakland to San Pablo & University Avenue five minutes faster than the 72, again a 26% difference in running times (Nelson Nygaard, 2005).

Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

Comparing the results of the two studies, it can be observed that the AC Transit study assessed travel time at the two traffic condition extremes – uncongested and peak-hour, while the Nelson Nygaard study produced an average value taken from runs conducted throughout the day. Therefore, it is logical that the travel time computed by Nelson Nygaard study (58 minutes), should lie between the upper and lower travel time limited calculated by the AC Transit study (52 minutes and 63 minutes). It is also important to note that the difference in travel time between the limited stop service and the rapid service was measured at 17 percent by both studies.

At the outset of the San Pablo Rapid project, AC Transit predicted an end-to-end travel time saving of 20 percent in comparison to the limited-stop service. The resulting 17 percent reduction was slightly lower than this estimate.

4.1.3 Source of Travel Time Savings

The San Pablo Rapid service was introduced with a variety of different features that aimed to reduce travel time. These included (i) reducing the number of stops, (ii) changing stop locations from a roughly equal number of near and far side stops to 90 percent far-side, (iii) providing Transit Signal Priority (TSP) for Rapid vehicles, (iv) providing queue jump lanes, and (v) using low-floor buses. In addition to these improvements, Alameda County Congestion Management Agency also coordinated the implementation of signal progression along the San Pablo Avenue corridor around the same time as the Rapid Bus was implemented. This improvement benefited all vehicles traveling on the corridor, including the Rapid Bus.

It would be useful to be able to determine the extent to which these different measures have contributed to the overall travel time saving of 17 percent. However, a quantitative assessment requires travel time component data to be collected. Lacking the necessary before and after data, a qualitative assessment has been obtained through discussions with a senior AC Transit official, who has based the following estimates (see Figure 4.1) on observation of system operations (Twichell, 2004-06).

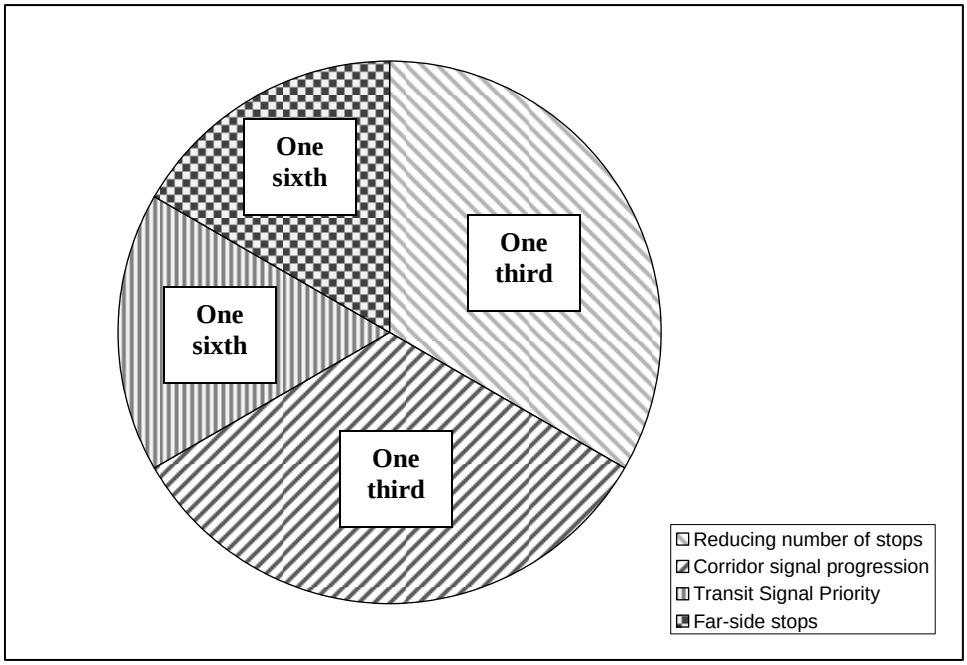


FIGURE 4.1 – Estimated Sources of Travel Time Savings

Figure 4.2 shows that the two main sources of travel time savings are the reduction in the number of stops along the route, and the introduction of signal progression on the corridor (which has increased travel speed for all corridor traffic). These two measures were estimated to each be responsible for approximately one third of total travel time savings. The other two time-saving sources are the Transit Signal Priority measures and the emphasis on far-side stops, each estimated at providing around one sixth of the total travel time savings.

4.1.4 User Perceptions of Travel Time Savings

Both the Nelson Nygaard and CUTR on-board surveys asked respondents to indicate how their travel time had been impacted by the introduction of the Rapid Bus. The results obtained from the three surveys are compared below.

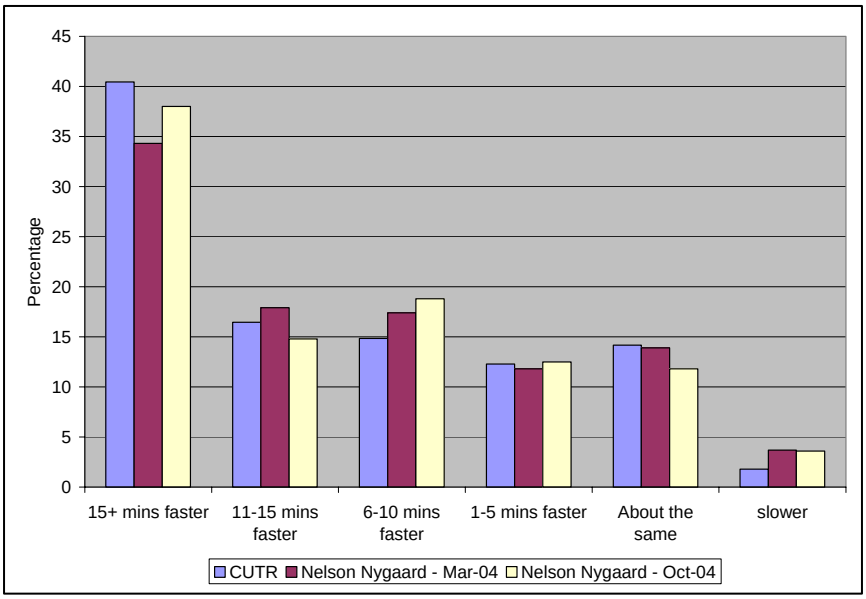


FIGURE 4.2 – Perception of Rapid Bus Impact on Travel Time

The figure indicates a high level of similarity in the results obtained from the three different surveys. The majority of respondents in each survey thought that the Rapid Bus had reduced their travel time, with less than 15 percent stating that their travel time had remained unchanged, and under 5 percent stating that their travel time was now slower. Thus, over 80 percent of riders thought that their travel time had decreased as a result of the Rapid Bus. Of these, around 35 to 40 percent stated that the travel time saving was greater than 15 minutes, while the remaining categories, 11 and 15 minutes, 6 to 10 minutes, and 1 to 5 minutes accounted for the remainder of the sample.

In a separate survey question, in which respondents were asked to rate different aspects of the Rapid service, "Travel time on the Rapid Bus" achieved an overall mean score of 4.3, one of the highest ratings. Overall, these results indicate that, from the viewpoint of its customers, the Rapid Bus had generally been successful in reducing travel times.
Comparing perceived travel time savings with actual travel time savings, it is interesting to note that almost half the sample thought that the Rapid Bus was more than 15 minutes faster than the previous service, while actual end-to-end travel time savings were measured at approximately 12 minutes. This provides evidence of the fact that many users perceive any travel time savings associated with improved service as greater than they actually are.

4.2 Reliability

The CBRT document defines three different types of reliability, (i) running time reliability, (ii) station dwell time reliability, and (iii) service reliability.

4.2.1 Running Time Reliability

The CBRT document recommends the use of three performance indicators to measure running time reliability:

- Maximum end-to-end travel time: Average weekday travel time required to complete a one-way trip from the beginning to the end of the line during peak hours
- Unconstrained end-to-end travel time: Average weekday travel time required to complete a one-way trip from the beginning to the end of the line during non-peak hours of service
- Ratio of unconstrained to maximum travel time: Calculated by dividing unconstrained end-to-end travel time by maximum end-to-end travel time. The higher the ratio, the greater the impact of peak our traffic conditions on end-to-end travel times

These measures are shown in Table 4.2 below.

TABLE 4.2 – Running Time Reliability*

Reliability Performance Indicator	Value
Maximum (Peak hour) End to End Travel Time	63 mins
Unconstrained End-to-End Travel Time	52 mins
Ratio of Unconstrained to Maximum Travel Time	1.21

* Source: Characteristics of Bus Rapid Transit for Decision-Making. (2004).

Table 4.2 shows that the average difference between peak hour and unconstrained end-to-end travel times is 11 minutes, which equates to a ratio of 1.21. This figure is comparable to other system assessed in the CBRT document, where ratios were observed to vary between 1.00 (i.e. no difference between peak hour an off-peak travel times, observed on the Orlando and Miami systems), and the much higher values of 1.42 (Chicago – Irving Park Express) and 1.54 (Los Angeles – Metro Rapid Ventura). This suggests that while variation between peak and off-peak travel times does exist on the San Pablo Avenue corridor definitely exists, it is not as extreme as that experienced by other BRT services.

Northbound services have longer running times in both the morning and afternoon.
Service reliability has been maintained by providing additional vehicles in the afternoon.

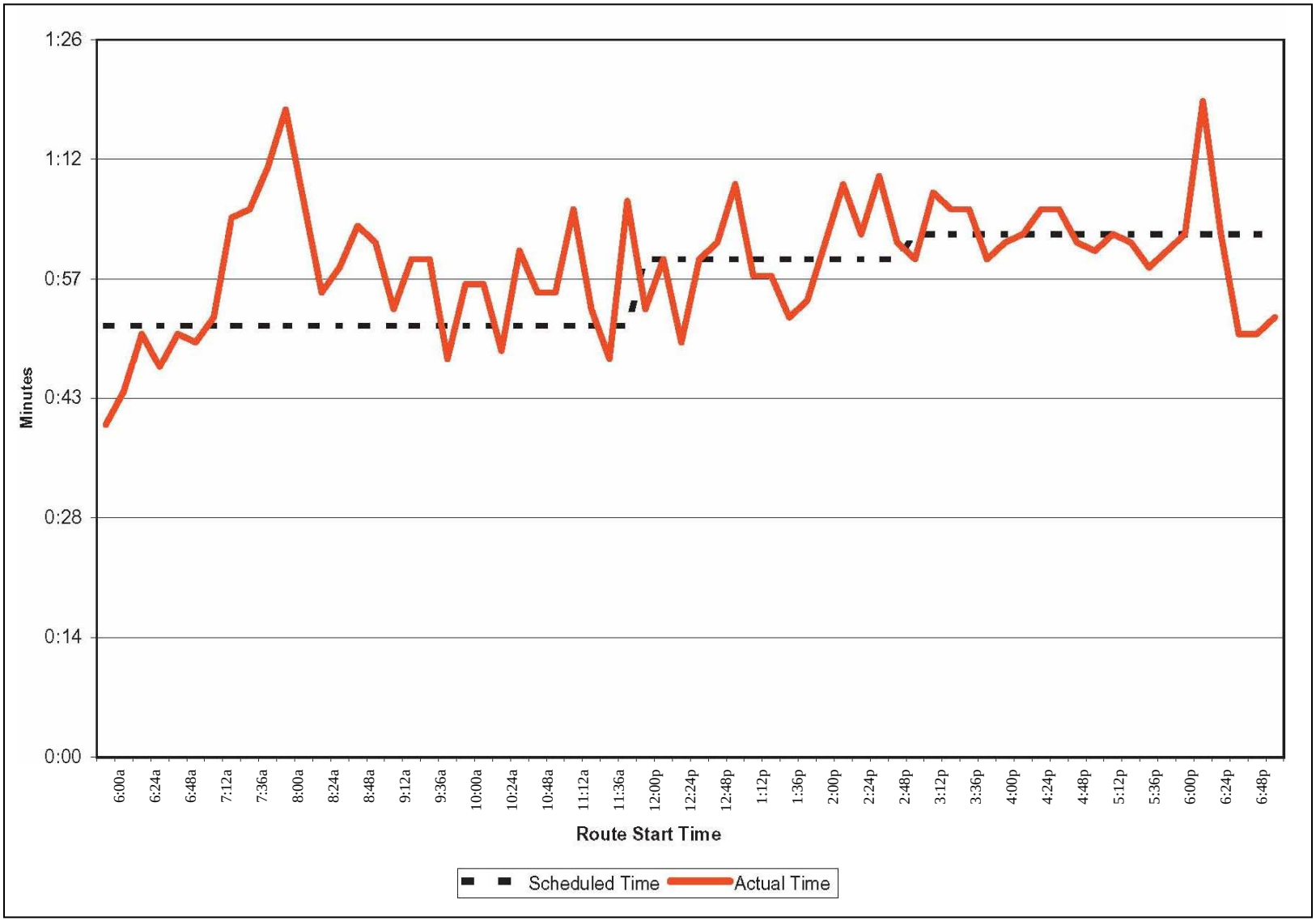
4.2.2 Schedule Adherence

Another measure of reliability is schedule adherence, which can be assessed by comparing observed average scheduled running times against scheduled running times throughout the day. Nelson Nygaard conducted such an analysis, which is reproduced in Figures 4.3 and 4.4 on the following page.

Figure 4.3 shows that inbound run times are scheduled at 52 minutes from 6:00 a.m. to 12:00 p.m. From 12:00 pm to 3:00 p.m., scheduled run time increases to 60 minutes, and from 3:00 p.m. to end of service at 6:48 p.m. scheduled run time is 63 minutes. Comparing these scheduled run times with actual run times observed in October 2004, it can be observed that most run-time variation occurs in the morning, with several individual runs timed at over one hour. After the morning peak period ends (at around 10:00 a.m.), actual run-time generally remains within 10 minutes of the scheduled time. Larger run-time variation is also apparent in the afternoon peak, with individual runs measured at more than 10 minutes under and more than 10 minutes over the scheduled run-time.

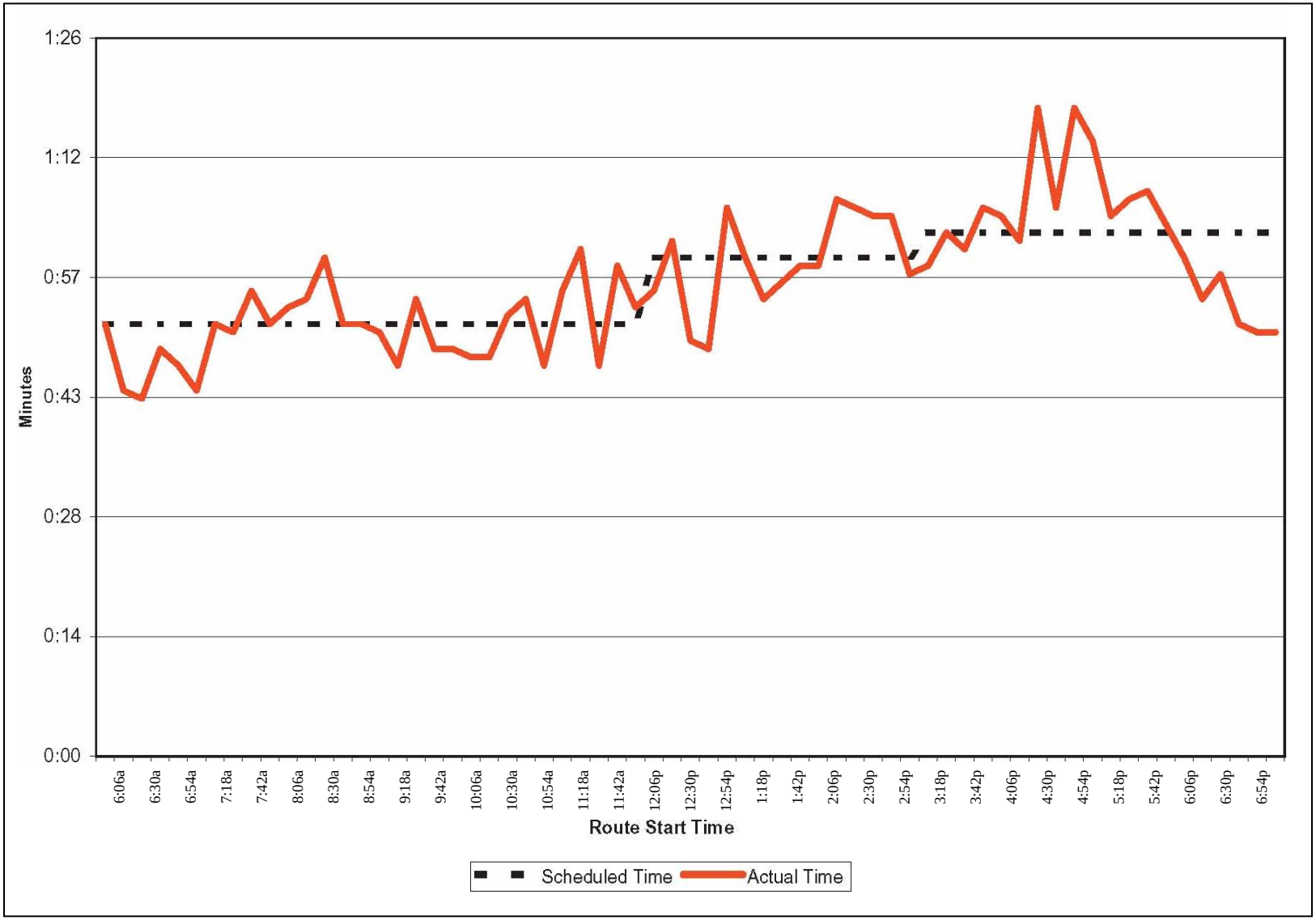
Figure 4.4 generally suggests a much higher level of schedule adherence in the outbound direction than was observed in the inbound direction. Actual run-times are generally within 7.5 minutes of schedule run-times, with the only exception being a small number of runs during the afternoon peak (4:30 p.m. to 5:00 p.m.). After 6:00 p.m., actual run-times were measured at more than 10 minutes shorter than schedule run-times.

FIGURE 4.3 – Schedule Adherence on the 72R (Inbound) – October 2004



Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

FIGURE 4.4 – Schedule Adherence on the 72R (Outbound) – October 2004



Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

4.2.3 User Perceptions of Reliability

The CUTR on-board survey asked respondents to rate "Dependability of the Rapid Bus (on-time performance)" on a five-point scale. Their responses are provided below:

TABLE 4.3 – Consumer Ratings of Rapid Bus Reliability

Dependability of Rapid Bus (on time performance)	% of Sample
Very Poor	0.5%
Poor	3.5%
Fair	16.4%
Good	39.7%
Very Good	39.9%
Mean Score	4.1

The table shows that most respondents rated service reliability as either good or very good. Less than five percent rated the service as poor or very poor. This resulted in a mean score of 4.1, which is about average in comparison to the ratings for other service aspects. Another source of consumer perception information is the comments provided at the end of the on-board survey. Six respondents commented that the service was unreliable, while 17 made positive remarks about service reliability.

A system-wide survey of AC Transit service was conducted in 2002. The survey results have been used to compare Rapid Bus reliability (presented in Table 4.3 above) equivalent ratings for system-wide AC Transit services, and for pre-Rapid service on the San Pablo Avenue corridor, shown in Table 4.4 below.

TABLE 4.4 – Consumer Ratings of AC Transit Service Reliability

"the bus comes on time"	System-Wide (N=11,658)	San Pablo Ave (N=259)
Poor	12.4%	17.4%
Fair	28.6%	25.5%
Good	30.4%	31.7%
Very Good	17.3%	14.7%
Excellent	11.3%	10.8%
Mean Score	2.86	2.76

This table shows that, both system-wide and on the San Pablo Avenue corridor, there are a wide range of responses across the five response categories. Views on reliability on San Pablo Avenue corridor services are very similar to views on the system as a whole, but with a slightly higher percentage rating the service as "poor" and a correspondingly lower percentage rating the service as "good" or "excellent", resulting in a slightly lower mean score of 2.76 compared to 2.86.

Care should be taken when comparing responses from the two surveys, because the questions posed, and the answer scales used, are different. It should also be noted that other AC Transit services run on a fixed schedule, with exact arrival and departure times provided. In contrast, the Rapid Bus runs on a headway-based schedule without any

published arrival and departure times, which perhaps makes it less obvious when the Rapid Buses are running late. Despite these caveats, comparison of the results from tables 4.6 and 4.7 show that the Rapid Bus mean score of 4.1 translates to slightly above a rating of "good" (4.0), while the system-wide and corridor ratings of 2.86 and 2.76 translate to slightly below their equivalent "good" rating of 3.0. Therefore, comparison suggests that Rapid Bus reliability is perceived as higher than that of other corridor services, or AC Transit services in general.

4.3 Identity and Image

On-board survey respondents were asked to rate different aspects of the Rapid Bus branding efforts:

- The look / design of the new vehicles used for the Rapid Bus
- Location of Rapid Bus Signage
- Ease of identifying the Rapid Bus service

The ratings received for these service aspects are shown in Table 4.5 below, along with overall ratings for the Rapid Bus and other non-Rapid AC Transit services.

TABLE 4.5 – Consumer Ratings for Different Aspects of Rapid Bus / AC Transit Service

Rapid Bus Service Element	Response Category (%)						Mean Score
	Very Poor (1)	Poor (2)	Fair (3)	Good (4)	Very Good (5)	TOTAL	
Ease of identifying the Rapid Bus service	0.2	0.9	9.1	34.2	55.6	100	4.4
Location of Rapid Bus signage	0.2	2.0	14.6	43.4	39.8	100	4.2
The look/design of the new vehicles used for Rapid Bus	2.3	3.3	15.3	37.5	41.6	100	4.1
Overall satisfaction with the Rapid Bus	0.7	1.4	12.6	45.1	40.2	100.0	4.2
Overall satisfaction with AC Transit non-Rapid Bus Services	2.9	9.2	26.4	34.7	26.7	100.0	3.7

Table 4.5 shows that all three elements related to service branding received high ratings, with the majority of respondents providing a "good" or "very good" rating. This translated into high mean scores of between 4.1 and 4.4. The ratings given for "ease of identification" of Rapid Bus services was particularly high, achieving a mean score of 4.4, which was the highest mean score given across all the different service aspects. This suggests that the branding and promotion of the Rapid Bus service has been successful. The table also shows that public perceptions of the Rapid Bus are favorable in comparison to other AC Transit services, with an overall rating of 4.2 compared to 3.7 for AC Transit's other services.

Table A.7 in Appendix I summarizes the additional comments on the Rapid Bus service made by survey respondents. The table shows that a significant number of survey respondents made positive comments towards the service, praising service frequency (5 comments), travel time/speed (54 comments), and reliability (17 comments). Other comments on service provision recommended expanding the service, either spatially (other areas or routes, 17 comments), or temporally (longer daily service span – 28 comments - or service provision on weekends – 38 comments).

Service provision criticisms included "more stops needed / stops too far apart" (12 comments), "service is unreliable" (6 comments), and the need for better service integration with other connecting services such a BART (12 comments). Other criticisms related mainly to either drivers vehicles or fares; driver criticisms (18 comments), overcrowding problems during peak periods (9 comments), and vehicle criticisms mentioning seating arrangements (15 comments) and lack of air conditioning (10 comments). On the issue of fare level, there were almost equal numbers of comments that the fares were cheap/affordable (9 comments), as there were comments that the fares were too expensive (10 comments). Nine respondents were critical of real-time information provision at shelters, stating that it didn't work, or was inaccurate, or that it was needed at more shelters.

Nelson Nygaard's on-board survey also included a question that asked respondents to indicate how they found out about the Rapid Bus. Responses to this question are provided below.

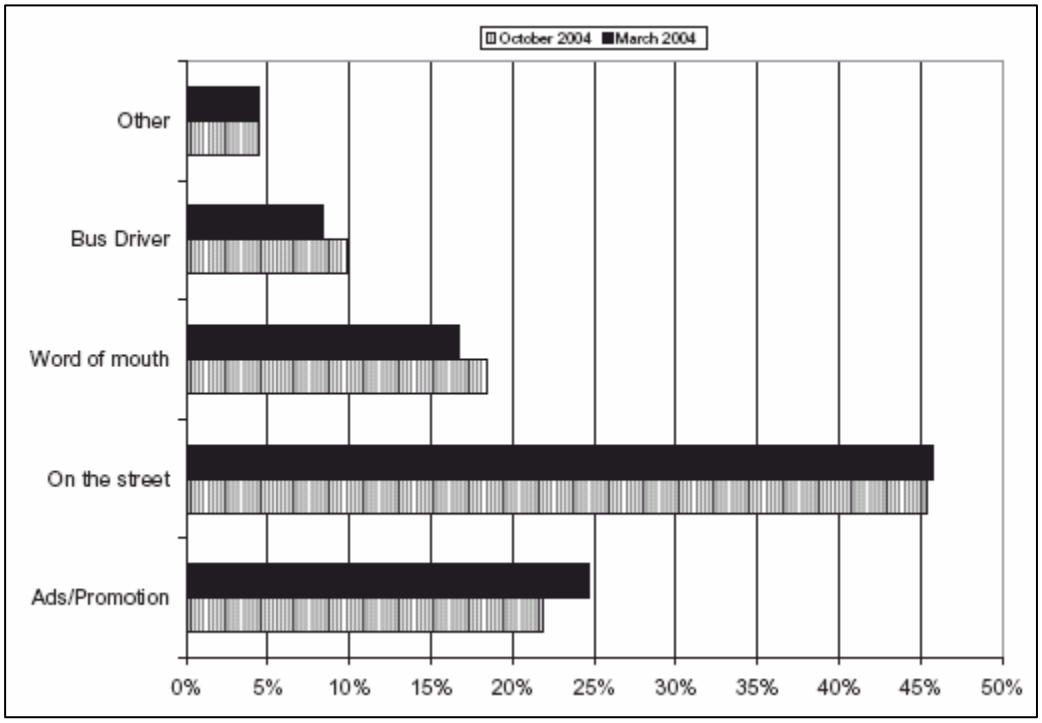


FIGURE 4.5 – How Rapid Users Found Out About the Rapid Bus

Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

The figure shows that the most common method for users to find out about the new service, cited by almost half of all respondents, was "on the street", which relates directly to the placement of "Rapid" branding on shelters, stops, and vehicles. This indicates the importance of creating a unique brand for BRT services and applying it to all service aspects. Advertising / Promotion was the next most common category, accounting for between 20 and 25 percent of responses.

4.4 Safety and Security

4.4.1 Accident Rates

No data were available on the impact of the Rapid Bus on accident rates.

4.4.2 User Perceptions of Safety

On-board survey respondents were asked to rate two different aspects of safety in relation to Rapid Bus use; safety while on the Rapid Bus, and safety while waiting at Rapid Bus stops.

TABLE 4.6 – Customer Ratings of Different Aspects of the Rapid Bus Service

Rapid Bus Service Element	Response Category (%)					TOTAL	Mean Score
	Very Poor (1)	Poor (2)	Fair (3)	Good (4)	Very Good (5)		
Personal safety on Rapid Bus	1.6	2.4	20.4	42.1	33.5	100	4.0
Personal safety at Rapid Bus stops	1.2	3.9	22.3	41.7	30.9	100	4.0

The table shows that both categories received an average rating of 4.0, equating to a "good" response. Only four percent of respondents rated personal safety on the Rapid Bus as poor or very poor, and only 5.1 percent rated personal safety at Rapid Bus stops as poor or very poor. Overall, this suggests that user perceptions of personal safety while using the Rapid Bus is high. However, it should be noted that these two service aspects are among the lowest rated overall.

Table 4.7 on the next page compares responses to similar questions that were asked in a 2002 systemwide survey of AC Transit riders.

Table 4.7 - Customer Ratings of Different Aspects of AC Transit Service

Rapid Bus Service Element	Response Category (%)					TOTAL	Mean Score
	Poor (1)	Fair (2)	Good (3)	Very Good (4)	Excellent (5)		
Systemwide - Safety on buses	9.1	21.2	35.4	20.9	13.4	100	3.08
Systemwide - Safety at bus stops	12.3	25.7	35.2	17.2	9.7	100	2.86
San Pablo Corridor - Safety on buses	11.6	24.0	35.1	18.7	10.7	100	2.93
San Pablo Corridor - Safety at bus stops	17.1	21.6	36.0	17.6	7.7	100	2.77

Table 4.7 shows that over one third of riders regard safety on buses, and safety at bus stops as "good". The views of the remaining two thirds are divided between "poor" / "fair" and "very good" / excellent". It also appears that safety at bus stops is rated slightly lower than safety on buses, and that safety on the San Pablo Avenue corridor (both on bus and at stop) is rated lower than safety on the system as a whole. Bearing in mind the differences between the two surveys (as discussed in Section 4.2.3), Table 4.9 shows that the Rapid Bus obtains a mean score of 4.0 for both safety on buses and safety at bus stops, which equates to a "good" rating. Equivalent responses for system-wide safety and San Pablo Avenue corridor safety are all around 3.0, which also equates to a "good" safety rating, although three of the four rating values fall below 3.0. This suggests that safety perception on the Rapid Bus is at least as good as safety on other corridor services and the system as a whole, if not better.

4.5 Capacity

Configured to the specifications of AC Transit, each Van Hool A330 Rapid Bus can carry a maximum of 77 passengers (32 seated, 45 standing) (Diaz, et al, 2004). The Rapid Bus operates with 12 minute headways, equating to 5 buses per hour. Thus, the Rapid Bus service has a one-way peak hour capacity of 385 passengers per hour (77*5), and bi-directional capacity of 770 (77*10).

A small number of Rapid Bus users made comments in relation to capacity in the on-board survey. These are shown below.

TABLE 4.8 – User Comments on Rapid Bus Capacity

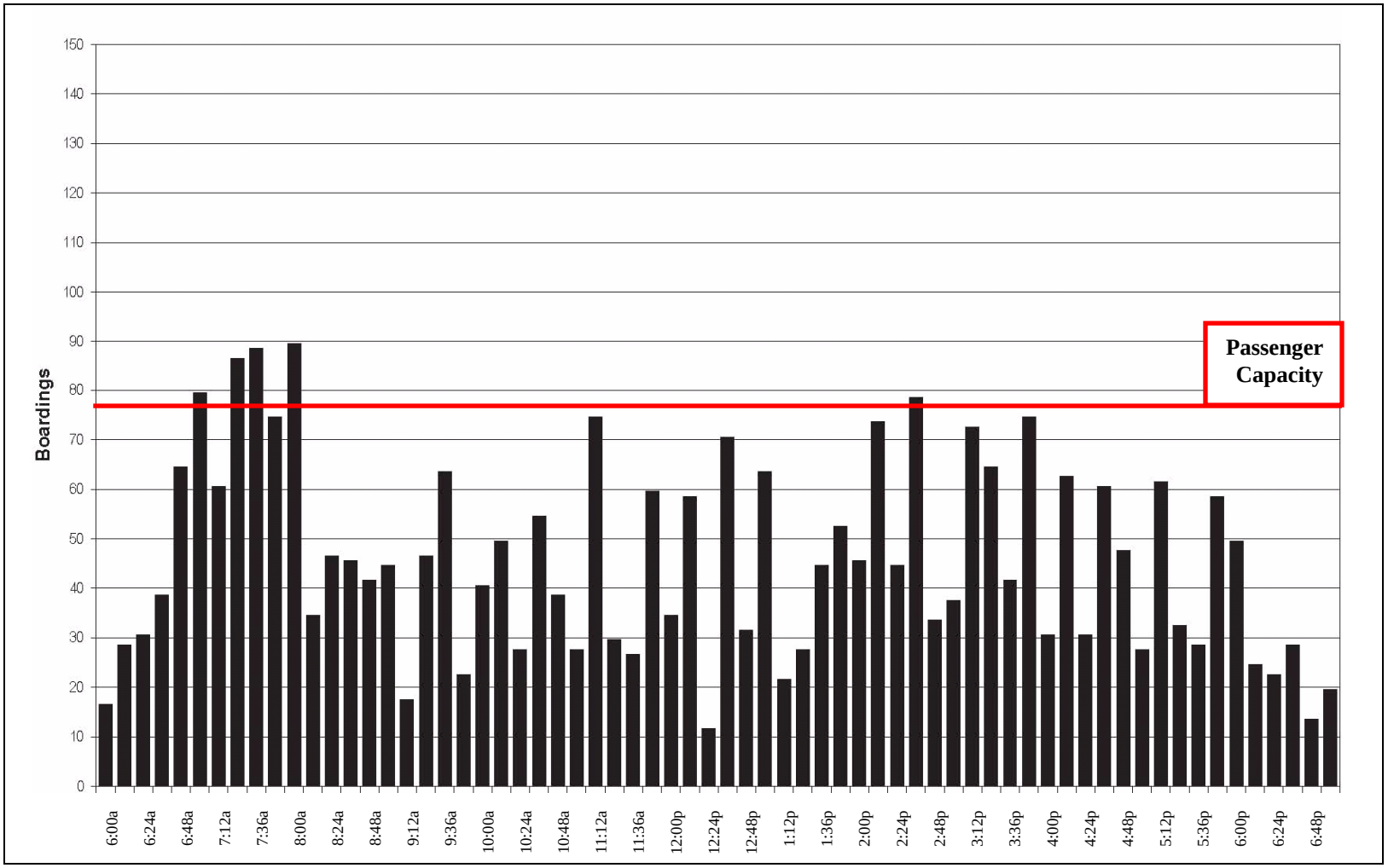
	N.	%.
Not enough seats / too crowded / buses too small / need bigger buses	9	2.5%
Like seat design / interior design / seats are comfortable / good seat availability	7	2.0%

The table shows that nine Rapid Bus users commented on the lack of space on the Rapid Bus, while seven made positive comments about the interior design of the bus and seat availability. The fact that only nine users commented on capacity problems suggests that

it is only a problem at certain times and places. This issue can be investigated further by considering the daily boardings throughout the day (demand), as provided in the study completed by Nelson Nygaard, against available capacity (supply). This comparison is shown in Figure 4.6 and 4.7 on the next two pages.

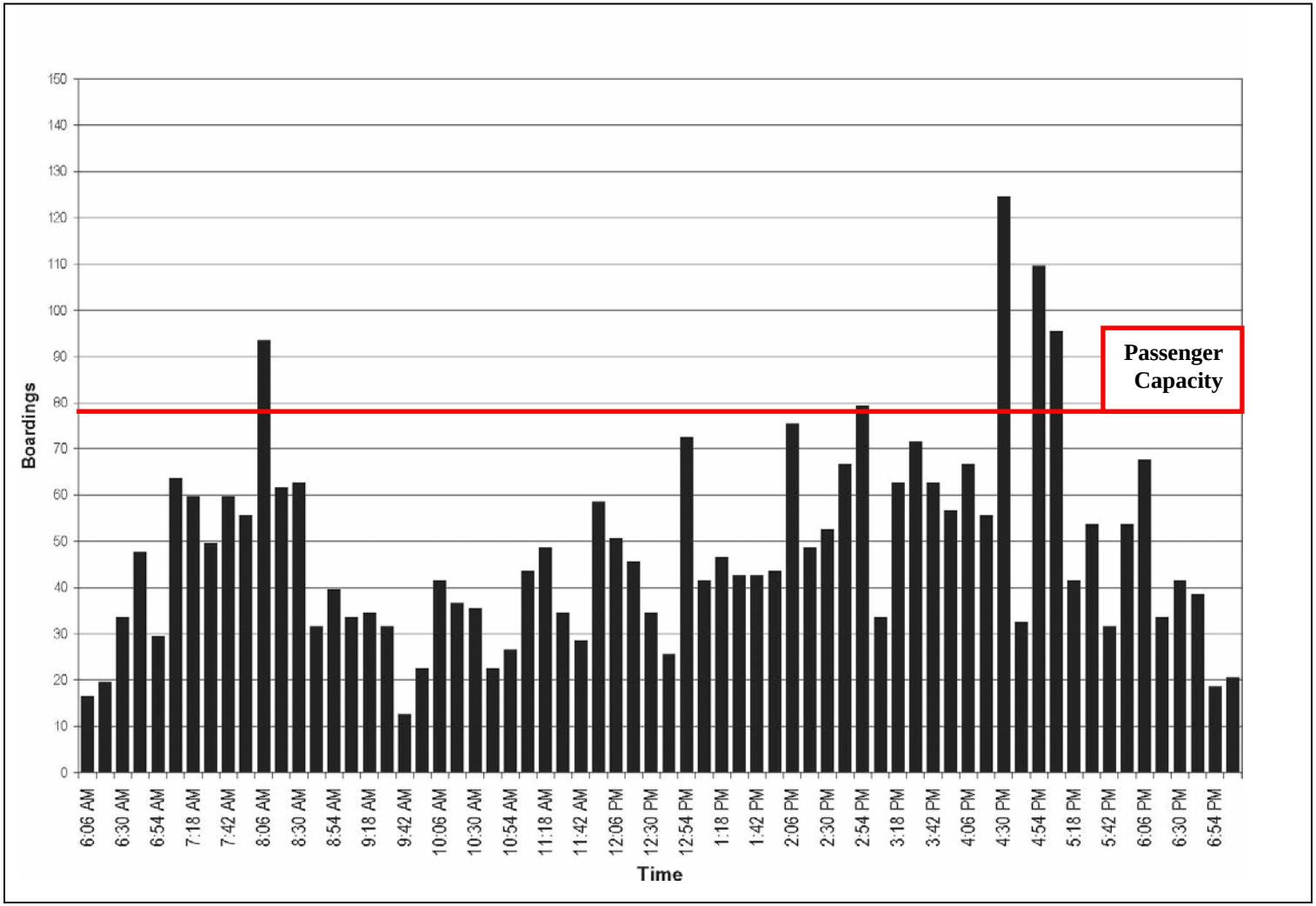
It should be noted that these figures show the total number of boardings for each route, which is not the same as the number of people on the Rapid Bus at any one time. With people also exiting the bus along its route, the actual number of people on board at any one time will be lower than the boarding values shown above. Thus, the boarding figures represent the maximum number of people that could be onboard any particular run. However, superimposing the bus capacity onto these figures does illustrate how capacity relates to demand throughout the day. It can be seen that for most of the day capacity is more than sufficient, with the route boardings for the whole route being lower than the bus capacity. At certain times of day, route boardings do exceed the bus capacity. While this does not mean that more than stated capacity of 77 people are on the bus at any one time, these periods of the day are likely to be the times when people complain of overcrowding or needing a bigger bus. These periods are generally limited to the AM and PM peak hours, when people are using the service to travel to and from work. Given that the service is operating with excess capacity for most of the day, this assessment suggests that providing larger buses or shorter headways for the very small periods of the day where demand is high would be an inefficient use of resources.

FIGURE 4.6 – Daily Boardings Versus Vehicle Capacity - 72R (Inbound) – October 2004



Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005
(Passenger Capacity annotation added by Evaluation authors)

FIGURE 4.7 – Daily Boardings Versus Vehicle Capacity - 72R (Outbound) – October 2004



Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005
(Passenger Capacity annotation added by Evaluation authors)

4.6 Summary of System Performance

End-to-end travel times on the San Pablo Rapid vary between 52 minutes in off-peak traffic conditions to 63 minutes in congested conditions. Data collected by Nelson Nygaard and CUTR show that the Rapid Bus service has reduced average end-to-end travel time by 12 minutes, equating to a 21 percent reduction compared to the local service and a 17 percent reduction compared to the superseded limited stop service. This reduction is close to the 20 percent reduction estimated by AC Transit at the outset of the project. Over 80 percent of users perceived the Rapid Bus as faster than the previous service, with almost half of surveyed respondents indicating that the service was at least 15 minutes faster. The absence of a Travel Time Component Analysis meant that a quantitative assessment of the source of travel time savings was not possible. A qualitative assessment estimated that one third of the travel time saving originated from the reduction in stops along the route, while another third came from signal progression improvements along the corridor. One sixth of the travel time savings were estimated to come from Traffic Signal Priority measures along the route and another sixth from the repositioning of the majority of stops to the far-side of intersections.

Service reliability and schedule adherence is generally good. Reliability problems are limited to the inbound direction in the morning peak and the outbound direction in the afternoon peak. In both cases reliability is negatively affected by high levels of congestion on the corridor.

AC Transit has been successful in creating a unique identity for its Rapid Bus service, using “Rapid” branding on buses, shelters and signs. Approximately 90 percent of users stated that the “ease of Rapid Bus identification” was “good” or “very good”. General public perceptions of the Rapid Bus are good, achieving an average rating of 4.2 on a five-point scale (in comparison, AC Transit’s other services received an average rating of 3.7). The high profile branding resulted in “on the street” being the most common method for users to find out about the new service, cited by over 45 percent of respondents to a Nelson Nygaard survey. Advertising / Promotion was the next most common category, accounting for between 20 and 25 percent of responses.

No quantitative data was available for the assessment of safety on the Rapid Bus. Average user perceptions were than safety was “good”, both on the Rapid Bus and at Rapid Bus stops. Comparisons with previous on-board surveys showed that perceived safety on the Rapid Bus is at least as good as safety on other corridor services and the system as a whole, if not better.

Each Van Hool A330 Rapid Bus has a maximum capacity of 77 passengers. This equates to a one-way peak hour capacity of 385 passengers per hour (77*5), and bi-directional capacity of 770 (77*10). These capacities are sufficient for the majority of passenger loads experienced throughout the day, with overcrowding limited to a small number of individual runs during the morning and afternoon peak periods. Passenger complaints of overcrowding were minimal.

5. System Benefits

5.1 Higher Ridership

5.1.1 Total Route Ridership Before and After Rapid Bus Implementation

Three ridechecks were conducted by Nelson Nygaard on the San Pablo Avenue corridor[2]. One in May 2003, just before Rapid Bus implementation, one in March 2004, 9 months after Rapid Bus implementation, and one in October 2004, 16 months after Rapid Bus implementation. Table 5.1 provides ridership figures along the total length of each corridor route.

TABLE 5.1 – Total Route Ridership on San Pablo Avenue Bus Services Before and After Rapid Bus Implementation

Route #.	Daily Boardings			% change		
	May 2003	March 2004	October 2004	March 2004 vs. May 2003	October 2004 vs. March 2004	October 2004 vs. May 2003
72	5,641	3,749	3,448	-33.5%	-8.0%	-38.9%
72L / 72R	1,939	5,899	6,133	204.2%	4.0%	216.3%
73 / 72M	5,306	4,167	3,644	-21.5%	-12.6%	-31.3%
Total	12,886	13,815	13,225	7.2%	-4.3%	2.6%

Source: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

Table 5.1 shows that total corridor boardings in May 2003, the month prior to Rapid implementation, was just under 13,000. The 5,641 boardings on the 72 local service accounted for 43.8 percent of total corridor boardings, with the 5,306 boardings on 73 / 72M services accounting for another 41.2 percent. The limited stop 72L service carried the remaining 15.0 percent of corridor boardings (1,939 boardings).

In March 2004, nine months after the Rapid Bus service replaced the 72L service, total corridor ridership was measured at 13,815 boardings, an increase of 7.2 percent. Ridership on the new 72R was measured at 5,899, an increase of 204.2 percent in comparison to the old 72L service. The 72R now accounted for 42.7 percent of total corridor ridership. Ridership on the 72 and 73/72M services decreased significantly during the same period by 33.5 percent and 21.5 percent respectively, suggesting that some riders diverted to the 72R.

The October 2004 ridecheck showed a corridor ridership of 13,225, a reduction of 4.3 percent from five months previous. Ridership on the 72 and 73/72M had decreased by a

[2] Month to month ridership data for the periods before and after Rapid Bus implementation were not available. In the absence of such data, ridechecks were used to assess ridership impact. This "snapshot" approach made it more difficult to draw firm conclusions about ridership impact.

further 8.0 and 12.6 percent respectively, while ridership on the 72R had increased to 6,133, now accounting for 46.4 percent of corridor ridership.

Considering the entire period between May 2003 and October 2004, it can be seen that corridor ridership increased by 2.6 percent. This small net rise was the result of a large ridership gain due to the replacement of the 72 Limited Stop service with the new Rapid service, offset by large ridership losses on the other corridor services.

5.1.2 Rapid Bus Corridor Ridership Before and After Rapid Bus Implementation

The analysis discussed in Section 5.1.1 was conducted for ridership along the total length of each of the routes serving San Pablo Avenue. This section considers only the sections of San Pablo Avenue served by the Rapid Bus. Thus, the ridership on corridor services north of Contra Costa College, south of 2nd St and Clay St, and along Macdonald Avenue and Richmond Parkway have been removed from the ridership analysis. Table 5.2 presents the results of this analysis.

TABLE 5.2 – Rapid Bus Corridor Ridership on San Pablo Avenue Bus Services Before and After Rapid Bus Implementation

Route #.	Daily Boardings			% change		
	May 2003	March 2004	October 2004	March 2004 vs. May 2003	October 2004 vs. March 2004	October 2004 vs. May 2003
72	5,099	3,474	3,171	-31.9%	-8.7%	-37.8%
72L / 72R	1,939	5,855	6,050	202.0%	3.3%	212.0%
73 / 72M	3,655	2,755	2,386	-24.6%	-13.4%	-34.7%
Total	10,693	12,084	11,607	13.0%	-3.9%	**8.5%**

As would be expected, Table 5.2 shows that removing from the analysis the sections of the corridor routes not covered by the Rapid Bus results in a slight reduction in ridership for each route. When these ridership changes are considered in percentage terms, it can be seen that the impact of the Rapid Bus is larger, with an overall ridership increase of 8.5 percent from May 2003 to October 2004, compared to only 2.6 percent for the same period if total route ridership is considered (see Table 5.2).

5.1.3 Analysis of Corridor Service Quantity Over Time

Implementing the Rapid Bus increased the amount of service on the corridor, both in terms of service span and service frequency. The 72L operated on weekdays from approximately 6:00 a.m. to 10:00 a.m. and 1.00 p.m. to 5:30 p.m. (inbound) and 7.30 a.m. to 11.30 a.m. and 3.00 p.m. to 7.00 p.m. (outbound), at 20 to 30 minute frequencies. The 72R operates continuously from 6:00 a.m. to 7:00 p.m., at 12 minute frequencies. Table 5.3 compares corridor service provision (revenue hours) on the San Pablo Avenue corridor before and after Rapid Bus implementation. The analysis has been limited to only the sections of San Pablo Avenue covered by the Rapid Bus service.

TABLE 5.3 - Corridor Revenue Hours and Ridership – Pre and Post Rapid Bus

Route	May 2003			March 2004			October 2004		
	Daily Revenue Hours	Daily Boardings	Passengers per Revenue Hour	Daily Revenue Hours	Daily Boardings	Passengers per Revenue Hour	Daily Revenue Hours	Daily Boardings	Passengers per Revenue Hour
72	73.3	5,099	69.6	63.6	3,474	54.7	63.6	3,171	49.9
72L / 72R	39.1	1,939	49.6	123.2	5,855	47.5	123.2	6,050	49.1
73 / 72M	56.4	3,655	64.8	45.7	2,755	60.4	45.7	2,386	52.3
Total	168.7	10,693	**63.4**	232.4	12,084	**52.0**	232.4	11,607	**49.9**

Table 5.3 shows that there have been considerable changes in the proportion of total corridor service provided by each route. In May 2003, the local route (72) provided most of the corridor service, with 73.3 daily revenue hours, while the 72L provided 39.1 daily hours of service and the 73 provided 56.4 hours of service. Combining these three services resulted in a total of 168.7 corridor revenue hours, which equated to 63.4 passengers per revenue hour.

Table 5.3 shows that the revenue hours of other corridor bus services were reduced upon the introduction of the Rapid Bus in June 2003. Revenue hours on the 72 local service decreased slightly from 69.6 hours in May 2003 to 63.6 hours in March 2004, while service hours on the 72M decreased from 56.4 hours to 45.7 hours. However, the high frequency and longer span of the Rapid Bus in comparison to the 72L meant that total corridor service hours actually increased significantly from 168.7 hours in May 2003 to 232.4 hours in March 2004. All three routes experienced reductions in passengers per revenue hour between May 2003 and March 2004, resulting in an overall corridor reduction in passengers per revenue hour from 63.4 in May 2003 to 52.0 in March 2004.

In October 2004, revenue hours on each of the three routes remained the same as in March 2004, while ridership on the 72 and 72M reduced further, resulting in less passengers per revenue hour on these routes than in March 2004. Ridership on the 72R increased slightly, meaning that the passengers per revenue hour rose slightly from 47.5 to 49.1. However, this figure was still lower than the 49.6 passengers per revenue hour carried by the previous 72L service in May 2003. Despite the slight increase on the 72R, overall corridor passengers per revenue hour decreased further from 52.0 in March 2004 to 49.9 in October 2004.

5.1.4 Equivalent Span Analysis

An additional analysis was conducted to assess the impact of the Rapid Bus on corridor ridership during only the period of the day when it predecessor, the 72L service, ran. Due to data restrictions, it was not possible to conduct this analysis on only the sections of the corridor on which the Rapid Bus runs, so the analysis is based on total route ridership, as reported in Table 5.1. The results of this analysis are shown in Table 5.4 below.

TABLE 5.4 – Equivalent Span Analysis

Route	May 2003			March 2004			October 2004		
	Revenue Hours*	Boardings	Passengers per Revenue Hour	Revenue Hours*	Boardings	Passengers per Revenue Hour	Revenue Hours*	Boardings	Passengers per Revenue Hour
72	60.35	3,593	59.5	48.88	2,603	53.3	48.88	2,372	48.5
72L / 72R	39.07	1,894	48.5	80.32	4,210	52.4	80.32	4,341	54.0
73 / 72M	58.08	3,600	62.0	49.95	2,919	58.4	49.95	2,487	49.8
Total	157.50	9,087	57.7	179.15	9,732	54.3	179.15	9,200	51.4

* Analysis restricted to periods of the day when previous 72L service ran

In aggregate terms, Table 5.4 shows a similar pattern of results as Table 5.3, with corridor passengers per revenue hour reducing following Rapid Bus introduction. However, the extent of the reduction is much smaller in this case, only reducing from 57.7 to 51.4, as opposed to 63.4 to 49.9 for the entire service span (see Table 5.3). It can also be seen that passengers per revenue hour was actually greater on the 72R service (52.4 in March 2004 and 54.0 in October 2004) compared to the previous 72L service (48.5 in May 2003). Overall these findings suggest that the lower passenger per revenue hour figures observed on the corridor after Rapid Bus implementation result at least in part from the large increase in off-peak service provision.

5.1.5 Service Elasticities

An elasticity is a measure of the sensitivity of a dependent variable, such as passenger trips, to changes in an independent variable, such as fare or level of service. It is represented by the percent change in a dependent variable divided by the percent change in an independent variable. Table 5.5 shows the service elasticities that were calculated for the 72R service and for the corridor as a whole.

TABLE 5.5 – Service Elasticities – May 2003 to October 2004

	72R / 72L	Corridor
% Change in Revenue Hours	215.1%	37.7%
% Change in Ridership	212.0%	8.5%
Elasticity	+0.986	+0.225

Table 5.5 shows that the elasticity associated with the 72R service, compared to the 72L, is 0.986. Average elasticity values for changes in service quantity typically range from +0.5 to +0.6 (see Evans, 2004 & Ecosometrics, Inc. 1980), with the majority of service elasticities for mature central city urban systems grouped at around +0.3, and the majority of service elasticities for expanding suburban systems grouped at around +1.0 (Evans, 2004). At almost unity, the elasticity value for the 72R service is very high and similar to the elasticities associated with expanding suburban systems. However, it should be noted that this high elasticity value is at least partially the result of the diversion of transit riders from other corridor services. When the same analysis was conducted for the corridor as a

whole, a modest elasticity of +0.225 was observed. This value is more typical of the service elasticities associated with changes to mature central city urban services. While San Pablo Avenue is neither suburban, nor central city, it is definitely "urban" and therefore would be expected to achieve elasticity values more towards the +0.3 range than the +1.0 range.

5.1.6 Regional Ridership Trends

Overall, the increase in ridership along San Pablo Avenue is not significant in relation to the associated increase in service quantity. This has been attributed to the fact that AC Transit's system-wide ridership has been declining due to a downturn in the regional economy. Figure 5.1 tracks total system ridership from 1998 to 2004.

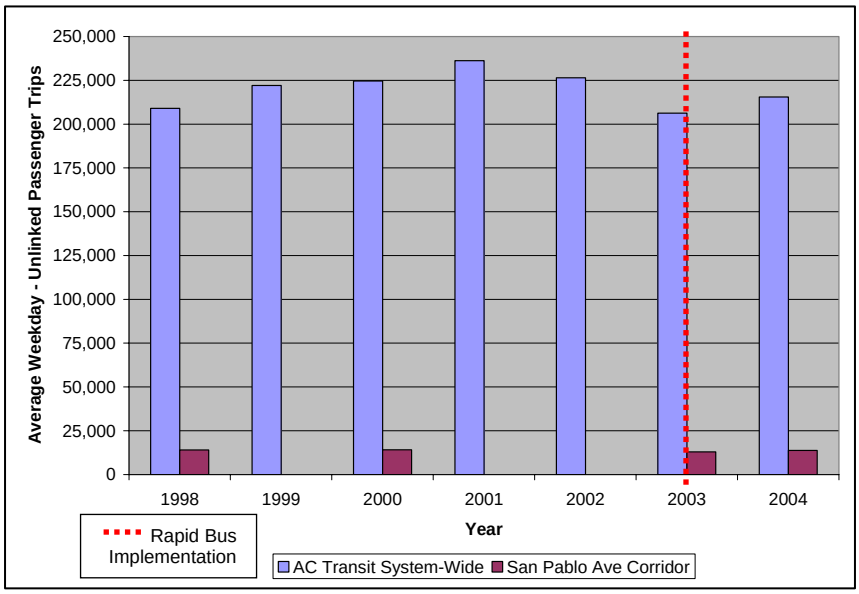


FIGURE 5.1 – Regional Ridership Trends

Figure 5.1 shows that, from 1998 to 2001, systemwide ridership increased by 13.0 percent from 209,000 to 225,000 unlinked passenger trips on a typical weekday. Then, between 2001 and 2003, ridership decreased by 12.7 percent to 206,000 unlinked passenger trips. In 2004, systemwide ridership was measured at 215,466 unlinked trips. This means that between 2003 and 2004, the period during which the Rapid Bus began operating, systemwide ridership increased by approximately 4.5 percent.

5.1.7 Sources of Rapid Bus Ridership

It is reasonable to conclude from Table 5.1 that some of the ridership gains experienced by the Rapid Bus were due to existing riders transferring from other corridor routes. The on-board survey results were used to assess how many existing riders were diverted. The Nelson Nygaard and CUTR on-board surveys asked respondents to indicate how they made their trip before the Rapid Bus opened. The responses from the CUTR and Nelson Nygaard surveys have been separated because of differences in the options offered.

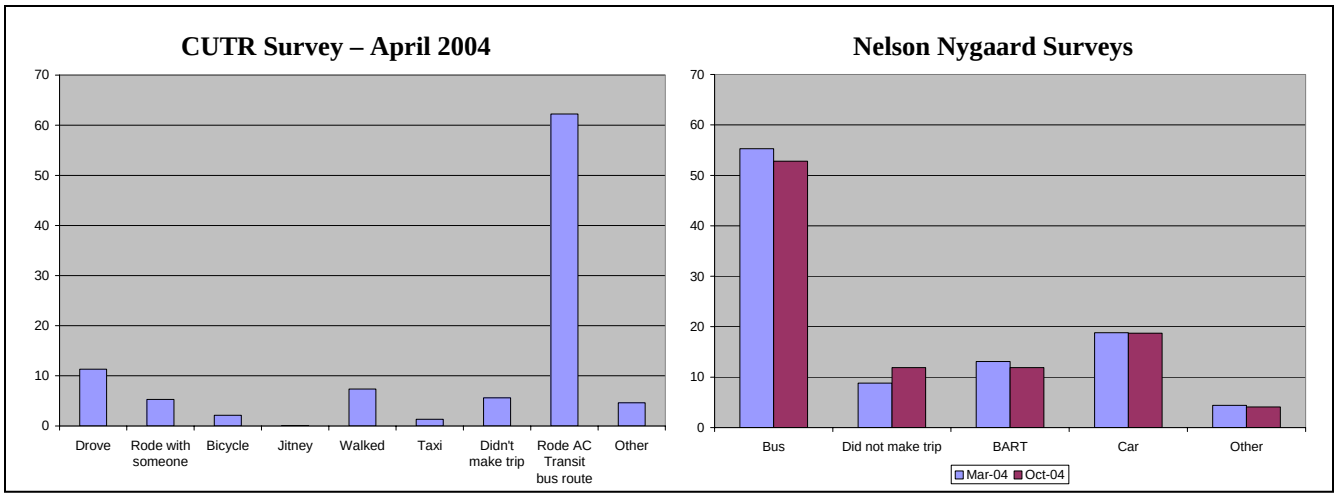


FIGURE 5.2 –Mode Used Before the Introduction of the Rapid Bus

The figure shows that some of the options in the CUTR and Nelson Nygaard surveys are directly comparable. All three surveys shows that the majority of Rapid Bus users previously used other bus routes on the corridor, although the CUTR survey percentage (62 percent) is slightly higher than the percentages from the two Nelson Nygaard surveys (53 percent and 55 percent). The proportion of Rapid Bus users that previously used a car is around 19 percent in the Nelson Nygaard surveys and around 17 percent in the CUTR survey (11.3 percent drove, 5.3 percent rode with someone). This equates to a reduction of around 1,100 auto trips per day on the corridor, which is significant considering that the San Pablo Avenue corridor runs primarily through low-income areas with relatively little "choice ridership". The fact that approximately 19 percent of Rapid Bus users previously used the car, while 10 to 15 percent came from BART (this was not offered as an option in the CUTR survey), indicates that travel time minimization is paramount even to the transit dependent (Twitchel, 2004-06).

Respondents who had used other bus routes before using the 72R were asked to indicate which bus line they had used. Their responses are shown below.

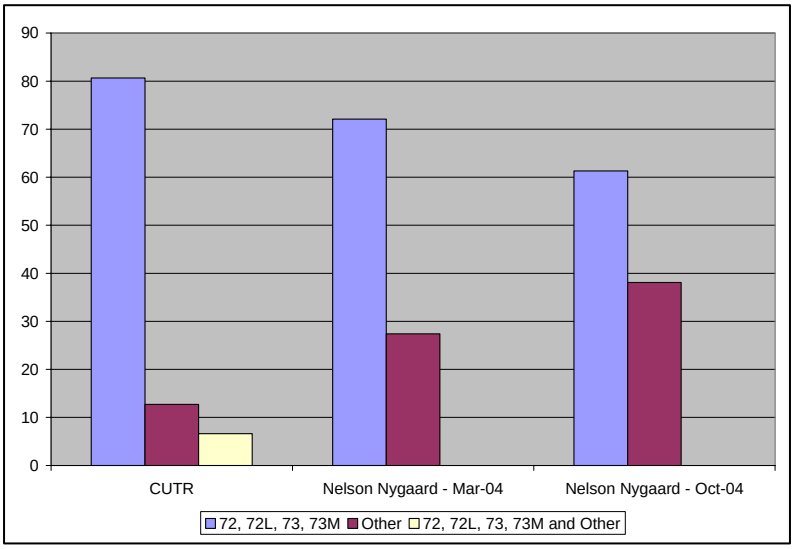


FIGURE 5.3 – Bus Line Used Before Introduction of Rapid Bus

Figure 5.3 shows that the Nelson Nygaard data was divided into two categories, those who had previously used the other main San Pablo Avenue routes, and those that had used other routes. The CUTR survey data included an additional category to account for those that had stated they had used these main routes as well as other routes. The figure shows that the proportion stating that they used routes other than the main San Pablo Avenue routes was much higher in October 2004 than in the two prior surveys. This may relate to the fact that the proportion of riders coming from the discontinued 72L service is likely to decrease as the period of time from discontinuation increases.

It is then possible to calculate the proportion of riders that used other services on the San Pablo corridor prior to Rapid Bus introduction. This calculation in shown in Table 5.6 below.

TABLE 5.6 – Proportion of Rapid Bus Users that Previously Used Other Corridor Routes

	CUTR April 2004	Nelson Nygaard March 2004	Nelson Nygaard October 2004
Proportion of Rapid Bus Users that previously rode the bus	62.2%	55.3%	52.8%
Proportion of Previous Bus Users that previously rode other corridor routes	80.6%	72.1%	61.3%
Proportion of Rapid Bus users that previously used San Pablo Ave corridor routes	**50.2%**	**39.9%**	**32.4%**

Table 5.6 shows that 50.2 percent of Rapid Bus users surveyed in the April 2004 CUTR survey had previously used other corridor routes. The Nelson Nygaard survey, conducted in March 2004, produced a figure of 39.9 percent. The later Nelson Nygaard survey returned the figure of 32.4 percent. Discounting the later Nelson Nygaard survey due to the time issue discussed above, it appears that the proportion of Rapid Bus riders that had been diverted from other corridor routes lies between 40 and 50 percent.

5.1.8 Temporal and Spatial Boarding Patterns

The Nelson Nygaard ridechecks also assessed boarding patterns over time and along the length of the corridor. The temporal boarding patterns in the inbound and outbound directions are shown in Figures 4.6.and 4.7 in Section 4.5. Commentary from the Nelson Nygaard report on temporal and spatial boarding characteristics are also provided.

72R Inbound:

- *Boardings for the whole route fluctuate throughout the day, with peak ridership occurring during the AM peak period (7:00am – 8:00am)*
- *Heaviest boarding totals are at Contra Costa College (351), Del Norte BART (242), and San Pablo & University (227)*
- *Heaviest alighting totals are at Broadway & 12th (523), San Pablo & Portrero (353), and San Pablo & Dwight Way (232)*
- *Passenger loads are steady throughout the day, exceeding 40 passengers at Del Norte BART*

Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

72R Outbound:

- *Boarding activity tends to follow commuter trends (AM and PM peaks) with the most boardings occurring between 4:00pm and 5:00pm*
- *Heaviest daily boarding totals are at Broadway & 12th (430), Broadway & 14th (384), and Del Norte BART (352)*
- *Heaviest alighting totals are at San Pablo & University Avenue (318), Contra Contra College (316), and Del Norte BART (277)*
- *Heavy passenger loads (ranging from 50 to 54 passengers) are found between 20th & Broadway and San Pablo & Dwight Way*

Extracted from: "Evaluation of Rapid Bus Service in the San Pablo Avenue Corridor." Final Report. Nelson Nygaard, February 2005

5.2 Capital Cost Effectiveness

The total capital cost of the San Pablo Avenue project was approximately $3.2M for the 14 mile route. This equated to a cost of approximately $230,000 per mile. This relatively modest capital cost is a result of the fact that (i) the service was designed to utilize existing general purpose travel lanes (thus no expensive busway or exclusive lane infrastructure was required), and (ii) vehicle acquisition was not considered part of the capital cost.

5.3 Operating Cost Efficiency

No data available

5.4 Transit Supportive Land Development

FIGURE 5.4 –
The Rapid in Downtown Oakland

There is no information available on the impact of the Rapid Bus service on land-use along the San Pablo Avenue corridor. This section provides a description of corridor land-use.

Land uses and urban design differ along San Pablo Avenue. Most of the avenue is zoned for high density residential, retail, or mixed use development. Buildings in Oakland have the largest maximum floor area ratio on the avenue, as it is the area with the greatest density. There are many four to six story apartment buildings interspersed with one to three story commercial buildings. These commercial buildings often offer housing on the upper floors.

In the cities of Berkeley, Albany, and El Cerrito, the majority of the retail and housing units are oriented to the street with little

setback. In Berkeley and downtown Albany, most of the buildings are two to three stories in height and are characteristic of offering first floor retail and upper story housing as well as dealerships, repair shops, and small-scale single story retail.

In addition, the provision of off-street parking is not as prevalent. Mini-malls, fast food drive-ins, older single story retail, and big box retail are more commonly found further north along the avenue. Multifamily housing developments have replaced some older retail along the avenue within recent years.

Parking requirements are often cited as being a constraint that makes it difficult to develop vacant lots on the avenue. The zoning requirements of each of the cities (other than Oakland) require new developments to have one or more parking spaces per new residential unit.

FIGURE 5.5 – Typical San Pablo Avenue Streetscapes

5.5 Environmental Quality

No data available

5.6 Summary of System Benefits

The impact of Rapid Bus implementation on ridership was assessed through a series of three ridechecks conducted by Nelson Nygaard, in May 2003 (pre-Rapid), March 2004, and October 2004 (post-Rapid). An analysis of ridership before and after Rapid Bus implementation (on only the sections of San Pablo Avenue now served by the Rapid Bus) found that ridership on the Rapid Bus was much higher than on the superseded limited stop service, with Rapid Bus ridership measured at 6,050 daily boardings in October 2004 versus 1,939 daily boardings on the limited stop service in May 2003, equating to an overall increase of 212.0 percent. However, this significant increase is partially related to the diversion of existing riders from other corridor routes. Evidence of this comes from the fact that ridership reductions of around 35 percent were observed on the other two corridor routes during the same period, while on-board survey data suggested that 40 to 50 percent of Rapid Bus riders had used other corridor services before Rapid Bus

implementation. Overall, total corridor ridership on the sections of San Pablo Avenue now served by the Rapid Bus rose from 10,693 in May 2003 (pre-Rapid) to 11,607 in October 2004 (post-Rapid), equating to an increase of 8.5 percent.

The significance of this measured increase in ridership must be considered in relation to the associated increase in service provision along the corridor. The Rapid Bus service featured both greater service frequency and longer service span in comparison to the superseded limited-stop service. Thus, Rapid Bus implementation significantly increased the number of revenue hours on the corridor from 168.7 hours per day in May 2003 to 232.4 hours per day in October 2004 (despite the fact that revenue hours on other corridor routes were slightly reduced during the same period). The result of these large service quantity increases in comparison to relatively modest ridership increases meant that average passengers per revenue hour on the corridor actually reduced from 63.4 passengers per revenue hour in May 2003 to 49.1 passengers per revenue hour in October 2004. These figures equated to a corridor service elasticity of +0.225, slightly below the average elasticity for mature urban area service quantity changes. Service elasticity for the Rapid Bus compared to the limited stop service was +0.986, but this high value must again be considered in relation to the diversion of passengers from other corridor routes.

Overall, the increase in ridership along San Pablo Avenue is not significant in relation to the associated increase in service quantity. However, regional ridership trends also need to be taken into consideration. From 1998 to 2001, systemwide ridership increased by 13.0 percent. Then, between 2001 and 2003, ridership decreased by 12.7 percent. In 2004, systemwide ridership was measured at 215,466 unlinked trips. This means that between 2003 and 2004, the period during which the Rapid Bus began operating, systemwide ridership increased by approximately 4.5 percent.

The proportion of Rapid Bus users that previously used a car is around 19 percent in the Nelson Nygaard surveys and around 17 percent in the CUTR survey (11.3 percent drove, 5.3 percent rode with someone). This equates to a reduction of around 1,100 auto trips per day on the corridor, which is significant considering that the San Pablo Avenue corridor runs primarily through low-income areas with relatively little “choice ridership”. The fact that approximately 19 percent of Rapid Bus users previously used the car, while 10 to 15 percent came from BART (this was not offered as an option in the CUTR survey), indicates that travel time minimization is paramount even to the transit dependent (Twitchel, 2004-06).

The total capital cost of the San Pablo Avenue project was approximately $3.2M for the 14 mile route. This equated to a cost of approximately $230,000 per mile. This relatively modest capital cost is a result of the fact that (i) the service was designed to utilize existing general purpose travel lanes (thus no expensive busway or exclusive lane infrastructure was required), and (ii) vehicle acquisition was not considered part of the capital cost.

Lack of available data has limited the evaluation of other system benefits, which include Operating Cost Efficiency, Land Development, and Environmental Quality.

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Appendix I – On-Board Survey Analysis

A.1 Introduction

Three similar onboard surveys of 72R riders were conducted; two by Nelson Nygaard in March and October 2004, and one by CUTR in April 2004. This appendix presents and compares the results obtained from the three surveys. The CUTR survey instrument is provided at the end of this appendix.

A.2 Methodology

The majority of the 2004 Rapid on-board survey was conducted on Wednesday, April 28th and Thursday, April 29th. All surveying was complete by April 30th, 2004. The dates of the survey were chosen to capture the midweek data. On Wednesday, buses were surveyed from the early morning until the afternoon. Afternoon and evening service was surveyed on Thursday. Over the two-day period the route was surveyed once for its entire service span; thus, the survey results represent one weekday of service. Survey distribution was carried out by temporary employees hired through Spherion. A copy of the survey instrument, which was also provided in Spanish, is included in Appendix I.

In all cases, one surveyor was assigned to a particular bus on a particular route. Surveys were personally handed to riders as they boarded the bus or just after they found their seats. Riders were encouraged to return completed surveys to the surveyor as they exited the bus. However, due to the short distance traveled by some passengers, some were allowed to take the survey with them to fill out and return to a bus driver at a later time. As time permitted, surveyors also walked through the bus asking for completed surveys. In some instances, surveyors assisted some riders with disabilities in the completion of their surveys. Riders were asked to complete a survey each time they boarded a bus regardless of whether they had previously completed a survey on a previous day or earlier trip.

A.3 Comparison of Sample and Population Demographics

The sample characteristics of the three on-board surveys conducted in 2004 are compared in Table A.1 below. These demographics are compared against those of San Pablo Avenue corridor ridership and system-wide AC Transit ridership, using data from a 2002 system-wide survey. The population characteristics of Alameda and Contra-Costa counties (from Census 2000) are also provided.

TABLE A.1 – Sample and Population Demographics

Demographic Variable	Categories	72R On-board Surveys (2004)			AC Transit On-Board Surveys (2002)		County Population	
		CUTR April 2004	Nelson Nygaard Mar. 2004	Nelson Nygaard Oct. 2004	San Pablo Ave. Corridor Ridership	AC Transit System-wide Ridership	Alameda County	Contra Costa County
N. (Population / Sample Size)		1,285	1,733	1,300	372	15,370	15,370	948,816
Age	Under 18	16.0	15.3	17.9	8.8	20.7	24.6	26.5
	18 to 24	22.3	20.3	19.6	18.8	18.5	9.6	7.7
	25 to 34	20.6	21.2	18.5	21.8	18.6	16.7	13.3
	35 to 49	24.3	25.4	26.1	25.7	22.4	24.6	25.1
	50 to 64	13.3	14.6	14.1	18.2	13.8	14.3	16.0
	65 or over	3.6	3.5	4.4	6.6	5.9	10.2	11.3
Ethnic Origin	Af. American / Black	48.3	47.7	45.1	42.8	33.4	14.7	9.4
	White	16.2	18.7	18.1	13.9	21.8	41.3	57.5
	Native American	1.3	1.3	1.0	0.3	1.2	1.0	1.0
	Asian / Pacific Islander	9.6	9.0	12.9	11.1	16.9	21.9	12.4
	Latino / Hispanic	18.7	18.4	18.1	27.5	20.8	19.6	18.5
	Other	5.9	4.8	1.9	4.5	5.8	1.4	1.2
Gender	Female	52.2	52.4	51.7	50.4	55.0	50.9	51.2
	Male	47.8	47.8	48.6	49.6	45.0	49.1	48.8
Household vehicles	None	35.4	36.4	37.7	Question not included in survey		Question not included in survey	
	One	31.1	34.4	32.3				
	Two	22.7	21.1	20.0				
	Three of more	10.7	8.9	11.1				
Annual Household Income*	Under $10,000	30.1	26.4	33.0	36.2	26.3	7.9	5.1
	$10,000 - $29,000	29.6	31.3	27.5	34.5	27.4	17.9	15.1
	$30,000 - $49,000	22.7	23.4	19.8	17.2	20.6	18.7	18.0
	$50,000 - $74,000	9.4	11.9	11.3	7.8	12.5	19.8	20.2
	$75,000 - $99,999	4.8	4.5	4.6	3.0	6.2	13.5	14.9
	$100,000 and over	3.4	2.5	3.0	1.3	7.0	22.2	26.7

* Income figures are indicative only because (a) data has not been adjusted to account for Inflation between 1999 and 2004, and (b) because Census 2000 income data was collected at the household level, not at the person level

Table A.1 shows that the demographic characteristics of the three survey samples are very similar to each other, which enhances the legitimacy of each survey's findings. Comparing the population characteristics with those of 72R riders, it can be seen that a higher percentage of riders are aged between 18 and 34 compared to the total population within these age groups, with around 40 percent of 72R riders in this age group, compared to only around 20 to 25 percent of the total population. It can also be seen that the "African American/Black" ethnic group is over-represented in the 72R ridership, accounting for 45 to 49 percent of ridership, in comparison to only 9 to 15 percent of the population. Correspondingly, the White and Asian / Pacific Islander ethnic groups are underrepresented. The proportion of Hispanic 72R riders is very similar to the proportion of Hispanics in the population, as is the proportion of male and female riders. Although the income data is only indicative, it does suggest that 72R riders tend to be at a lower income level the general population – Around 60 percent of 72R riders earn less than $30,000, while the corresponding proportion in the population is only 20 to 25 percent. Although there is no population data available on household car ownership, the survey data show that over one third of 72R riders come from no car households, and are thus likely to be captive transit riders. The remaining two-thirds come from households with at least one car, and may or may not be captive riders, depending on whether a vehicle is available to them or to another household member.

Comparing the demographics of 72R riders with those of other corridor riders, and AC Transit ridership as a whole, it appears that the characteristics of 72R riders are very

similar to those of the corridor as a whole. Income levels of 72R riders appear to be slightly higher than the corridor average, but are lower than the system-wide average.

Overall, this demographic analysis shows that 72R riders are likely to be of working age, of lower income, and belong to an ethnic minority. This is consistent with transit ridership demographics in general.

A.4 Characteristics of Current Rapid Bus Use

A.4.1 Reasons for Riding the Bus

Respondents were asked "why are you riding the bus today?", and given six response options. Multiple responses were permitted.

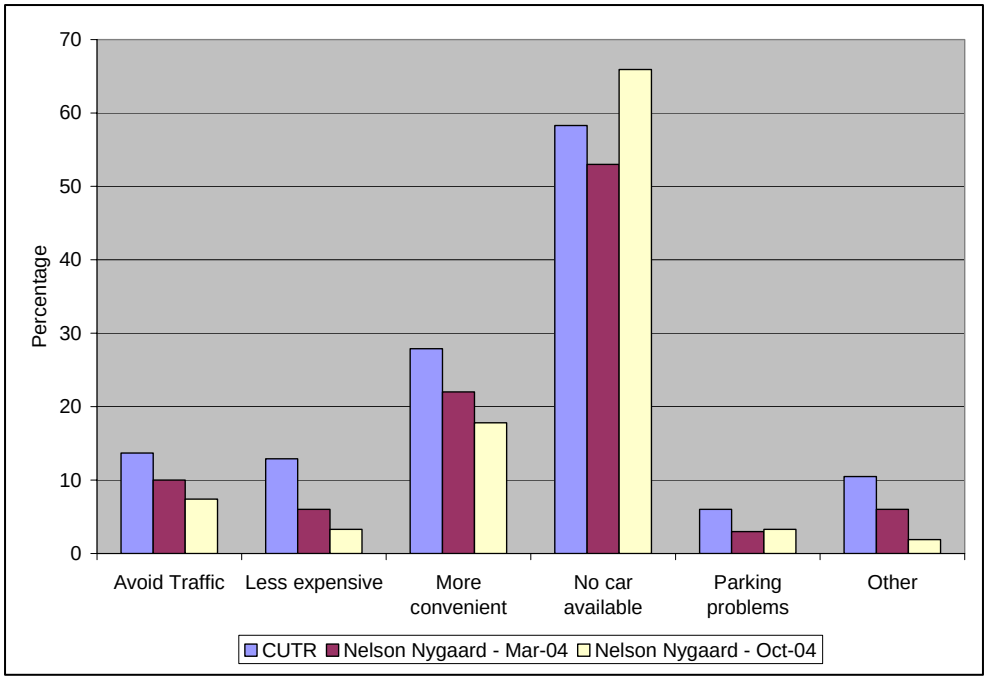


FIGURE A.1 – *"Why are you riding this bus today?"*

The responses from the three surveys are relatively consistent in terms of the rank ordering of response frequency – "no car available" was the most frequently selected option, ranging from 53 to 66 pecent. This category can be used as a proxy for "captive riders", which suggests that around 40 percent of 72R ridership are choice riders. For these riders, the most popular reason for choosing to ride the bus was that it is "more convenient", followed by "avoid traffic" and "less expensive". Lack of parking was only identified as a problem in limited number of cases.

A further question was included in the CUTR survey that asked respondents *"what is the most important reason you currently ride the Rapid Bus?"*.

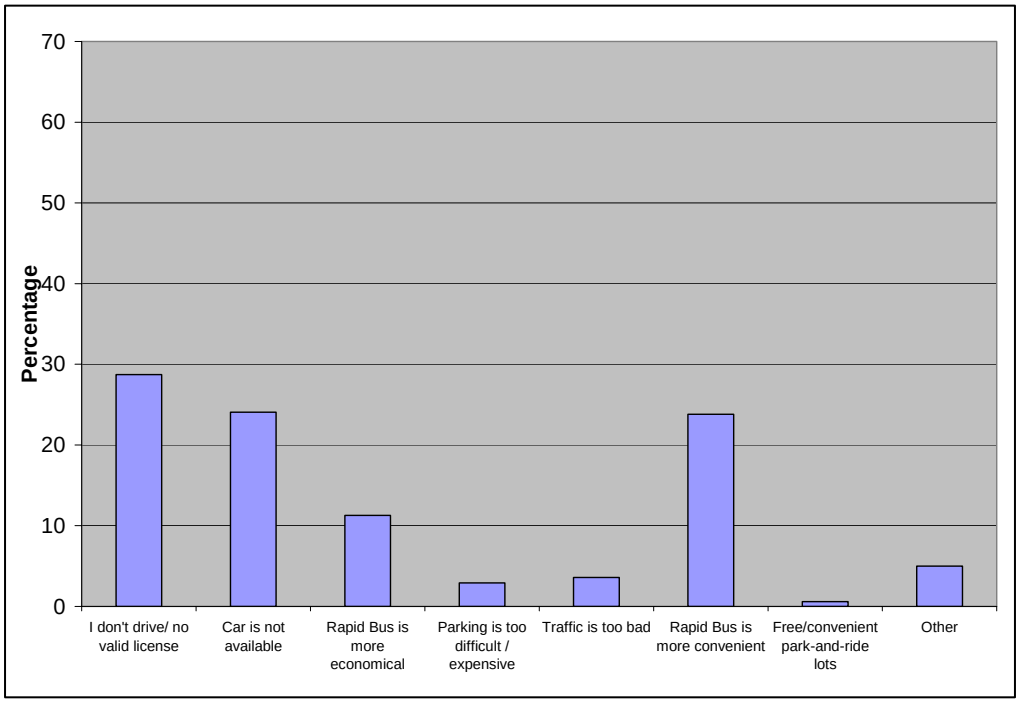


FIGURE A.2 – *"What is the Most Important Reason You Currently Ride the Rapid Bus?"*

This figure provides more insight into why people take the 72R. Almost 30 percent stated that they do not drive, while 24.1 percent stated that a car is not available. These two responses account for 53 percent of total responses, which his similar to the proportion of respondents in Figure A.1 who stated that they didn't have a car available. This suggests that there are two types of captive rider – those that do not drive, and those that can drive but do not have access to a car. There are also other examples of the degree of consistency in the responses to this and the previous question, with convenience being cited as the most important reason by 23.8 percent in this question, compared to 27.9 percent in the previous question. Those stating that the "Rapid bus is more economical" (11.3 percent) is also consistent with the proportion of respondents in the previous question that stated that the Rapid Bus was less expensive (12.9 percent). Overall, this figure reinforces the findings of the previous figure, that the most frequently cited reason for choice riders using the Rapid bus is due to perceived greater convenience.

A.4.2 Trip Purpose

The figure below shows the stated trip purposes of 72R riders.

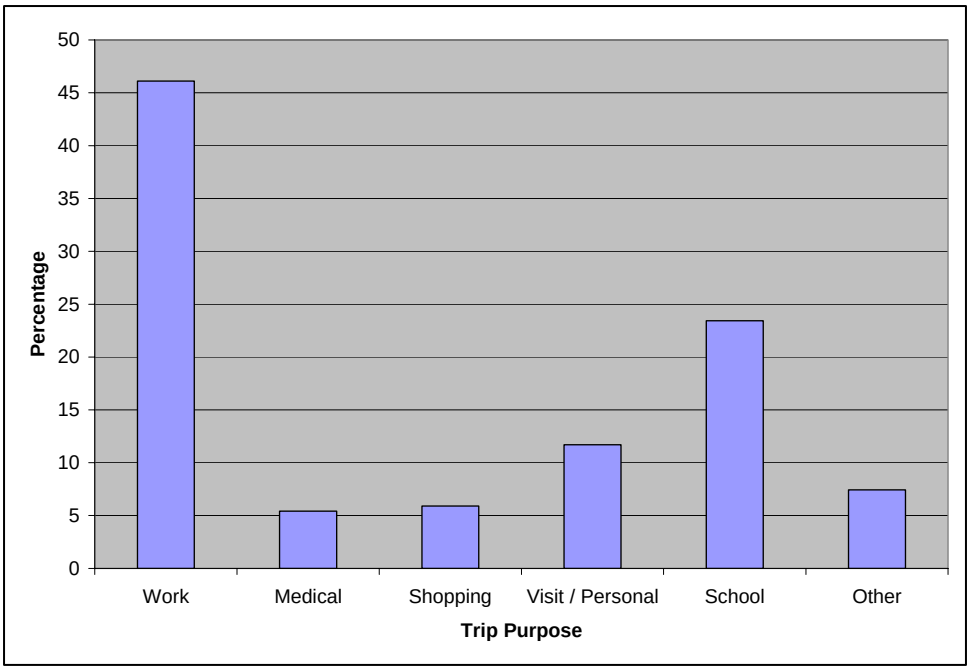


FIGURE A.3 – Trip Purpose

The figure shows that the almost half the trips taken on the Rapid are for work purposes – most likely for commuting to or from a regular workplace. School related trips are the next most common trip purpose, accounting for almost one quarter of total trips. This information correlates with the findings of the previous section, which show that the majority of riders are of working age, with a greater proportion of people under 34 than exists in the total population.

A.4.3 Mode of Access to and from the Rapid Bus

Figure A.4 below shows how Rapid Bus users got to the bus and how they got from the bus to their final destination.

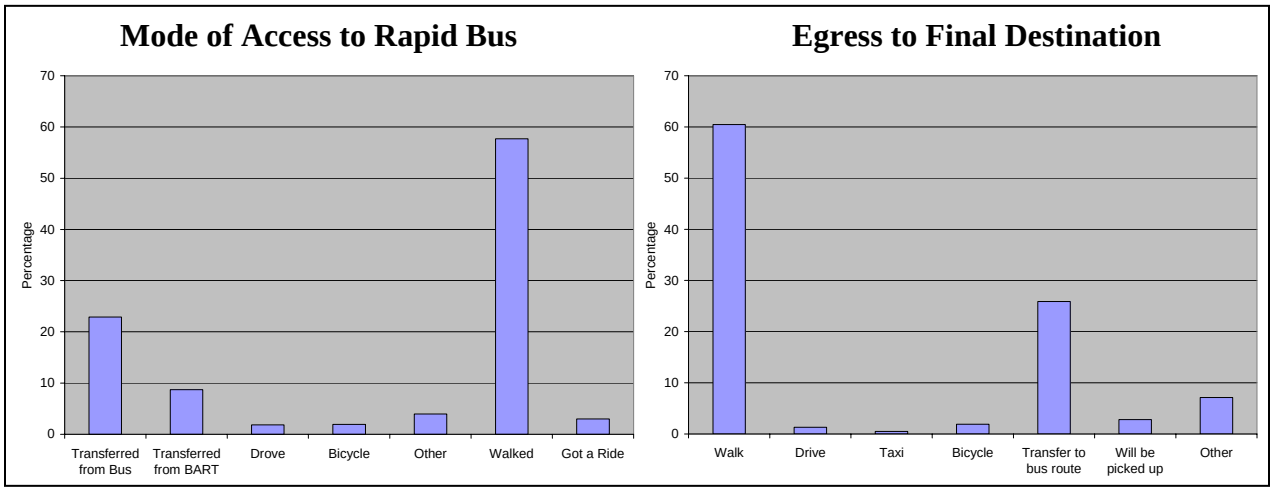


FIGURE A.4 – Mode of Access To and Egress From the Rapid Bus

The figure shows that the most common access and egress mode is walking, accounting for around 60 percent of respondents. Transfers to and from other transit modes (BART or other bus lines) account for 25 to 30 percent of the total. Use of the remaining modes were minimal.

A.4.4 Fare Payment

All three on-board surveys included a question on fare payment method. Responses are provided in Figure A.5 below.

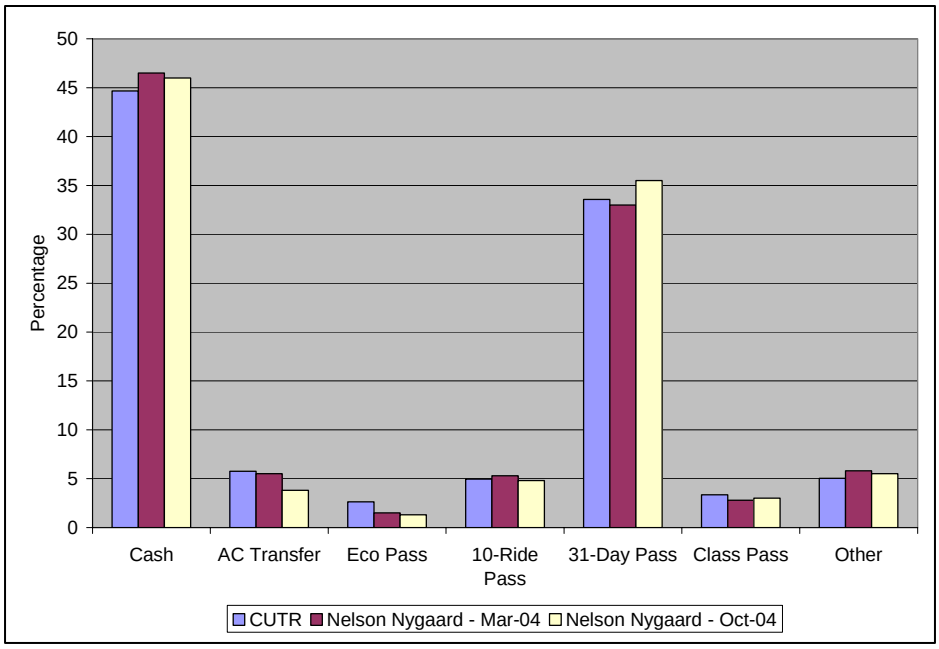


FIGURE A.5 – Fare Payment Method

The figure again indicates a high degree of consistency between the three surveys. Cash is the most popular fare payment method, accounting for around 45 percent of transactions, followed by use of the monthly pass, at around 33 to 35 percent. Use of the remaining options is minimal at around 5 percent or less in each case.

Cash payers were then asked to provide information on the fare type that they paid. Their responses are provided below.

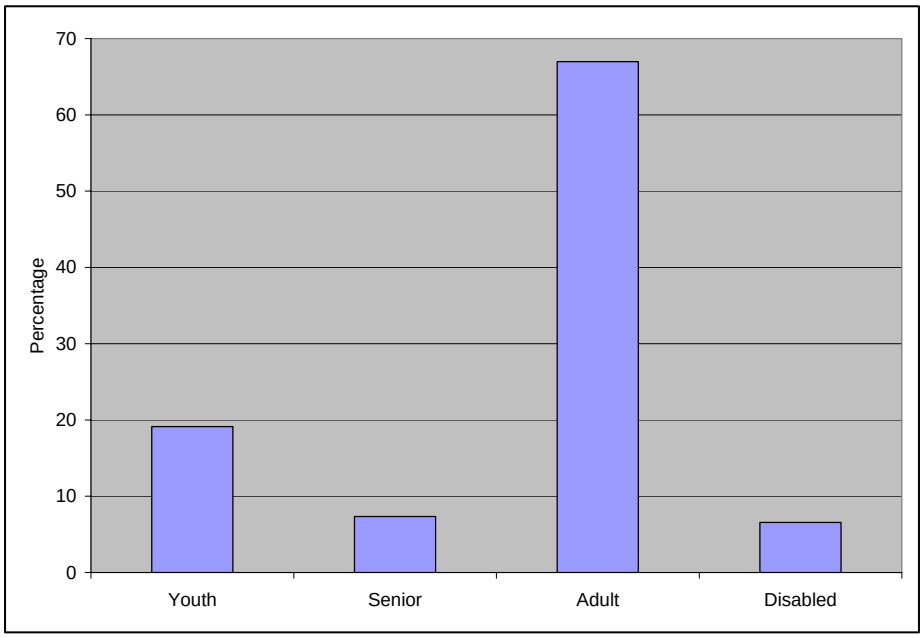


FIGURE A.6 – Cash Payment Type

Figure A.6 shows that most cash payers paid the standard adult fare (67.0 percent). Almost 20 percent paid the youth fare, while less than 10 percent paid the reduced rate senior and disabled fares.

A.4.5 User Perceptions of Rapid Bus Impact on Travel Time

All three on-board surveys asked respondents whether their travel time had changed due to using the Rapid Bus.

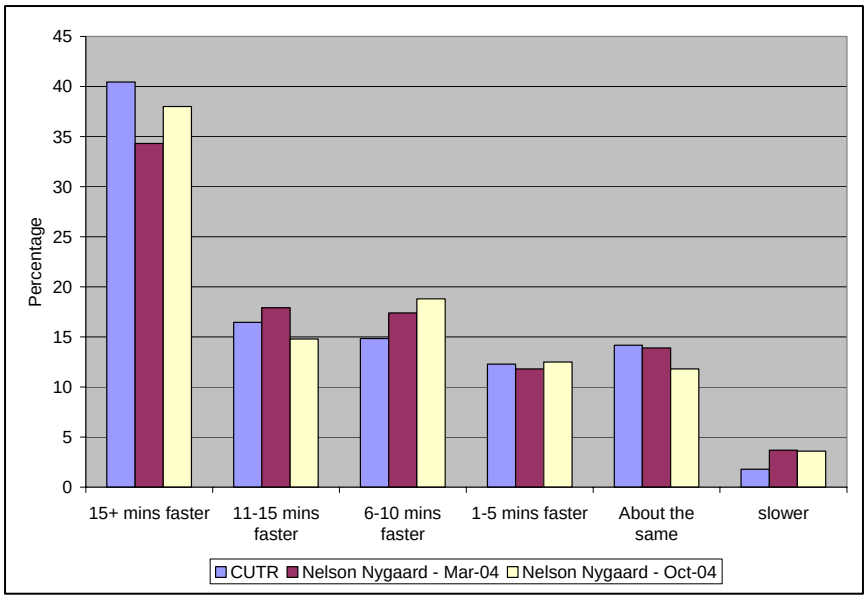


FIGURE A.7 – Perception of Rapid Bus Impact on Travel Time

Figure A.7 shows that the majority of respondents thought that the Rapid Bus had reduced their travel time, with less than 15 percent stating that their travel time had remained unchanged, and under 5 percent stating that their travel time was now slower. Thus, over 80 percent of riders thought that their travel time had decreased as a result of the Rapid Bus. Of these, around 35 to 40 percent stated that the travel time saving was greater than 15 minutes, while the remaining categories, 11 and 15 minutes, 6 to 10 minutes, and 1 to 5 minutes accounted for the remainder of the sample.

The amount of travel time saved obviously depends on the length of the trip. Table A.2 below provides a cross-tabulation of perceived travel time savings against the trip length indicated by respondents on their questionnaires.

TABLE A.2 – Perceived Travel Time Saving By Trip Length

Perceived Impact of Rapid Bus on Travel Time	*Trip Length (Number of Stops)*									
	1-5		6-10		11-15		16-20		21-25	
	N.	%	N.	%	N.	%	N.	%	N.	%
15+ mins faster	58	33.0	78	37.9	44	52.4	32	61.5	13	65.0
11-15 mins faster	31	17.6	50	24.3	16	19.0	5	9.6	3	15.0
6-10 mins faster	26	14.8	35	17.0	10	11.9	7	13.5	0	0.0
1-5 mins faster	31	17.6	19	9.2	2	2.4	4	7.7	1	5.0
About the same	28	15.9	18	8.7	12	14.3	4	7.7	3	15.0
Slower	2	1.1	6	2.9	0	0.0	0	0.0	0	0.0
TOTAL	176	100	206	100	84	100	52	100	20	100

Table A.2 shows that the most frequently cited response within each trip length category was for a time saving of 15 minutes or more. This would be a reasonable response for people taking longer trips on the Rapid Bus, but seems less likely for people taking a shorter trip of less than 10 stops. However, it can be seen that as trip length increases, so does the proportion of the sample stating that the Rapid Bus saved them 15 minutes or more, from 33.0 percent for those taking a trip of between one and five stops, up to 65.0 percent for those traveling 21 to 25 stops. Also, none of the riders taking trips of 11 stops or more thought that the Rapid Bus was slower than their previous mode.

Another way to consider perceived travel time savings is to cross-tabulate the results by the mode that Rapid Bus customers used before its introduction. The following table presents the results of this cross-tabulation.

TABLE A.3 – Impact of Rapid Bus on Travel Time for Different Prior Modes Used

Travel Time Impact	*Mode Used Prior to Rapid Bus*															
	Drove		Rode with someone		Bicycle		Jitney		Walked		Taxi		AC Transit bus route		Other	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
15+ mins faster	48	39.7	20	33.3	12	50.0	0	0.0	38	43.2	4	30.8	293	40.5	20	40.0
11-15 mins faster	18	14.9	8	13.3	4	16.7	0	0.0	7	8.0	0	0.0	136	18.8	11	22.0
6-10 mins faster	16	13.2	8	13.3	3	12.5	0	0.0	9	10.2	2	15.4	116	16.0	7	14.0
1-5 mins faster	10	8.3	9	15.0	3	12.5	1	100	15	17.0	5	38.5	88	12.2	2	4.0
About the same	22	18.2	13	21.7	2	8.3	0	0.0	17	19.3	2	15.4	83	11.5	9	18.0
Slower	7	5.8	2	3.3	0	0.0	0	0.0	2	2.3	0	0.0	8	1.1	1	2.0
TOTAL	121	100	60	100	24	100	1	100	88	100	13	100	724	100	50	100

Table A.3 shows that there is not much variation in travel time savings in relation to previous mode used – and that the most frequently selected option for each modal category was a time saving of 15 minutes or more. This included modes that are commonly perceived as faster than public transit such as the car, and modes perceived as slower, such as walking. The highest percentage of people stating that the Rapid bus was slower than their previous mode came from those who previously drove, but this accounted for only 5.8 percent of sampled drivers.

A.4.6 Frequency of Rapid Bus Use

Respondents were asked how many times a week they ride the rapid bus.

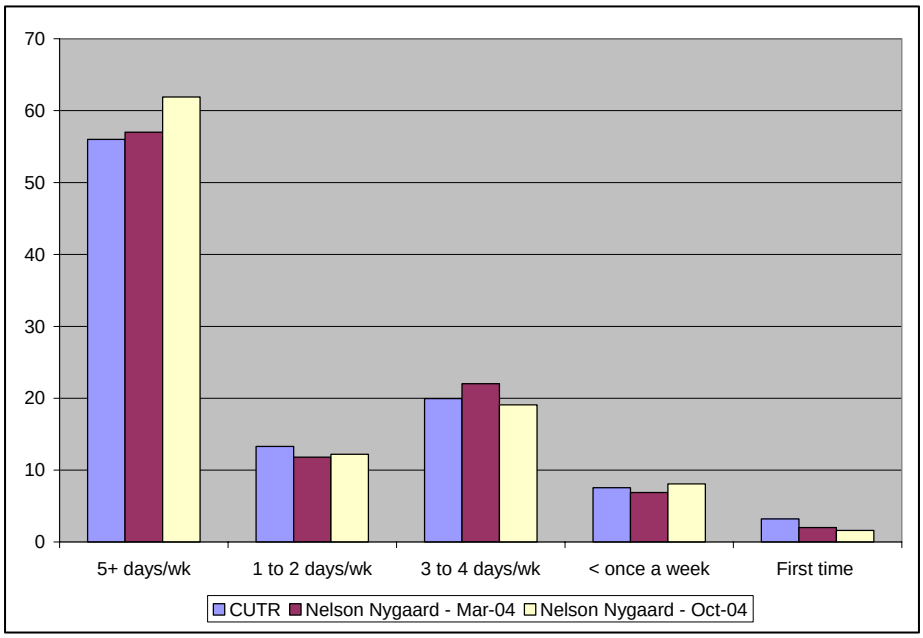


FIGURE A.8 – Frequency of Rapid Bus Use

A high degree of consistency is again apparent across the three surveys. It can be seen that over half the surveyed riders stated that they used the Rapid Bus five or more times per week. The figure below looks at frequency of Rapid Bus use by trip purpose.

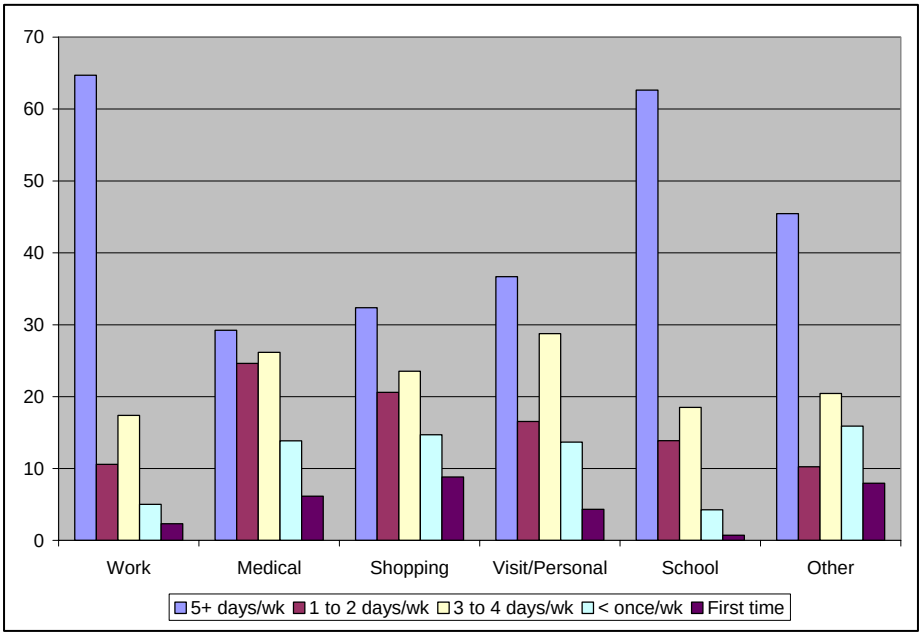


FIGURE A.9 - Frequency of Rapid Bus use by Trip Purpose

Figure A.9 shows that the work and school trip purposes are associated with high frequency of service use. Weekly trip frequencies associated with the other trip purposes, medical, shopping and visit/personal, were more diverse. Overall, the figure shows that regular riders are likely to be using the Rapid service to get to and from daily work or school activities.

A.4.7 Length of Time Using Rapid Bus / AC Transit

Both the Nelson Nygaard surveys and the CUTR survey asked respondents how long they had been using AC Transit. The CUTR survey also asked for the length of time that riders had been using the Rapid Bus. Figure A.10 below provides their responses.

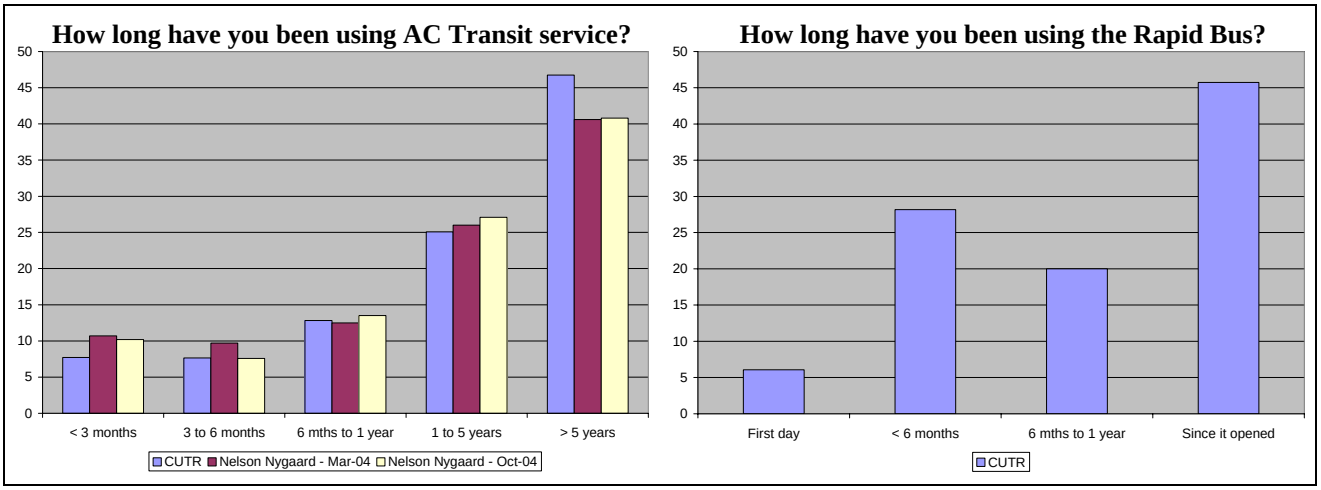


FIGURE A.10 – Length of Time Using Rapid Bus / AC Transit

Responses to the question on the period of AC Transit service use shows that over 40 percent of surveyed riders were long-term AC Transit users, with over five years of service use. A further 25 percent of riders have been using AC Transit for between 1 and 5 years. Looking at period of Rapid Bus use, almost half the surveyed riders stated that they had been using the service since it started.

A.4.8 Rating of Different Aspects of Rapid Bus Use

Survey respondents were asked to rate different aspects of the Rapid bus service on a scale of 1 (very poor) to 5 (very good). The final two questions related to public perceptions of the Rapid Bus service overall, and non-rapid AC Transit bus services overall. Table A.4 below provides the analysis of these responses showing, for each service element, the sample proportions in each response category, the overall mean score, and the response rate. The service elements have been sorted based on the overall mean score that they achieved.

TABLE A.4 – Customer Ratings of Different Aspects of the Rapid Bus Service

Question #.	Rapid Bus Service Element*	Response Category (%) Very Poor (1)	Poor (2)	Fair (3)	Good (4)	Very Good (5)	TOTAL	Mean Score	Response Rate (%)
q.	Additional door in the middle of the bus	0.4	1.3	9.8	39.3	49.1	100	4.4	71.4
r.	The low-floor entrance onto the bus	0.5	0.8	10.5	39.1	49.1	100	4.4	71.7
S	Ease of identifying the Rapid Bus service	0.2	0.9	9.1	34.2	55.6	100	4.4	71.1
f.	Travel time on Rapid Bus	0.8	2.0	10.9	40.3	46.0	100	4.3	74.4
t.	Wheelchair securement on Rapid Bus vehicles	0.6	1.9	13.8	37.1	46.7	100	4.3	66.7
a.	Hours of Rapid Bus service	1.2	3.2	15.3	39.4	40.9	100	4.2	79.9
b.	Frequency of Rapid Bus (how often buses run)	0.8	2.3	15.0	39.2	42.6	100	4.2	77.7
c.	Convenience of Rapid Bus (where buses go)	0.8	3.3	15.7	39.0	41.2	100	4.2	75.8
o.	Ease of getting on and off Rapid Bus vehicles	1.4	2.0	12.9	40.9	42.8	100	4.2	73.1
p.	Location of Rapid Bus signage	0.2	2.0	14.6	43.4	39.8	100	4.2	71.2
u.	Accessibility of Rapid Bus vehicles to handicapped	1.1	2.4	14.6	36.9	45.1	100	4.2	66.1
aa.	Connectivity of Rapid Bus to local bus service/BART	0.8	2.8	15.2	42.1	39.1	100	4.2	69.6
d.	Dependability of Rapid Bus (on time performance)	0.5	3.5	16.4	39.7	39.9	100	4.1	74.4
e.	Wait time at station/stop for Rapid Bus	0.3	3.7	19.7	41.1	35.2	100	4.1	75.6
h.	Availability of Rapid Bus information/maps at stations	1.2	4.2	19.0	38.9	36.8	100	4.1	73.0
l.	Quality of bus shelters/stops	1.0	3.1	18.4	44.0	33.4	100	4.1	71.9
n.	The look/design of the new vehicles used for Rapid Bus	2.3	3.3	15.3	37.5	41.6	100	4.1	73.3
v.	Rapid Bus operator courtesy	2.0	3.7	17.8	38.6	38.0	100	4.1	71.4
w.	Rapid Bus operator driving competence	1.1	2.5	16.1	41.0	39.3	100	4.1	70.6
x.	Cleanliness of vehicles used for Rapid Bus	1.3	2.2	19.6	42.0	34.9	100	4.1	71.4
j.	Personal safety on Rapid Bus	1.6	2.4	20.4	42.1	33.5	100	4.0	73.6
k.	Personal safety at Rapid Bus stops	1.2	3.9	22.3	41.7	30.9	100	4.0	71.6
m.	Smoothness of ride on Rapid Bus vehicles	1.6	5.7	20.2	40.1	32.3	100	4.0	71.8
bb.	Posted minutes to next bus at stations	3.3	5.3	16.6	37.6	37.3	100	4.0	68.2
g.	Cost of riding Rapid Bus (value for what you pay)	3.9	5.2	24.1	32.8	34.0	100	3.9	73.9
i.	Availability of seats on Rapid Bus	3.2	5.7	23.2	38.5	29.4	100	3.9	73.2
y.	Cleanliness of Rapid Bus shelters	1.7	4.1	23.6	42.4	28.2	100	3.9	69.6
z.	Amenities provided at Rapid Bus shelters (benches, trash bins, telephones, etc.)	1.6	5.0	24.8	38.6	30.0	100	3.9	69.7
cc.	**Your overall satisfaction with the Rapid Bus**	**0.7**	**1.4**	**12.6**	**45.1**	**40.2**	**100.0**	**4.2**	**70.8**
dd.	**Your overall satisfaction with AC Transit non-Rapid Bus Services**	**2.9**	**9.2**	**26.4**	**34.7**	**26.7**	**100.0**	**3.7**	**71.6**

* Elements have been sorted in descending order on the basis of their mean score.

Table A.4 indicates that the Rapid Service is highly regarded by its customers, with 65 to 80 percent of responses to each question in either the "good" or "very good" category. None of the service elements were rated "poor" or "very poor" by more than 10 percent of the sample, with most elements receiving only 5 percent of less of their total responses in these two categories. It can also be seen that the responses were relatively consistent across the different service elements, meaning that the mean scores only vary between 3.9 to 4.4. The service elements receiving the highest rating of 4.4 included "additional door in the middle of the bus", "the low-floor entrance onto the bus", and "ease of identifying the Rapid Bus service". Service elements receiving a 4.2 or 4.3 rating included travel time, service hours, and frequency, which were all targeted for improvement in relation to the previous 72L service. Elements at the low end of the rating scale were cost, seat availability, bus shelter cleanliness, and bus shelter amenities, although it should be noted that a mean score of 3.9 still indicates a high level of satisfaction.

Response rates varied between the mid-sixties and the upper-seventies. Multi-sectioned questions such as this tend to suffer from respondent attrition, and this is also apparent in this case. The questions with the lowest response rates involved provision for disabled customers, and it is likely that non-disabled people did not respond to these questions as they would not have an opinion either way.

Overall, the Rapid Bus received a mean score of 4.2, with around 85 percent of the sample rating the service as either "good" or "very good". Less than 3 percent rated the service overall as "poor" or "very poor". This rating compares favorably with AC Transit services overall, which only received a mean score of 3.7, and only around 60 percent rated AC Transit services as "good" or "very good".

A.4.9 Average Trip Length

Trip origin and trip destination information was used to assess the trip length and trip direction of the different passengers that used the Rapid Bus. Table A.5 below provides this information.

TABLE A.5 – Trip Length and Trip Direction

Trip length (Number of Stops)	N.	Valid Percent
0	1	0.2
1-5	187	32.4
6-10	220	38.1
11-15	94	16.3
16-20	55	9.5
21-25	21	3.6
Total	578	100.0
Mean	8.56	

Table A.5 shows that most (around 70 percent) of the journeys made on the Rapid Bus are for 10 or less bus stops, with almost one third of riders taking the bus for only five stops or less, and over one third traveling on the bus for between six and ten stops. The remaining 30 percent of trips are between 11 and 25 stops in length. Only two riders on the day of the survey traveled the complete route length from Contra Costa College to 2nd St. Overall, the average number of stops traveled by Rapid bus riders was 8.56. With an average width between bus stops of 0.54 miles, this means that the average trip length of people using the rapid bus is 4.6 miles.

A.5 Mode Use Before Rapid Bus Implementation

Rapid Bus users were asked how they traveled along the San Pablo Avenue corridor before the Rapid Bus was implemented. The responses from the CUTR and Nelson Nygaard surveys are shown in separate charts due of differences in the options offered.

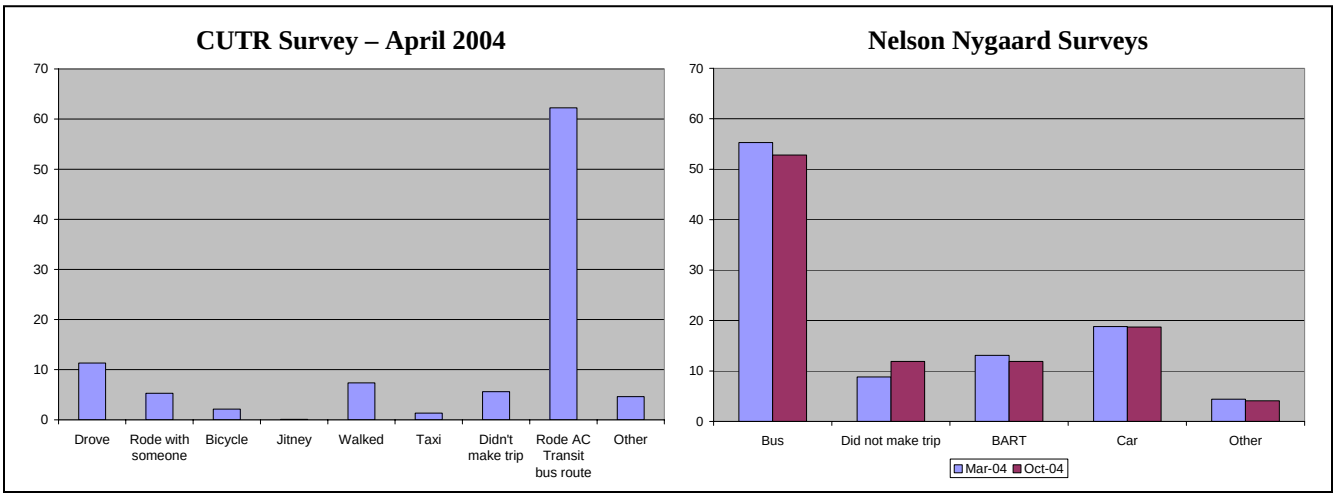


FIGURE A.11 –Mode Used Before the Introduction of the Rapid Bus

Figure A.11 shows that some of the options in the CUTR and Nelson Nygaard surveys are directly comparable. All three surveys shows that the majority of Rapid Bus users previously used other bus routes on the corridor, although the CUTR survey percentage (62 percent) is slightly higher than the percentages from the two Nelson Nygaard surveys (53 percent and 55 percent). The proportion of Rapid Bus users that previously used a car for their trip is around 19 percent in the Nelson Nygaard surveys and around 17 percent in the CUTR survey (11.3 percent drove, 5.3 percent rode with someone). These figures represent the proportion of additional choice riders that have been induced into taking transit as a result of Rapid Bus introduction. Switching from BART was not offered as an option in the CUTR survey, but further investigation showed that the majority of responses in the "other" category were from those that previously rode BART. However, the proportion in the "other" category (5 percent) is still much lower than the 10 to 15 percent of prior BART users identified in the Nelson Nygaard surveys.

Respondents who had used other bus routes before using the 72R were asked to indicate which bus line they had used. Their responses are shown below.

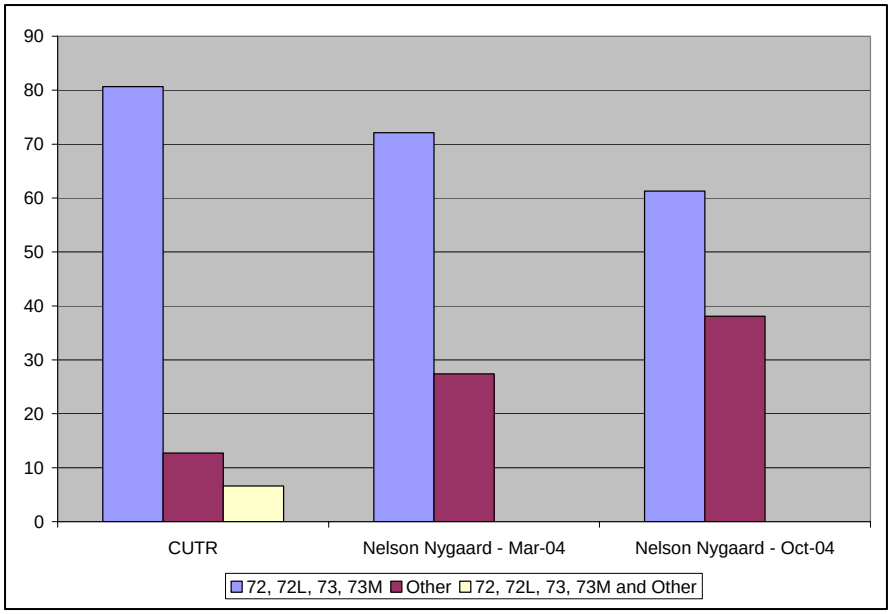


FIGURE A.12 – Bus Line Used Before Introduction of Rapid Bus

Figure A.12 shows that the Nelson Nygaard data was divided into two categories, those who had previously used the other main San Pablo Avenue routes, and those that had used other routes. The CUTR survey data included an additional category to account for those that had stated they had used these main routes as well as other routes. The figure shows that the proportion stating that they used routes other than the main San Pablo Avenue routes increased with successive surveys. This may relate to the fact that the proportion of riders coming from the discontinued 72L service is likely to decrease over time. The following table considers how stated travel times changed in relation to previous modes used.

TABLE A.6 – Impact of Rapid Bus on Travel Time for Different Prior Modes Used

Travel Time Impact	*Mode Used Prior to Rapid Bus*															
	Drove		Rode with someone		Bicycle		Jitney		Walked		Taxi		AC Transit bus route		Other	
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
15+ mins faster	48	39.7	20	33.3	12	50.0	0	0.0	38	43.2	4	30.8	293	40.5	20	40.0
11-15 mins faster	18	14.9	8	13.3	4	16.7	0	0.0	7	8.0	0	0.0	136	18.8	11	22.0
6-10 mins faster	16	13.2	8	13.3	3	12.5	0	0.0	9	10.2	2	15.4	116	16.0	7	14.0
1-5 mins faster	10	8.3	9	15.0	3	12.5	1	100	15	17.0	5	38.5	88	12.2	2	4.0
About the same	22	18.2	13	21.7	2	8.3	0	0.0	17	19.3	2	15.4	83	11.5	9	18.0
Slower	7	5.8	2	3.3	0	0.0	0	0.0	2	2.3	0	0.0	8	1.1	1	2.0
TOTAL	121	100	60	100	24	100	1	100	88	100	13	100	724	100	50	100

Table A.6 shows that there is not much variation in travel time savings in relation to previous mode used – and that the most frequently selected option for each modal category was a time saving of 15 minutes or more. This included modes that are commonly perceived as faster than public transit such as the car, and modes perceived as slower, such as walking. The highest percentage of people stating that the Rapid bus was slower than their previous mode came from those who previously drove, but this accounted for only 5.8 percent of sampled drivers.

A.6 Additional Comments and Suggestions

The final section of the CUTR survey provided space for respondents to write any other comments or suggestions that they had about the Rapid Bus service. These comments have been categorized to facilitate a quasi-quantitative analysis. Table A.7 provides the results of this analysis.

The table shows that a total of 353 separate comments were coded. While the majority of respondents only made one comment, some commented on a range of different issues, and were thus assigned multiple codes. The comments were separated into five major themes; service provision, drivers, vehicles, fares, and shelters.

Most of the comments were made on the theme of service provision. The most frequently cited comment was that the travel time / travel speed was good (54 comments). Other positive comments on the service were made in relation to reliability (17 comments) and frequency (5 comments), while a further 34 positive comments were made in relation to the service in general. Negative comments on frequency and reliability were also observed, but with much lower frequency. Many of these comments related to suggested service improvements, with the most popular choices being to extend the service hours (some requested a 24 hour service, others simply asked for night services), and to provide weekend service. Some comments conceded that these off-peak temporal service extensions could feature lower service frequencies. Other suggested service improvements included extending the service to other areas, and adding bus stops at specific locations like the Richmond BART station. Respondents making positive comments about the service often suggested implementing similar services on other routes. Six respondents commented that the Rapid Bus was better than other AC Transit services, and a number of other comments (not coded) criticized the removal or reduction of other AC Transit routes.

A variety of comments were made about the Rapid bus drivers. Five respondents gave positive comments (good drivers / courteous drivers), while the rest of the comments were negative. Criticisms included rudeness, poor driving (too fast / jerky / leave before people can sit down), not accepting transfer tickets, not stopping for people, and not enforcing rules (no eating / no foul language / exit through rear doors). Overall, it is concerning that the negative comments outweighed the positive ones, but the numbers are still fairly negligible.

TABLE A.7 – Additional Comments / Suggestions on Rapid Bus Service

	Comment Category	N.	%
Service Provision	Frequency is good / like frequency	5	1.4%
	Good travel time / travel speed	54	15.3%
	Good reliability	17	4.8%
	Service is unreliable	6	1.7%
	Higher frequency / more buses needed	1	0.3%
	Extend current route length	4	1.1%
	More stops needed / stops too far apart / specific stop needed	12	3.4%
	Less stops needed	1	0.3%
	Improve transfer system / better co-ordination with BART / MUNI / not enough time to transfer using current ticket	12	3.4%
	Apply rapid service to other routes / areas	13	3.7%
	Extend service hours	28	7.9%
	Provide Saturday / Weekend service	38	10.8%
	Rapid is better than other AC Transit services	6	1.7%
	Service is good / great (non specific)	34	9.6%
	Service is safe / like safety	4	1.1%
	Service not safe	1	0.3%
Drivers	Drivers are good / courteous	5	1.4%
	Drivers lack courtesy / are rude	5	1.4%
	Drivers drive badly / too fast / too slow / take off before people are seated	5	1.4%
	Drivers don't accept transfer tickets	2	0.6%
	Drivers don't stop for people	2	0.6%
	Drivers don't enforce rules	2	0.6%
	General criticism of drivers (non-specific)	1	0.3%
	Need more ethnic diversity in driver pool	1	0.3%
Vehicles	Not enough seats / too crowded / buses too small / need bigger buses	9	2.5%
	Criticisms of seating / interior design (seats too high, not enough room, uncomfortable, hard to get in and out of seats, specially elderly disabled, don't like backward facing seats)	15	4.2%
	Like bike racks	1	0.3%
	Need hand rails	2	0.6%
	Buses are clean / like clean buses	6	1.7%
	Buses dirty / need to be cleaned better / more frequently	2	0.6%
	Need wheelchair securement	1	0.3%
	Buses too hot / poor ventilation / need better air-conditioning	10	2.8%
	Like seat design / interior design / seats are comfortable / good seat availability	7	2.0%
	Criticisms of doors (open and close too slowly / often break)	3	0.8%
	Like doors / doors work well	1	0.3%
Fares	Like fares / fares are cheap / affordable	9	2.5%
	Fares are too expensive / need to reduce fares	10	2.8%
	Transfers should not cost more / transfers cost too much	2	0.6%
	Need to integrate Rapid fares with BART / MUNI. Need monthly pass / discounted pass	4	1.1%
Shelters	Need more bus shelters / need shelters at every stop	1	0.3%
	Like real-time info / NextBus	1	0.3%
	Real-time info doesn't work / is inaccurate. Fix or remove.	6	1.7%
	More shelters need to provide real-time info.	3	0.8%
	TOTAL	353	100.0%

Most of the comments on the Rapid Bus vehicles were criticisms or suggestions for improvement. The most frequently cited criticism (15 comments) was in relation to the seating design. Customers complained that the seats were uncomfortable and too high, making it difficult for people (especially old and disabled) to get in and out. Others did not like the backward facing seats. Nine comments related to the number of seats, stating that there were not enough during peak periods, and that more seats or bigger buses were required. However, it should also be noted that seven positive comments were made in relation to the seating and interior design. Another common issue was high temperatures and poor ventilation on the Rapid Bus (ten comments). Several comments suggested that better air conditioning was required.

Twenty five comments were made on the subject of the Rapid Bus fare, and there was a relatively even balance between those stating that the fare was cheap / affordable (nine comments) and those that thought it was too expensive (10 comments). The issue of transferring, already discussed in the Service Provision paragraph, was also mentioned as a problem issue here. Four respondents requested better integration of the Rapid Bus fare with the BART and MUNI systems, with references made to the provision of a discounted monthly pass.

The final theme of bus shelters was dominated by comments on the provision of real-time bus arrival information, which is provided using the NextBus system. Six comments stated that the system did not work, or was inaccurate, and therefore needed to be rectified or removed. Three respondents stated that more shelters needed to have the NextBus information.

AC TRANSIT RAPID BUS CUSTOMER SURVEY
(la version en Español al dorso)

DEAR VALUED AC TRANSIT CUSTOMER: AC Transit would like information about your trip and your opinion to help improve the Rapid Bus service. PLEASE take a few minutes to complete the following survey. Please do not put your name or other identifying marks on the survey. Please check (T), write out, or circle your responses as appropriate. Even if you do not complete the survey, please return it to a surveyor or leave in your seat as you exit the bus. THANK YOU FOR YOUR COOPERATION!

1. Why are you riding this bus today? (Check all that apply)
   1___ Avoid traffic
   2___ Less expensive
   3___ More convenient
   4___ No car available
   5___ Parking problems
   6___ Other (Specify) _____

2. What is the main purpose of your trip today?
   1___ Work
   2___ Medical
   3___ Shopping
   4___ Visit/Personal
   5___ School
   6___ Other (Specify):_____

3. How did you get to the bus stop for this bus today?
   1___ Transferred from AC Transit Bus Line#:_____
   2___ Transferred from BART
   3___ Drove
   4___ Bicycle
   5___ Other (Specify): _____
   6___ Walked
   7___ Got a ride

4. How did you pay for your fare on the Rapid Bus?
   1___ Cash
   2___ AC Transfer
   3___ Eco Pass
   4___ Other (Specify):_____
   5___ 10-Ride Pass
   6___ 31-Day Pass
   7___ Class Pass

5. If cash, what kind of fare did you pay to ride the Rapid Bus?
   1___ Youth 2___ Senior 3___ Adult 4___ Disabled

6. Has your travel time changed with the Rapid Bus?
   1___ 15+ min. faster
   2___ 11-15 min. faster
   3___ 6-10 min. faster
   4___ 1-5 min. faster
   5___ About the same
   6___ Slower

7. How will you get to your final destination? (please T only ONE)
   1___ Walk
   2___ Drive
   3___ Taxi
   4___ Bicycle
   5___ Transfer to bus route # or name _____
   6___ Will be picked up
   7___ Other (specify): _____

8. How often do you ride the Rapid Bus? (Check one)
   1___ 5+ days per week
   2___ 1-2 days per week
   3___ 3-4 days per week
   4___ Less than once a week
   5___ First time riding

9. Before the Rapid Bus opened, how did you make this trip?
   1___ Drove
   2___ Rode with someone
   3___ Bicycle
   4___ Jitney
   5___ Walked
   6___ Taxi
   7___ Didn't make trip
   8___ Rode AC Transit bus route # _____
   9___ Other (Specify):_____

10. What is the most important reason you currently ride the Rapid Bus? (please Tonly ONE)
    1___ I don't drive/no valid license
    2___ Car is not available
    3___ Rapid Bus is more economical
    4___ Parking is too difficult/expensive
    5___ Traffic is too bad
    6___ Rapid Bus is more convenient
    7___ Free/convenient park-and-ride lots
    8___ Other (Specify): _____

11. How long have you been using the Rapid Bus?
    1___ This is the first day
    2___ Less than 6 months
    3___ 6 months to 1 year
    4___ Since it opened

Please tell us a little about yourself. All replies are strictly confidential.

12. How long have you been using AC Transit service?
    1___ Less than 3 months
    2___ 3 to 6 months
    3___ 6 months to 1 year
    4___ 1 to 5 years
    5___ More than 5 years

13. Your age is . . .
    1___ Under 18 years
    2___ 18 to 24 years
    3___ 25 to 34 years
    4___ 35 to 49 years
    5___ 50 to 64 years
    6___ 65 year or more

14. Your ethnic origin is . . .
    1___ African American/Black
    2___ White
    3___ Native American
    4___ Asian/Pacific Islander
    5___ Hispanic
    6___ Other (Specify):_____

15. You are:
    1___ Female
    2___ Male

16. How many working motor vehicles are available in your household?
    1___ None
    2___ One
    3___ Two
    4___ Three+

17. Your total annual household income is . . .
    1___ Less than $10,000
    2___ $10,000-$29,999
    3___ $30,000-$49,999
    4___ $50,000-$74,999
    5___ $75,000-$99,999
    6___ $100,000 and over

18. Please circle the station you got on the Rapid Bus and the station you got off of the Rapid Bus for this trip.

19. In general, how would you rate each of the following aspects of Rapid Bus service?

	Please circle the number that best reflects your opinion	Very Good	Good	Fair	Poor	Very Poor
a.	Hours of Rapid Bus service	5	4	3	2	1
b.	Frequency of Rapid Bus (how often buses run)	5	4	3	2	1
c.	Convenience of Rapid Bus (where buses go)	5	4	3	2	1
d.	Dependability of Rapid Bus (on time performance)	5	4	3	2	1
e.	Wait time at station/stop for Rapid Bus	5	4	3	2	1
f.	Travel time on Rapid Bus	5	4	3	2	1
g.	Cost of riding Rapid Bus (value for what you pay)	5	4	3	2	1
h.	Availability of Rapid Bus information/maps at stations	5	4	3	2	1
i.	Availability of seats on Rapid Bus	5	4	3	2	1
j.	Personal safety on Rapid Bus	5	4	3	2	1
k.	Personal safety at Rapid Bus stops	5	4	3	2	1
l.	Quality of bus shelters/stops	5	4	3	2	1
m.	Smoothness of ride on Rapid Bus vehicles	5	4	3	2	1
n.	The look/design of the new vehicles used for Rapid Bus	5	4	3	2	1
o.	Ease of getting on and off Rapid Bus vehicles	5	4	3	2	1
p.	Location of Rapid Bus signage	5	4	3	2	1
q.	Additional door in the middle of the bus	5	4	3	2	1
r.	The low-floor entrance onto the bus	5	4	3	2	1
S	Ease of identifying the Rapid Bus service	5	4	3	2	1
t.	Wheelchair securement on Rapid Bus vehicles	5	4	3	2	1
u.	Accessibility of Rapid Bus vehicles to handicapped	5	4	3	2	1
v.	Rapid Bus operator courtesy	5	4	3	2	1
w.	Rapid Bus operator driving competence	5	4	3	2	1
x.	Cleanliness of vehicles used for Rapid Bus	5	4	3	2	1
y.	Cleanliness of Rapid Bus shelters	5	4	3	2	1
z.	Amenities provided at Rapid Bus shelters (benches, trash bins, telephones, etc.)	5	4	3	2	1
aa.	Connectivity of Rapid Bus to local bus service/BART	5	4	3	2	1
bb.	Posted minutes to next bus at stations	5	4	3	2	1
cc.	Your overall satisfaction with the Rapid Bus	5	4	3	2	1
dd.	Your overall satisfaction with AC Transit non-Rapid Bus Services	5	4	3	2	1

20. Using the letters from Question 20 above, what are the THREE (3) aspects of Rapid service that you like most?

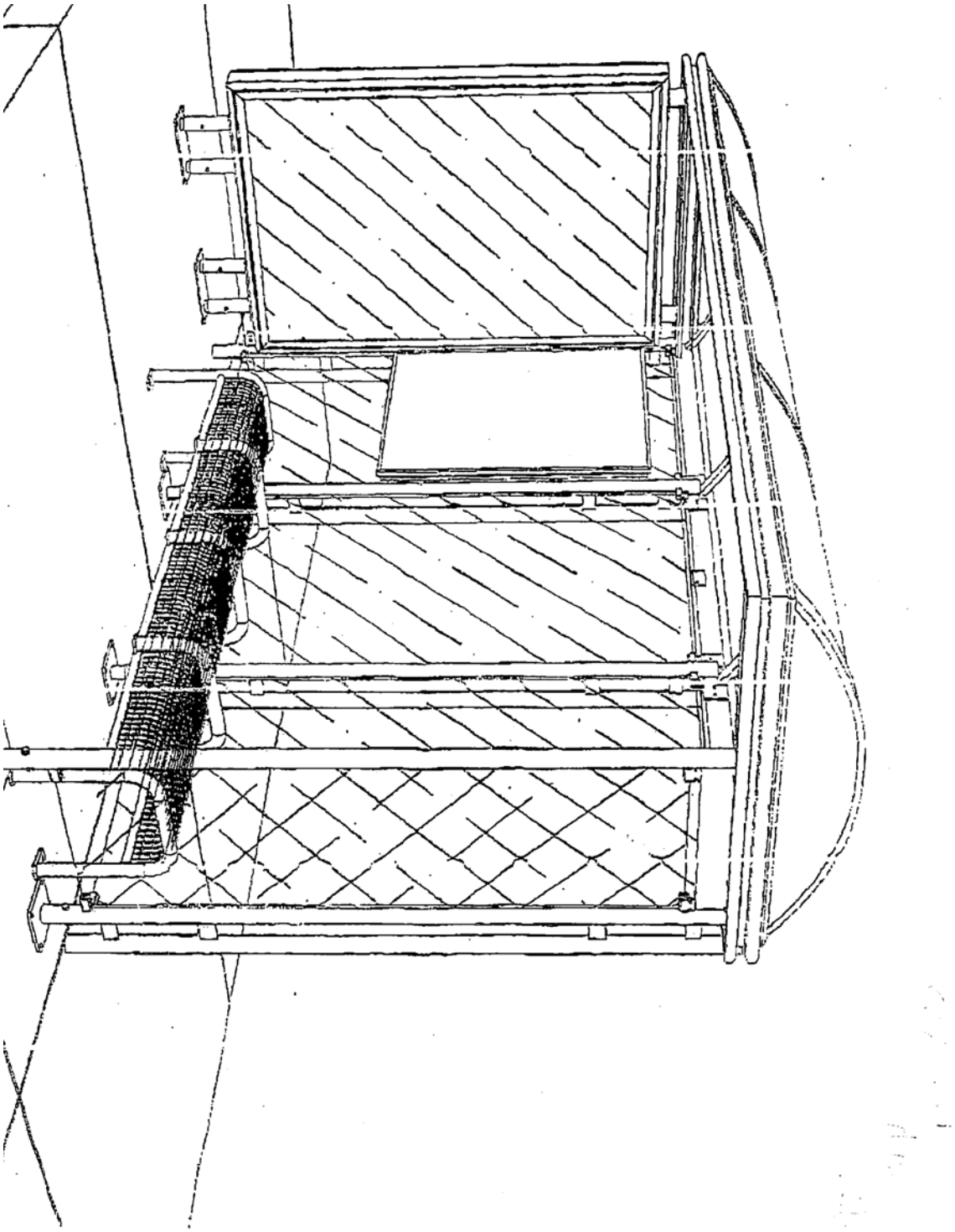
    1._____ 2._____ 3._____

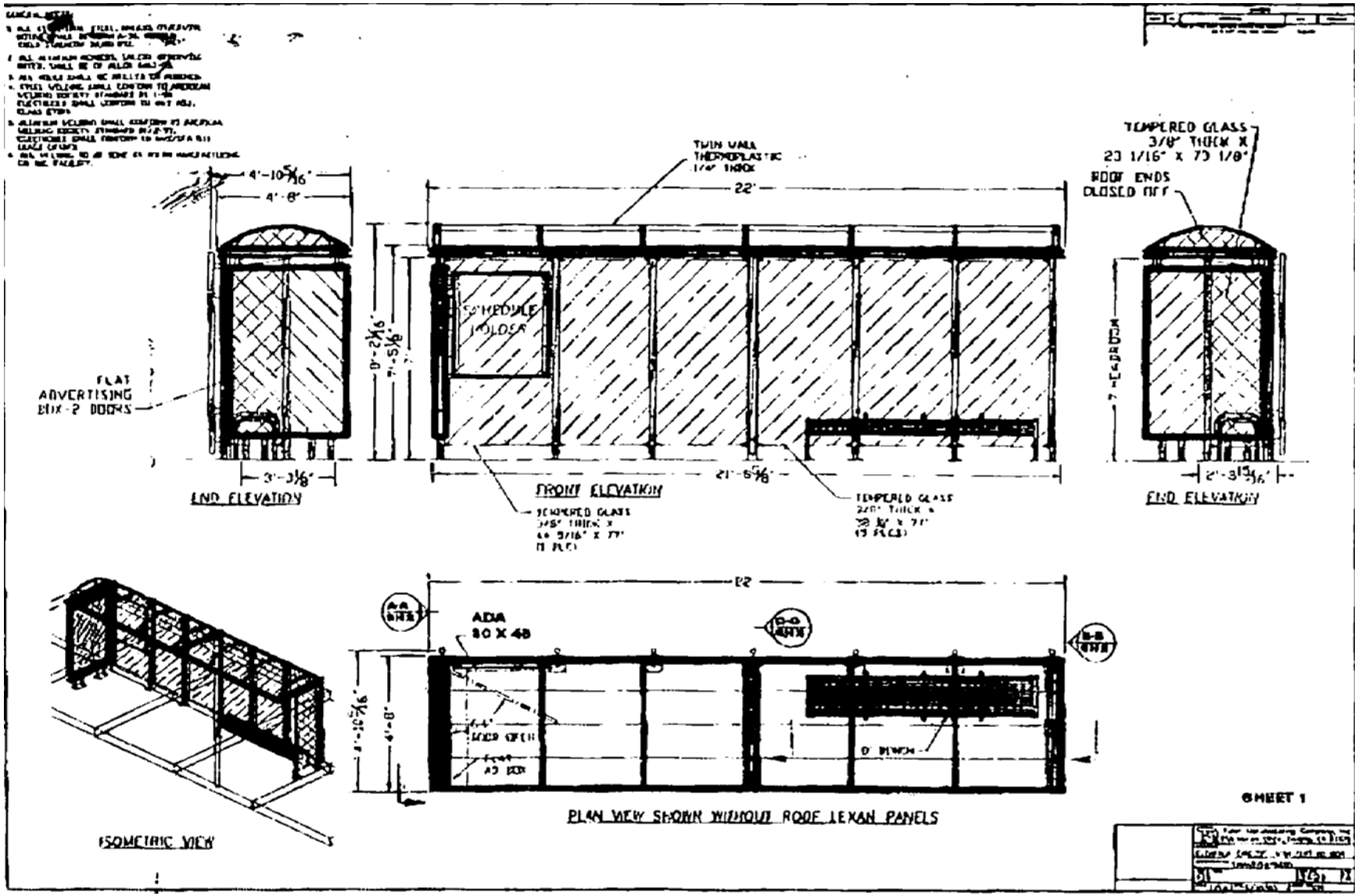
Comments and Suggestions about Rapid Bus service:

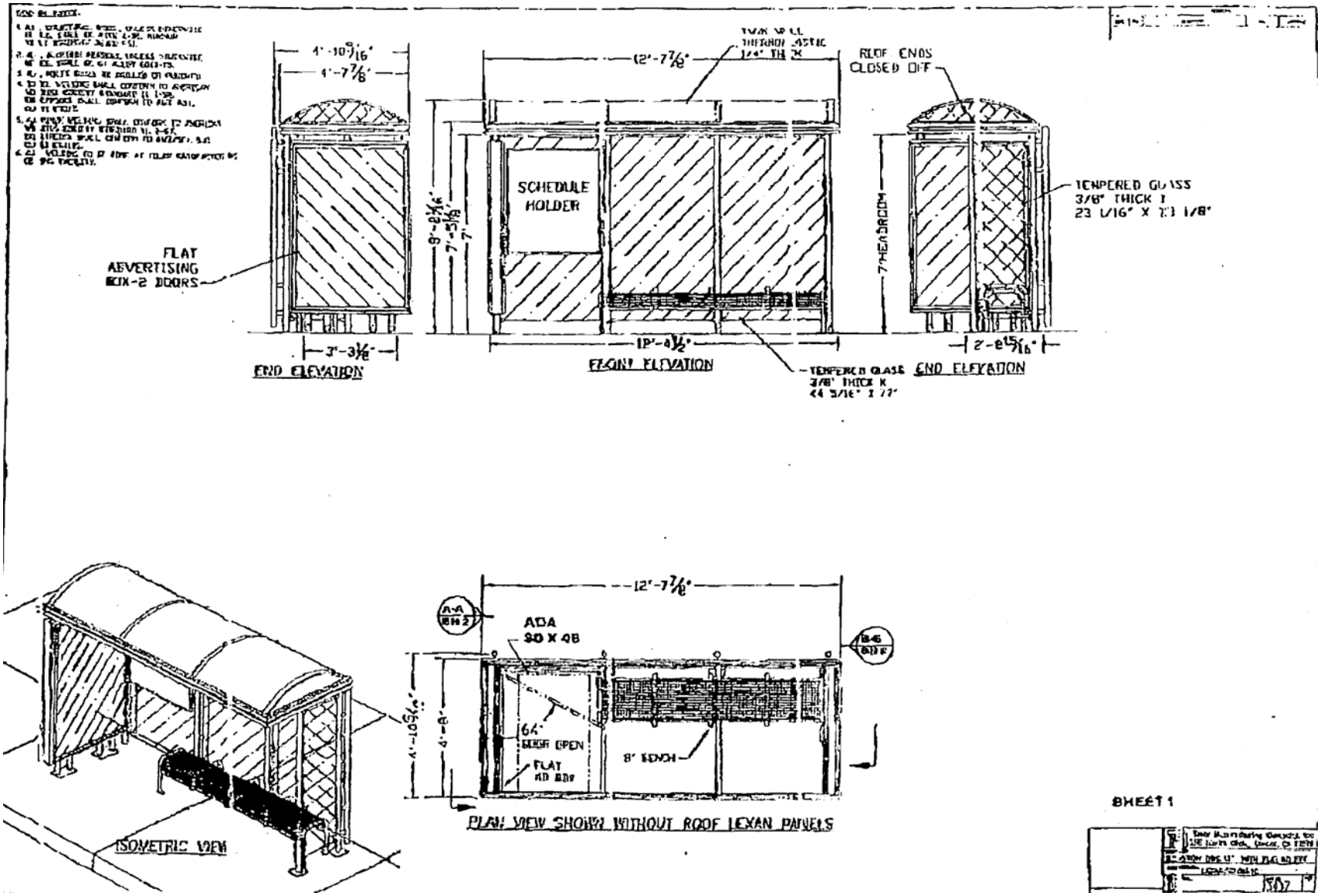
THANK YOU FOR COMPLETING THE SURVEY!!!

PLEASE RETURN THE COMPLETED SURVEY TO THE BUS DRIVER, SURVEYOR, OR LEAVE SURVEY IN YOUR SEAT TO BE PICKED UP.

APPENDIX II – Station Design Schematics




TWIN WALL THERMOPLASTIC
1/4" THICK
22'
TEMPERED GLASS
3/8" THICK X
23 1/16" x 73 1/8"
ROOF ENDS CLOSED OFF
SCHEDULE HOLDER
FLAT ADVERTISING BOX - 2 DOORS
4'-10 5/16"
4'-8"
3'-3 1/8"
21'-6 5/8"
2'-3 13/16"
END ELEVATION
FRONT ELEVATION
END ELEVATION
TEMPERED GLASS
TEMPERED GLASS
ADA
30 X 48
22
ISOMETRIC VIEW
PLAN VIEW SHOWN WITHOUT ROOF LEXAN PANELS
SHEET 1


FLAT
ADVERTISING
BOX-2 DOORS
SCHEDULE
HOLDER
ROOF ENDS
CLOSED OFF
TEMPERED GLASS
3/8" THICK
END ELEVATION
FRONT ELEVATION
END ELEVATION
TEMPERED GLASS
3/8" THICK
ADA
30 X 48
64"
8' BENCH
FLAT
AD BOX
ISOMETRIC VIEW
PLAN VIEW SHOWN WITHOUT ROOF LEXAN PANELS
SHEET 1