Line 1R Service and Reliability Study Final Report
AC Transit Service and Operations Planning

Ajay Martin, Transportation Planner
Angie Perkins Haslam, Service and Operations Planning Intern
Cory LaVigne, Director of Service Development

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1 Introduction

Following the success of the San Pablo Avenue Rapid bus line (Route 72R), the Alameda-Contra Costa Transit District (AC Transit) began operating Line 1R on June 24, 2007. Line 1R routing is a combination of the former 40L and 82L bus routes that operated on the Telegraph Avenue and International Boulevard corridors, respectfully. Line 1R is a Rapid/Express Service route that operates from Downtown Berkeley (including the University of California (UC) Berkeley), through downtown Oakland, to the Bayfair Mall, terminating at the Bay Fair Bay Area Rapid Transit (BART) Station in San Leandro. At the time this report was compiled, Line 1R carries over 12,000 passengers a day, making it one of AC Transit's most heavily utilized bus routes.

1.1 Reason for Study

Since the opening of Line 1R, AC Transit has received numerous anecdotal comments from both bus operators and passengers regarding service reliabilty issues. In response to these comments and concerns, the AC Transit Service and Operations Planning Department began a multi-faceted study of the line, and all of its operating characteristics. Simliar to the Line 51 Operations and Reliability Report, a comprehensive workplan was developed that included the identification of suitable data types for the needed analysis, the development of a statistical baseline for the data and the collection and analysis of the empirical data obtained.

To serve as a techical advisory group, the Line 1R Task Force (Task Force) was convened on October 13, 2008, and was charged with making recommendations that would improve Line 1R operations and reliability. The Task Force was composed of AC Transit staff from Service Development, Operations, and Transportation, as well as representatives from the Transportation Planning Departments of the Cities of Berkeley, Oakland, San Leandro and Caltrans. This broad-based coalition was well-suited to address the varied and complex nature of issues affecting Line 1R's performance.

1.2 Study Objectives

At the beginning of the Line 1R Service and Reliability Study (Study), the following objectives were developed:

- Improve Schedule Adherence/Reduce Running Time
- Improve Headway Adherence
- Reduce Travel Time for Passengers
- Increase Ridership
- Increase Productivity

As staff began to outline the form and structure of the Study, these objectives were continually referenced. Creating a plan that would be conducive to the achievement of these goals was a priority for both staff and the Task Force alike.

1.3 Study Process

In September of 2008, staff began the organization and data collection phase of the Study. Following the Study objectives, staff analyzed available data sources and created a plan to obtain the necessary data. This data collection effort included:

- International/Telegraph Corridor Rapid Bus Study, April 2009 (Nelson/Nygaard)
- Interviews with bus operators and line supervisors
- Data from AC Transit's SATCOM system, including Automatic Vehicle Location (AVL) data
- Information from the Automatic Passenger Counters (APCs)
- A speed and delay field survey
- Field observations and measurements

After detailing the various sources and requirements for robust data collection and analysis, staff established a schedule for Study completion. Periodically, the Task Force was provided updates on data obtained during the process, and staff received feedback from them on interpretation and meaning of the data presented. At the conclusion of the Study, staff worked with The Task Force to formulate short and long-term recommendations for improving Line 1R. These recommendations included both internal changes to operating practice as well as external changes that would involve cooperation with member-jurisdictions for matters under their purview.

The following personnel served on the Line 1R Service and Reliability Task Force:

AC Transit

- Service and Operations Planning – Nancy Skowbo, Cory LaVigne, Ajay Martin, Angie Perkins Haslam, Robert del Rosario, Rick Gorelnik, Alex Petersen
- Long Range Planning – Nathan Landau
- Scheduling – Bill Coffel
- Capital Projects Implementation – Jon Twichell, Wahid Amiri
- Transportation Department – Kathleen Kelly, Maxine Thompson
- Supervision Department – Larry Jamieson
- East Oakland Transportation Division Management – Jim Lair
- 1R Rapid Bus Operators (2) – Division 4 Operators
- Marketing – Victoria Wake, Karen Bakar, Doug Miller

External Representation

- Berkeley – Kara Vuicich/Matt Nichols, Transportation Planning
- Oakland – Bruce Williams, Transportation Planning
- San Leandro – Dean Hsiao, Traffic Engineer
- CalTrans – James Lau

Meeting a total of seven times throughout the course of the Study, the Task Force reviewed and discussed data gathered, and provided input and feedback to staff at each stage of the process; from goal setting to final recommendations. The meeting dates, relevant tasks completed and data discussed are presented below:

September 25, 2008
The Task Force received information on Line 1R Study goals and discussed the initial task of developing a statistical baseline regarding operational and street conditions (including Transit Signal Priority), and passenger data.

October 13, 2008
Staff prepared a detailed overview of the goals, objectives and tasks of the Study, and the Task Force provided feedback. The Task Force received an update on the progress of onboard data collection efforts.

December 16, 2008
The Task Force received an update on the recently completed "delay and dwell" data collection efforts, with signal delay results highlighted and discussed.

February 9, 2009
The Task Force received updates on: running time, deadhead, yard pull, mobility devices, sources of delay, Transit Signal Priority, and passenger count data.

March 23, 2009
Updated data collected from Line 1R regarding signal progression and priority, bus stops, passenger counts and delay locations was presented by staff. The Task Force then discussed potential internal and external areas of improvement along the line, and reviewed the findings from the final phase of the Nelson Nygaard report.

June 1, 2009
The Task Force received and discussed updated information regarding pull outs on Line 1R, as well as the initial recommendations made by staff.

September 10, 2009
Recommendations by staff were presented and discussed for bus stop, city, and route level issues. The Task Force provided feedback and input on possible changes to recommendations.

2 Line Background and Characteristics

2.1 Selecting the 1R Rapid Route

In the early 1990's, AC Transit completed a systematic study of its busiest bus routes. That study, the Alternative Modes Analysis (AMA), was completed in April 1993 and it identified priority corridors and candidate technologies for major transit investments that would serve AC Transit's ridership cost effectively. The AMA identified the Berkeley / Oakland / San Leandro corridor as the best candidate for further evaluation.

Between 1999 and 2001, AC Transit, in cooperation with the cities of Berkeley, Oakland, and San Leandro, and Alameda County conducted a Major Investment Study (MIS) to evaluate alternatives for improved transit services based on the findings of the AMA. The MIS examined several different street alignments in the northern and southern portions of the study corridor.

Corridors in the north included: College Avenue (Line 51), Telegraph Avenue (Line 40), and Shattuck Avenue (Line 43). Study corridors in the south included: International Boulevard and East 14th Street (Line 82), Foothill Boulevard (Line 40 and 43), Bancroft Avenue (Line 40), and San Leandro Boulevard.

In the north, College Avenue was identified as having the highest future transit ridership and Shattuck Avenue the lowest. However, Telegraph Avenue was selected for having ridership only slightly below College Avenue and for having greater potential for infill development oriented to transit by the cities of Berkeley and Oakland. Shattuck Avenue was viewed as having the least potential for infill development, and is also the closest parallel route to BART.

In the south, International Boulevard and East 14th Street were selected because they had the highest ridership and the greatest focus by the cities of Oakland and San Leandro for neighborhood revitalization and new development. The study evaluated East 14th Street through the city limits of San Leandro, and a portion of unincorporated Alameda County that included the Ashland and Cherryland neighborhoods.

On August 2, 2001, the AC Transit Board of Directors supported development of Bus Rapid Transit along the Berkeley/Oakland/San Leandro corridor (Board Resolution No. 2018).

The AC Transit Strategic Vision (2002) planned for a two-phase implementation of rapid transit elements along the Telegraph/International corridor. The implementation of Line 1R was the first step in the development of BRT along the corridor. Currently, the BRT project is in the final environmental report stage, to be followed by design and construction activities. Opening date for the BRT project is planned for 2015.

2.2 Line Characteristics

As previously noted, Line 1R was formed by merging segments of two previous AC Transit routes, the 40L and the 82L, to create a new limited-stop Rapid Bus route. The 40L formerly ran on Telegraph Avenue, and the 82L ran on International Boulevard/East 14th Street corridor. The new Line 1R incorporates much of the former line's routing along these major arterials. Thus, the line is composed of mainly straight road segments connecting key commercial corridors with downtown business districts and high-density urban housing.

In keeping with the District's Rapid Bus stop spacing guidelines, the distance between a majority of consecutive stops was increased to a one-third mile minimum. A key feature of the Rapid design is longer distance between stops, which allows the bus to spend more time in motion, and as a result, reduces travel time.

The service operates every 12 minutes from 6:00am to 7:00pm on weekdays. Weekend service is truncated to the International Boulevard portion of the line, and operates every 15 minutes from 7:30am to 7:00pm. Frequent service on this line was deemed essential to accommodate the heavy passenger loads and ensure reduced wait times for passengers. The route was implemented as a "headway-based" service, meaning that the bus would arrive every 12 minutes at any given point along the line. The route was designed to operate frequently enough that passengers could arrive randomly at stops along the route and wait an average of 6 minutes for the next bus.

During each weekday, Line 1R makes 66 southbound trips and 68 northbound trips. With a scheduled running time between 73 to 78 minutes, and route length of approximately 17 miles, the line operates 158 in-service hours and 2,267 in-service miles per day. As reported in the International/Telegraph Rapid Bus Report (April 2009), the line carries 12,023 passengers per day with an average of 89 passengers per trip or 76 passengers per in-service hour. The operating subsidy per passenger is approximately $1.17.

2.3 Line Structure

Line 1R is a 17 mile route with its northern terminus in Downtwon Berkeley and its southern terminus at the Bay Fair BART station in San Leandro. Figure 2.1 illustrates the current routing of Line 1R.

The southbound route operates from Downtown Berkeley, Shattuck Avenue, left on Durant Avenue, right on Dana Street, left on Dwight Way, right Telegraph Avenue, left on 20th Street, right on Broadway, left on 11th Street, across the East 12th Street Dam, right on International Boulevard (East 14th Street), right Bay Fair Drive, left Mooney Avenue, right Coelho Drive, left into the Bay Fair BART station.

The northbound route operates from the Bay Fair BART station via the BART roadway, right on Coelho Drive, left on Mooney Avenue, right on Bay Fair Drive, left on East 14th Street, left on 1st Avenue, across the East 12th Street Dam into 12th Street, right on

Broadway, left on 20th Street, right on Telegraph Avenue, left on Bancroft Way, and terminates at Downtown Berkeley at Center Street.

2.4 Bus Stops

There are currently 36 bus stops in each direction on Line 1R. Tables 2.1 and 2.2 document the characteristics of each bus stop location including the order of the stops along the route, the location (near side, far side, mid block) in relation to the nearest intersection, the length of red curb, and distance from the previous stop. Staff completed a detailed analysis of each stop that included curb measurements, context to the area, and cataloging street furniture / amenities. This information was input into a visual design program to aid with documentation and explanation of issues that might require city or external assistance.

District-wide stop spacing standards are set by AC Transit Board Policy 508. For Rapid lines, the stop spacing target is generally around 1700 feet (1/3 mile), but stops can be located as far as 5000 feet apart. Exceptions to this rule can be made based on the proximity of, "trip attractors, stop activity or demand, transfer points, or other land uses that may warrant it (Policy 508)."

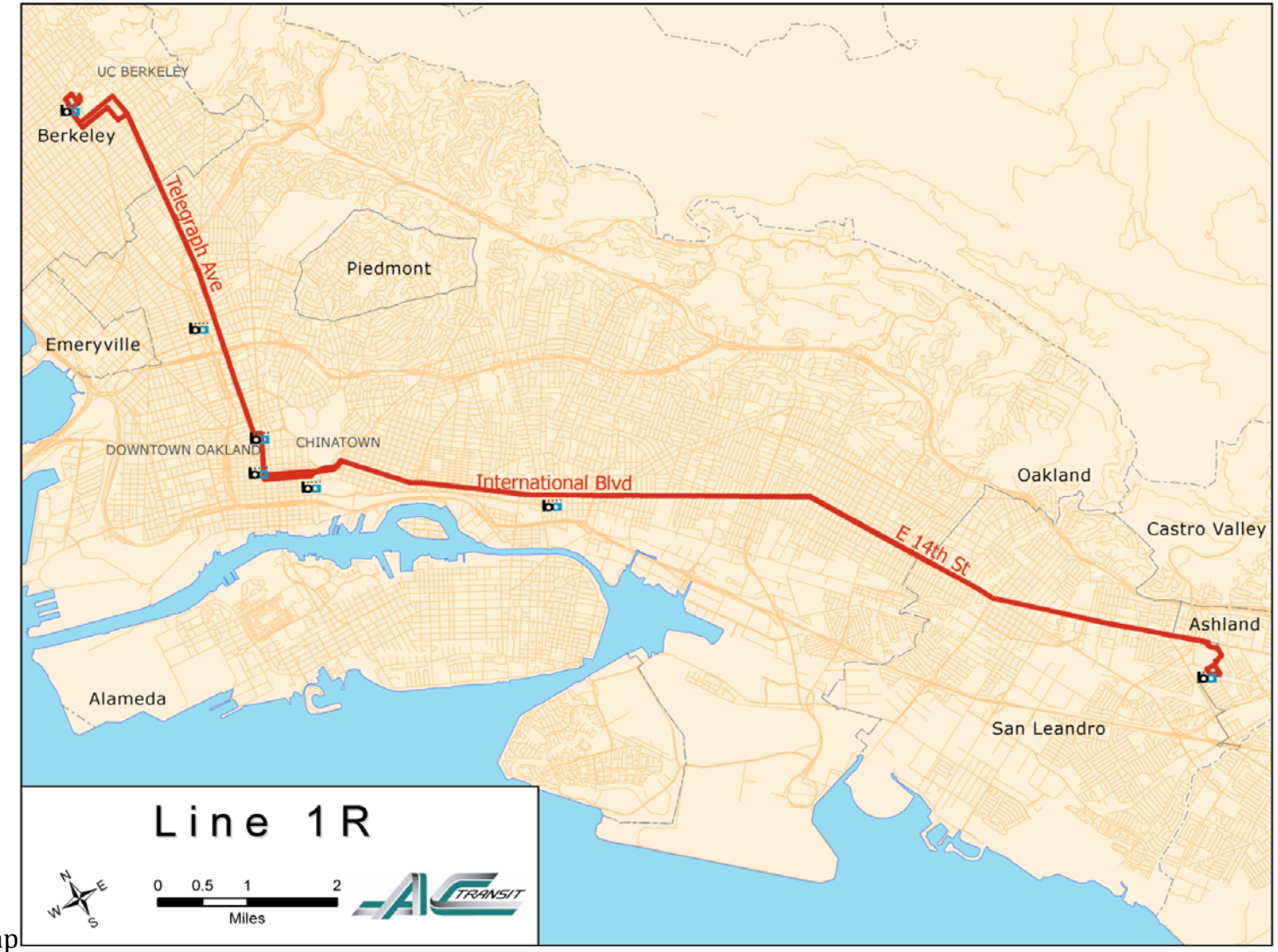
As such, stop spacing in downtown Oakland can be as close as 800 feet (or 3 blocks), while stop spacing along International Boulevard/East 14th Street in Oakland and San Leandro can be as high as 5,000 feet. Currently, bus stops on the line are an average of approximately 2,400 feet apart. It should be noted that underlying local service (Line 1) uses local stop spacing guidelines which allow for a range of 800 to 1,300 feet between stops.

For nearside stops , 80 feet of unobstructed red curb is needed behind the pole to allow the 60 foot articulated buses to pull into the stop without delay. An additional 10-foot buffer from the crosswalk is also required in front of the pole.

For farside stops , 65 feet of unobstructed red curb is needed behind the pole, and an additional 15 feet of red curb is needed to pull out of the stop.

All stops also require a minimum 5 by 8 foot clear ADA area near the middle door. The middle door on the District's buses is typically located 16 to 24 feet from the front of the bus.

Figure 2.1 - Route



Map

Table 2.1 - Line 1R Bus Stop Inventory Northbound

Name	Location	Stop Spacing (ft)	Stop Length (ft)	Stop Length from pole (ft)
Bay Fair BART station	At		151	151
Bay Fair Drive at East 14th Street	Midblock	2298	30	24
East 14th Street at 150th Avenue	Farside	3849	81	75
East 14th Street at San Leandro Boulevard	Farside	5179	60	53
East 14th Street at Dolores Avenue	Farside	4073	57	54
East 14th Street at Estudillo Avenue (cutout)	Farside	1213	89	61
East 14th Street at Dutton Avenue	Farside	2436	95	80
International Boulevard at 104th Avenue	Nearside	3844	76	59
International Boulevard at 98th Avenue	Farside	1853	119	122
International Boulevard at 90th Avenue	Nearside	2035	64	46
International Boulevard at 82nd Avenue	Farside	2883	91	88
International Boulevard at 73rd Avenue	Farside	2640	123	117
International Boulevard at Havenscourt Boulevard	Nearside	1669	62	57
International Boulevard at Seminary Avenue	Farside	2440	78	77
International Boulevard at High Street	Farside	5136	33	31
International Boulevard at 34th Avenue (bus bulb)	Farside	3061	65	65
International Boulevard at 26th Avenue	Nearside	2929	61	49
International Boulevard at 14th Avenue	Nearside	4760	94	87
International Boulevard at 10th Avenue (bus bulb)	Nearside	1489	76	61
International Boulevard at 5th Avenue (bus bulb)	Farside	1906	46	40
International Boulevard at 1st Avenue	Nearside	1320	67	55
12th Street at Oak Street	Farside	2218	80	68
12th Street at Harrison Street	Farside	1506	73	64
12th Street at Broadway	Nearside	957	90	68
Broadway at 14th Street	Farside	844	65	50

Name	Location	Stop Spacing (ft)	Stop Length (ft)	Stop Length from pole (ft)
20th Street at Telegraph Avenue	Nearside	2124		
Telegraph Avenue at 24th Street	Farside	1681	84	67
Telegraph Avenue at 31st Street	Farside	2312	107	102
Telegraph Avenue at 40th Street	Farside	3461	174	87
Telegraph Avenue at 49th Street	Farside	2474	68	38
Telegraph Avenue at 59th Street	Farside	3347	69	59
Telegraph Avenue at Alcatraz Avenue	Farside	1913	79	59
Telegraph Avenue at Webster Street	Nearside	1679	77	62
Telegraph Avenue at Dwight Way	Nearside	3609	83	55
Bancroft Way at Telegraph Avenue	Farside	1585	153	78
Shattuck Avenue at Center Street	Nearside	3271	99	99

Table 2.2 - Line 1R Bus Stop Inventory Southbound

Name	Location	Stop Spacing (ft)	Stop Length (ft)	Stop Length from pole (ft)
Shattuck Avenue at Allston Way	Nearside		147	141
Durant Avenue at Dana Street	Nearside	2886	93	70
Telegraph Avenue at Dwight Way	Farside	1785		
Telegraph Avenue at Webster Street	Nearside	3371	103	81
Tele graph Avenue at Alcatraz Avenue	Nearside	1801	109	70
Telegraph Avenue at 59th Street	Farside	2095	91	80
Telegraph Avenue at 50th Street	Nearside	3001	89	83
Telegraph Avenue at 40th Street	Nearside	2620	77	70
Telegraph Avenue at 30th Street	Nearside	3846	191	178
Telegraph Avenue at 24th Street	Farside	2195	85	61
20th Street at Telegraph Avenue	Midblock	1663		
Broadway at 14th Street	Farside	2227	203	150
11th Street at Broadway	Farside	804	162	145
11th Street at Harrison Street	Farside	1120	85	78

Name	Location	Stop Spacing (ft)	Stop Length (ft)	Stop Length from pole (ft)
11th Street at Madison Street	Nearside	963	90	77.5
International Boulevard at 2nd Avenue	Nearside	2874	61	57
International Boulevard at 5th Avenue (bulb)	Farside	1239	67	62
International Boulevard at 10th Avenue (bulb)	Nearside	1634	69	54
International Boulevard at 14th Avenue	Farside	1590	64	52
International Boulevard at 26th Avenue	Nearside	4672	91	85
International Boulevard at 34th Avenue	Farside	3267	65	63
International Boulevard at High Street	Farside	2968	77	71
International Boulevard at Seminary Avenue	Farside	5160	99	91
International Boulevard at Havenscourt Boulevard	Farside	2274	104	76
International Boulevard at Hegenberger Road	Farside	2061	104	90
International Boulevard at 82nd Avenue	Nearside	2256	60	60
International Boulevard at 90th Avenue	Farside	2764	56	53
International Boulevard at 98th Avenue	Farside	2268	77	70
International Boulevard at 104th Avenue	Nearside	1690	65	45
East 14th Street at Best Avenue	Farside	4016	91	86
East 14th Street at W Estudillo Ave (cutout)	Nearside	2268	90	70
East 14th Street at Parrott Street	Farside	1452	59	51
East 14th Street at San Leandro Hospital	At	4363	126	73
East 14th Street at Hesperian Boulevard	Farside	4602	94	90
Bay Fair Drive at East 14th Street	Midblock	3815	62	57
Bay Fair BART station	At	3053	51	30

2.5 Scheduled Running time and Fleet Requirement

Line 1R has a variable running time that changes throughout the day. From 6 am to 2 pm, the route is scheduled to run at 73 minutes. From 2 pm to 6 pm, due to peak traffic volumes, the route is scheduled at 78 minutes. In the late evening, it drops back down to 73 minutes. The total cycle time of the route (round trip running time including layover) is a constant 180 minutes throughout the day. Reliability issues stemming from a shortage of running time prompted the District to add four minutes of running time to all schedules in December of 2007.

Previously, only 14 buses were scheduled during the AM and mid-day while the PM peak operated with 15 buses. Currently 15 buses operate on the line at all times of day, with more running time allocated during the PM peak. However, the recovery time is reduced during the PM peak to accommodate the extra running time. Table 2.3 provides comparision detail on running time by sign-up.

Table 2.3 - Scheduled Running Times

Sign-up	Off-peak One-way Running Time	Off-peak Roundtrip Cycle Time	PM peak One-way Running Time	PM peak Roundtrip Cycle Time
Spring 2007	69	168 (14 buses)	74	180 (15 buses)
Fall 2008	73	180 (15 buses)	78	180 (15 buses)

2.6 Road and Traffic Signal Configuration

Line 1R operates in mixed-flow traffic with cars, trucks, and bicycles along the entire corridor. The route primarily uses arterial signalized roadways in Berkeley, Oakland, and San Leandro. Most sections of roadway have two lanes of traffic in each direction, except for the following areas:

- One-way couplets of Bancroft Way and Durant Avenue in Berkeley (3 lanes each direction)
- One-way couplets of Telegraph Avenue and Dana Street in Berkeley north of Dwight Way (2 lanes each direction)
- 11th Street and 12th Street east of downtown Oakland (3 lanes each direction)
- East 14th Street in downtown San Leandro (1 lane in each direction)

Line 1R is one of the District's longest routes at over 17 miles in length. It traverses the three city boundaries of Berkeley, Oakland, and San Leandro; the portion of International Boulevard and East 14th Street south of 42nd Avenue is designated as California State Highway 185. Ownership of the traffic signals along the route of the 1R is divided between City of Berkeley, City of Oakland, and the California Department of Transportation (Caltrans). Table 2.4 provides information about signal ownership by location.

2.6.1 Signal Progression and Coordination

For purposes of signal timings and progression, the corridor is divided into four areas. These areas have the following boundaries:

- Bay Fair BART to 42nd Avenue
- 42nd Avenue to Downtown Oakland (20th Street)
- North of 20th Street to Berkeley
- Within the City of Berkeley

The signal timing progression for each of these areas, if coordinated, is optimized for the speed limit; in most cases 25 miles per hour (one location in Oakland has a 30mph speed limit).

Unlike cars, bus speeds tend to fluctuate widely, based upon loading and unloading passengers, and constantly leaving and entering traffic. Changing signal timings to match a typical bus speed is not practical because typical bus speed between stops can be slower than average speeds.

More appropriately, an analysis can be peformed to determine which corridor segments would be benefitted by re-coordination which would more closely match typical bus speeds. For example, speeds appropriate on Broadway in downtown Oakland with closely spaced signal would be different than International Blvd in East Oakland.

2.6.2 Transit Signal Priority

Major portions of Telegraph Avenue, International Boulevard, and East 14th Street have been equipped with infrared TSP as part of the Alameda Congestion Management Agency (ACCMA) Smart Corridors Program. This technology is designed to either trigger an "early green" signal or "hold" the green light for a few seconds to allow Rapid buses to cross an intersection. As such, TSP works most effectively when bus stops are located at the far side of the intersection. Priority is only given if the TSP has not been triggered within the previous 10 minutes.

3 Operating Characteristics

This chapter summarizes the data gathered throughout the course of the Study. All data collected by AC Transit staff was gathered in the Fall of 2008, except for the fleet deployment data, which was collected in Winter 2008 and Summer 2009. Ridership data collected by the outside firm of Nelson/Nygaard was collected between June 2007 and November 2008.

Staff collected data on a wide variety of route performance measurements, including: bus operator and line supervisor experiences, vehicles and fleet deployment, sources of delay, ridership characteristics, load profiles, running times, operating speeds, schedule and headway adherence, yard pulls, deadheads, dwell times, and operator seniority. Staff attempted to follow the Federal Transit Administration's guidance on performance measurements, which encourages a holistic approach to performance measurement, and "…uses traditional and non-traditional measures to address customer-oriented and community issues (TCRP Report 88. Federal Transit Administration. A Guidebook for Developing a Transit Performance-Measurement System. October 2002.)."

Special emphasis is placed in this chapter upon the analysis of operating characteristics (ridership, running times, operating speed, schedule and headway adherence, and fleet deployment). These forms of data give insight into how the line is actually performing and are key to setting a statistical baseline for further analysis and recommendations. Each of these forms of data will be outlined and analyzed in further detail in the body of this chapter.

3.1 Operator Interviews and Feedback

In addition to the feedback received from operator Taskforce members, staff interviewed operators who had been assigned to Line 1R. The bus operators shared many insights regarding the operation of Line 1R which assisted staff in focusing the Study. Some of the key issues noted by Line 1R operators were: schedule adherence and running times, vehicles and fleet deployment and specific sources and locations of delay.

3.2 Supervisor Interviews and Feedback

Staff conducted interviews spoke with Line Management Supervisors who had worked on Line 1R and/or the 72R Rapid Bus routes. Line Management Supervisors are responsible for monitoring the route on a day-to-day basis. They have the power to hold buses, deadhead buses to the end of the line, or use any other means to respace the buses and better achieve on-time performance.

There were several operational practices that Supervisors who had worked both the Line 72R and Line 1R implementations noted as being vital to the success of the lines operation. Line 72R was intially implemented with a dedicated team of Line Management Supervisors (one on each end of the line). In addition, the route was furnished with two dedicated

standby coaches (one on each end) that Supervisors could deploy in order to ensure consistent schedule adherence and spacing.

A Rapid Bus route, by definition, operates differently than a standard/local bus route, and making sure that Line 1R operators are familiar with the differences between the two types was a recurring suggestion by both bus operators and supervisors.

The supervisors who had worked both the Line 72R and Line 1R Rapid implementations had a unique perspective regarding Line 1R. Line 72R, in contrast to Line 1R, operates relatively effectively and generally has stable reliabilitiy. Staff compared and contrasted how each line (1R and 72R) operates to aide in the diagnosis of systemic issues. As with the bus operator suggestions, these comments were useful in both designing the Study, and knowing which operational recommendations were most likely to benefit Line 1R.

3.3 Ridership and Passenger Loads

Ridership statistics and passenger loads are a key source of information that allow staff to see where and when passengers are boarding and alighting a route. For Line 1R, this information was also used to see how many people were utilizing each individual bus stop, and helped to provide a discrete snapshot on the number of mobility devices (strollers, wheelchairs, scooters, etc.) used at each stop. Line 1R ridership was measured at the route level, by time-of-day, segment, and by individual stops.

AC Transit has installed Automatic Passenger Counters (APCs) on approximately 20% of its revenue fleet. APCs use laser technology to count each time someone enters or exits a bus, and then relay the counts, GPS coordinates, and time of each entrance or exit to a central computer system where the information is organized and stored for later use. Most ridership data for Line 1R was collected using the APC system during the Fall 2008 Sign-up (August 2008 to December 2008). Of the 15 Rapid buses that comprise the Line 1R sub-fleet, 4 are equipped with APC systems, enabling District staff to rotate these coaches at various times of day to obtain a complete sampling of the line.

In addition to gathering ridership information, staff created graphs and charts to aid in analyzing the data from different angles. By using several types of ridership data analysis, staff was able to get a deeper understanding of what Line 1R passenger activity looked like at various locations and times of day. Two of types of ridership numbers analysis are explained in more detail below; total year-over-year ridership and passenger load profiles.

3.3.1 Total year-over-year ridership

Year-over-year ridership information compares passenger activity from one year to the next, and is useful in establishing ridership trends on specific bus routes. Line 1R's year-over-year ridership data was taken from onboard ride checks done by the consulting firm Nelson Nygaard in November 2008 and is illustrated in Table 3.1. Analysis of this data reveals that total route ridership increased 11.4% from 2007 to 2008. Passengers per revenue hour (a measure of productivity) also improved with a 5.6% increase; from 58.4 to 61.6 passengers per hour.

Table 3.1 - Year-over-year ridership by segment

Year	Northern Segment (Telegraph Avenue)	Central Segment (International Boulevard)	Southern Segment (East 14th Street)	Total
2007	2,615	4,817	3,359	10,791
2008	3,268	5,139	3,616	12,023
Percent change	+25.0%	+6.3%	+7.7%	+11.4%

Ridership increased significantly for the entire route from 2007 to 2008, with the greatest increase (25%) occurring in the northern segment of the route on Telegraph Avenue.

The increase in ridership on Telegraph Avenue may be attributed to several factors:

- The opening of the Uptown Transit Center on 20th Street between Telegraph Avenue and Broadway made transfers between Line 1R and other routes easier. The Center opened in November 2007, just one month after the 2007 ridecheck.
- The June 2007 introduction of Rapid bus service on Telegraph Avenue is the first use of limited-stop service in this corridor. The 2007 ridecheck was conducted in October 2007, only four months after the service began. As such, riders may not have had sufficient time to become acclimated to the new service.
- Gas prices increased significantly in the summer of 2008. This gas price spike may have discouraged automobile use, and contributed to increased transit ridership in the Telegraph Avenue corridor.

Despite these increases in ridership on the Telegraph Avenue segment, the middle third of the route (International Boulevard) remains the most productive, accounting for 43% of all boardings (Per Nelson/Nygaard 1R Study data). This large usage on the International Boulevard segment is likely attributed to the transit dependence and lack of automobile access of many residents in East Oakland.

3.3.2 Load profile by time-of-day and stop location

Load profiles were generated based on data gathered by the APC System. Each load profile includes the average number of boardings and alightings at Line 1R bus stops by time periods. In addition, the average load (number of passengers on the bus at a given location) is shown. Examining these graphs is a useful method of determining maximum load points (MLP), major trip generators, and stops with low usage. The load profile graphs are organized by direction (northbound/southbound), and by time period (early morning, AM peak, mid-day, PM peak, and evening). Two sample graphs, Figures 3.1 and 3.2, have been included in this section for reference. Additionally, Table 3.2 provides information regarding the time period definitions used in the analysis. All remaining graphs depicting both directions by all time periods can be found in the Appendix.

The following table defines the time periods for the load profile graphs.

Table 3.2 - Time Period Definitions

Period	Begin time	End time
Early AM	5:53 AM	7:00 AM
AM Peak	7:00 AM	9:00 AM
Mid-day	9:00 AM	2:00 PM
PM Peak	2:00 PM	6:00 PM
Evening	6:00 PM	7:00 PM

Several important pieces of information are clear when analyzing the load profiles for Line 1R. These are summarized briefly below, and will be of particular relevance in the Recommendations chapter:

- During the morning commute, the peak direction is predominantly to the north towards the major employment centers of downtown Oakland, downtown Berkeley, and the University of California campus (Figure 3.1).
- Return commute peak occurs in the mid to late afternoon. This peak is especially apparent in the southbound direction from 2:00 to 6:00p.m. along International Boulevard (Figure 3.2).
- In both directions, ridership remains high throughout the day. This suggests that the 1R is likely used for many kinds of trips rather than just for the traditional work commute.
- The busiest stops are generally those in the commercial districts and near BART stations, including Center Street and Allston Way in downtown Berkeley, Broadway at 14th Street in downtown Oakland, International Boulevard at 34th Avenue, and the Bay Fair BART station.
- Heavy patronage is observed along International Boulevard between 73rd Avenue and 104th Avenue in East Oakland.
- The heaviest loads are observed on International Boulevard in East Oakland. (East of downtown Oakland to the San Leandro border)
- Loads along Telegraph Avenue, north of downtown Oakland, tend to be 30% lower than those east of downtown Oakland.
- Ridership is comparatively light in San Leandro along East 14th Street. Most riders on this segment board and alight at the Bay Fair BART station.

Figure 3.1 - AM Peak Load Profile

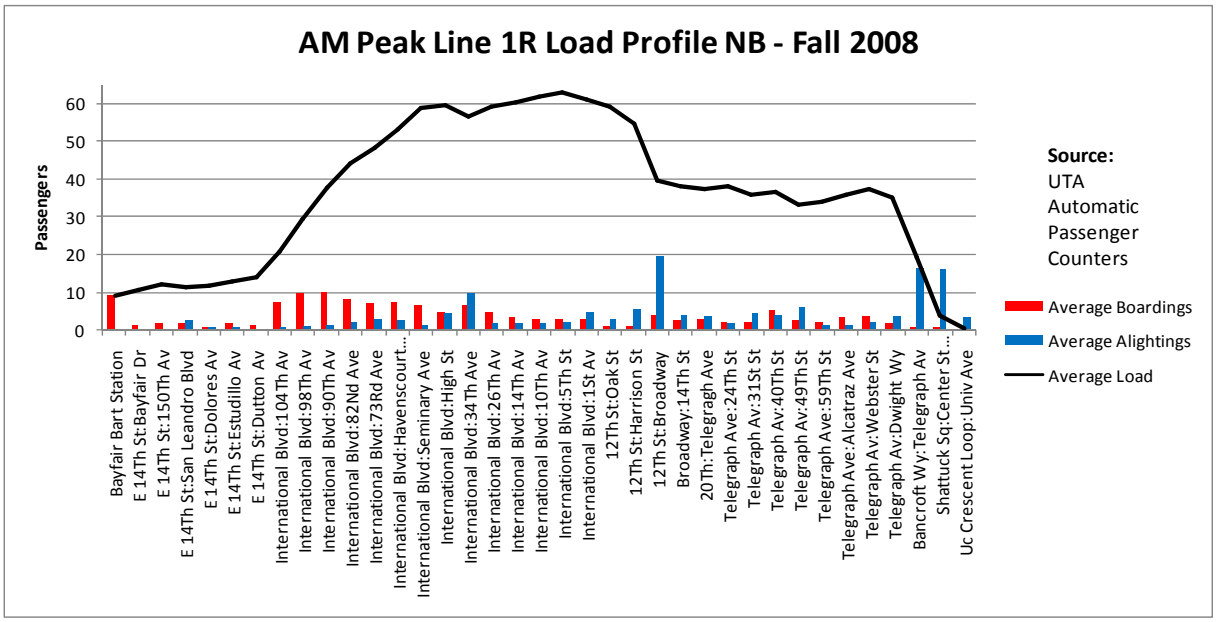
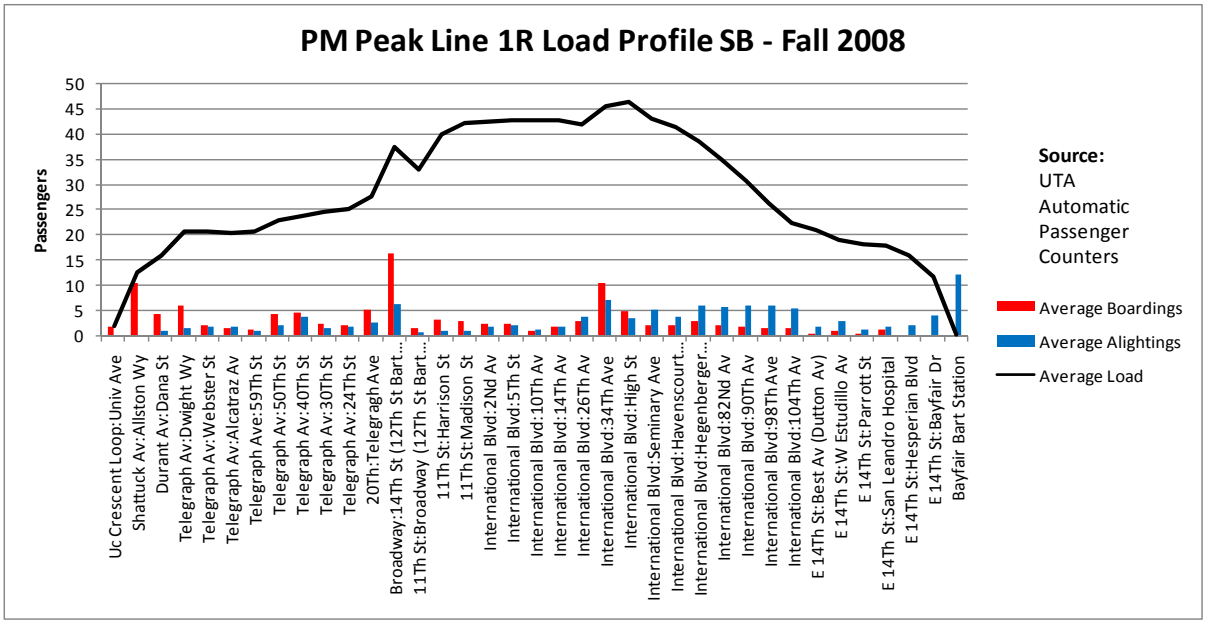


Figure 3.2 - PM Peak Load Profile



3.4 Running Times

An evaluation of the scheduled versus actual running time (the time it actually takes for a vehicle to travel the length of a route) was needed in order to provide suggestions to improve bus speed and reliability. The running time analysis was conducted using data collected by AC Transit's GPS-based AVL system from the Fall 2008 signup.

It was discovered that Line 1R's actual running time consistently exceeds its scheduled running time for most of the day, in both directions. However, some early morning and late evening trips operate faster than the scheduled running time.

The scheduled and actual running times, by time of day, are compared in Tables 3.3 and 3.4 below. For the actual running times, the mean (average), median (middle number), mode (most frequently occuring), 85th Percentile, minimum, and maximum values are shown. The 85th Percentile column shows the point at which 85% of the samples are at or below that running time. The median column shows the point at which an equal number of samples are below and above the running time. The mode column shows the most common running time sampled.

On average, northbound average running times are highest in the AM peak at 85.4 minutes. The median running time is comparable at 85 minutes. Only in the evening time period does the average actual running time fall below the scheduled running time.

Table 3.3 - Northbound End-to-End Running times

Time Period	Scheduled Running time	Actual Running time					
		Mean	Median	Mode	85th %	Minimum	Maximum
Early AM	73	79.5	79	80	83	64	95
AM Peak	73	85.4	85	79	93	68	113
Mid-day	73	83	82	83	90	67	115
PM Peak	78	83.7	83	81	91	59	117
Evening	73	72.3	73	74	77	60	86

On average, southbound average running times are highest in the PM peak at 89 minutes. The median running time is comparable to this average at 88 minutes. Only in the early morning time period does the average actual running time fall below the scheduled running time.

Table 3.4 - Southbound End-to-End Running times

Time Period	Scheduled Running time	Actual Running time					
		Mean	Median	Mode	85th %	Minimum	Maximum
Early AM	73	71.1	70	79	80	56	95
AM Peak	73	79.5	80	80	86	60	108
Mid-day	73	83.8	84	86	92	61	143
PM Peak	78	89	88	87	98	65	127
Evening	73	77.4	77	71	85	61	104

Figures 3.3 and 3.4 illustrate the average running time versus scheduled running time for each Line 1R trip throughout the day.

Figure 3.3 - Southbound Average Running Times

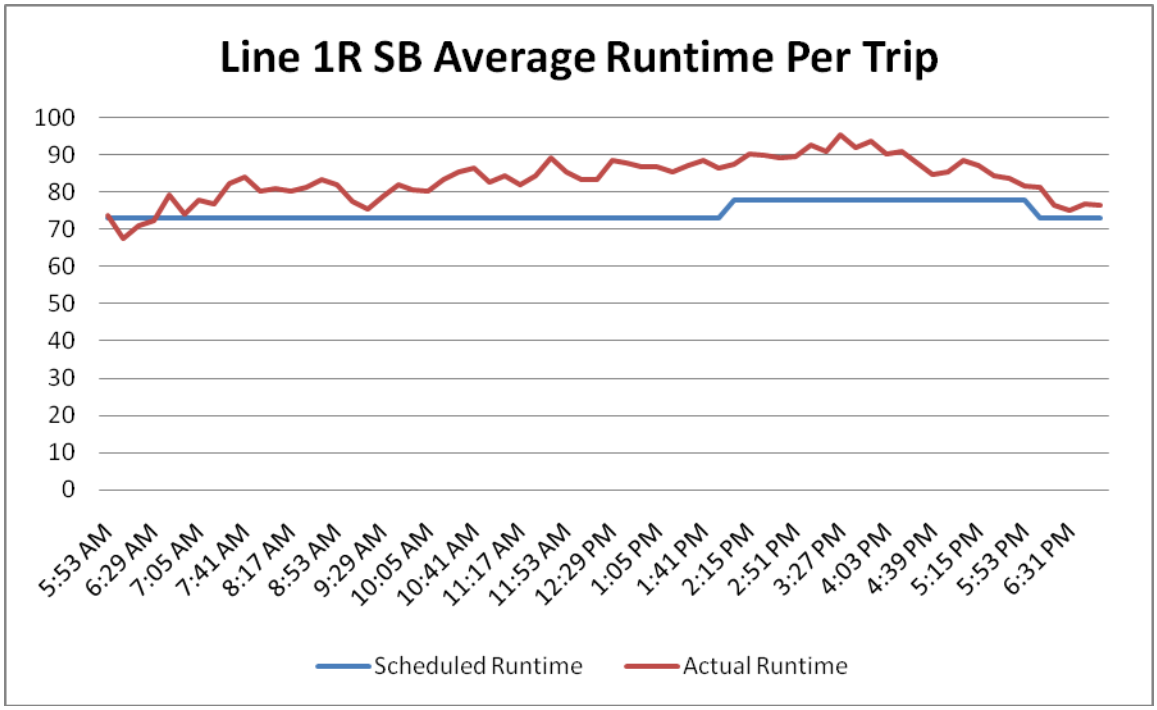
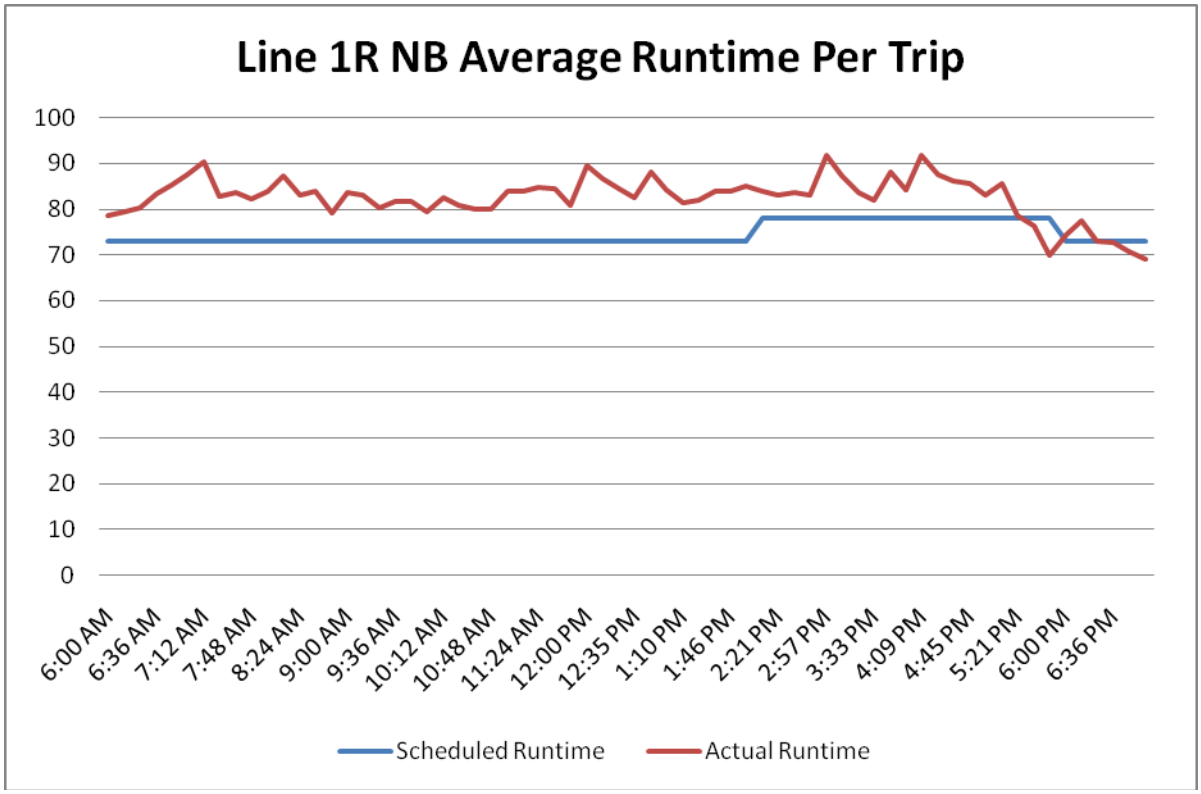


Figure 3.4 - Northbound Average Running Times



One method of measuring running time performance is by the number of trips that complete the route within five minutes of the scheduled time. Table 3.5 illustrates this statistic by time-of-day and direction.

Table 3.5 - Percent of runs completed within 5 minutes of scheduled running time

Time Period	Northbound	Southbound
Early AM	50%	81%
AM Peak	21%	59%
Mid-day	32%	30%
PM Peak	58%	30%
Evening	90%	61%

The AM peak, in the northbound direction, and the PM peak, in the southbound direction, are the least likely times that a bus will traverse the route within 5 minutes of the

scheduled running time. In addition, trips during the mid-day time period are likely to take longer than scheduled. These time periods coincide with the heaviest loads on the Line 1R.

3.5 Operating Speed

Operating speed, the speed at which a bus typically travels, is another useful tool that was employed to analyze Line 1R's performance. As with running times, the average speeds are slowest in the commute direction of the AM and PM peaks. The average speed slows to 11.8 miles per hour in the southbound PM peak, and the average speed is highest in the early morning southbound direction at 14.7 miles per hour. Table 3.6 illustrates average speed by period of Line 1R.

Table 3.6 - Average Speed by Time Period

Time Period	Northbound	Southbound
Early AM	13.1	14.7
AM Peak	12.2	13.2
Mid-day	12.6	12.5
PM Peak	12.4	11.8
Evening	14.4	13.5

Average speed was also examined by route segment, in both directions of travel. Table 3.7 shows that average speeds generally decreased in the areas closer to Berkeley, while they increased in the line segments closest to San Leandro. These speed phenomena were likely caused by the greater levels of density, traffic congestion, and pedestrian activity experienced in Berkeley and parts of Oakland.

Table 3.7 - Average Speed by Segment

Segment	Northbound	Southbound
Downtown Berkeley to Alcatraz Ave	9.9	7.0
Alcatraz Ave to Broadway/14th St	11.6	12.5
Broadway/14th St to High St	13.0	12.8
High St to 98th Ave	13.2	13.4
98th Ave to Bay Fair BART	14.5	17.4

While GPS data from AC Transit's AVL system is an effective tool to assess operating conditions, staff also conducted a speed and delay study to help classify and quantify the reasons behind the delay. Figures 3.5, 3.6, 3.7, 3.8, 3.9, 3.10 are graphcial representations that depict the average speed observed, organized by geographic segment. These were prepared to highlight areas that might need traffic or other improvements in order to decrease bus delay. More information regarding the methdology and other findings of the speed and delay study can be found in Chapter 4.

Figure 3.5 – Northbound Speed Observations (Bay Fair BART to 73rd Avenue)

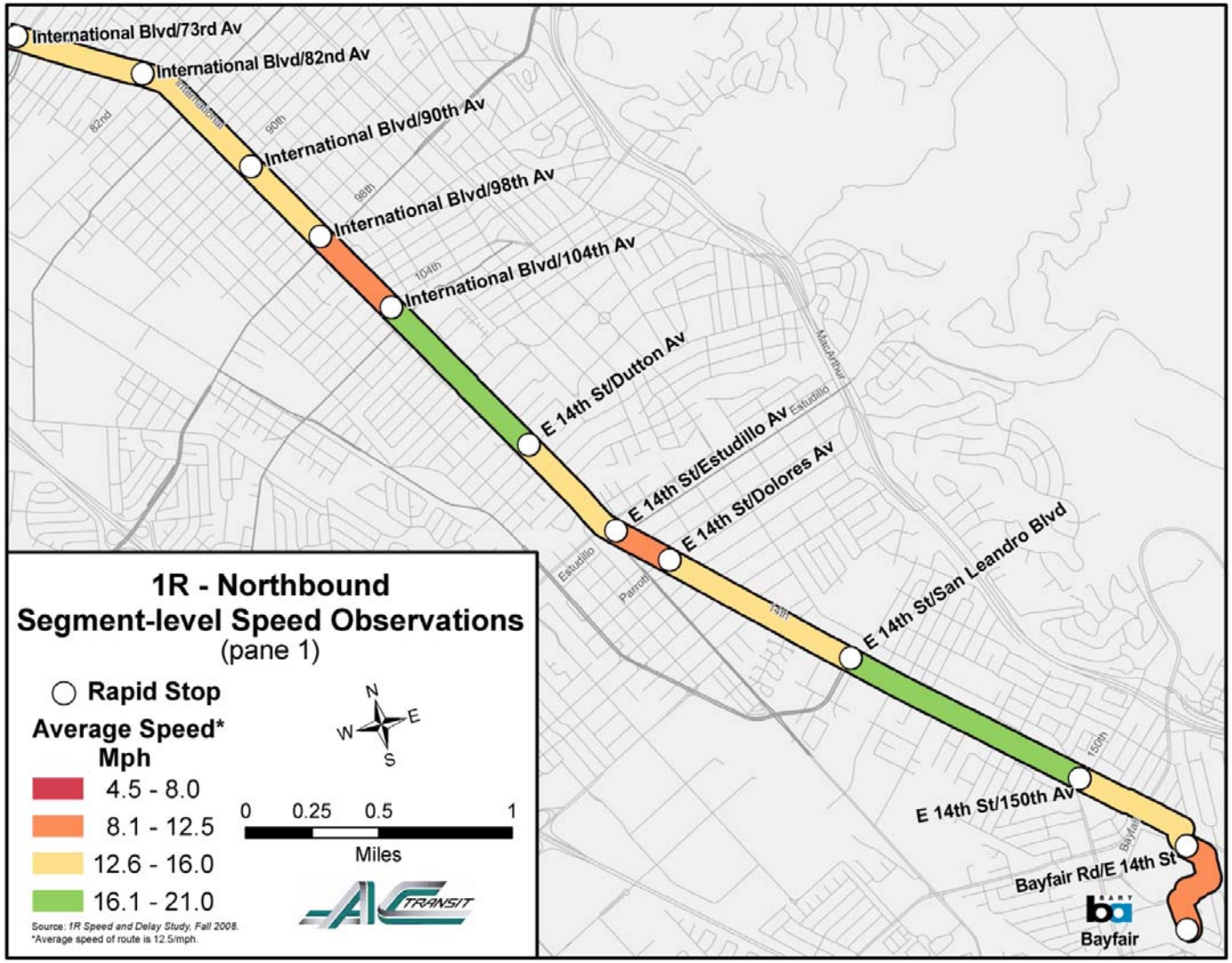


Figure 3.6 – Northbound Speed Observations (73rd to Downtown Oakland)

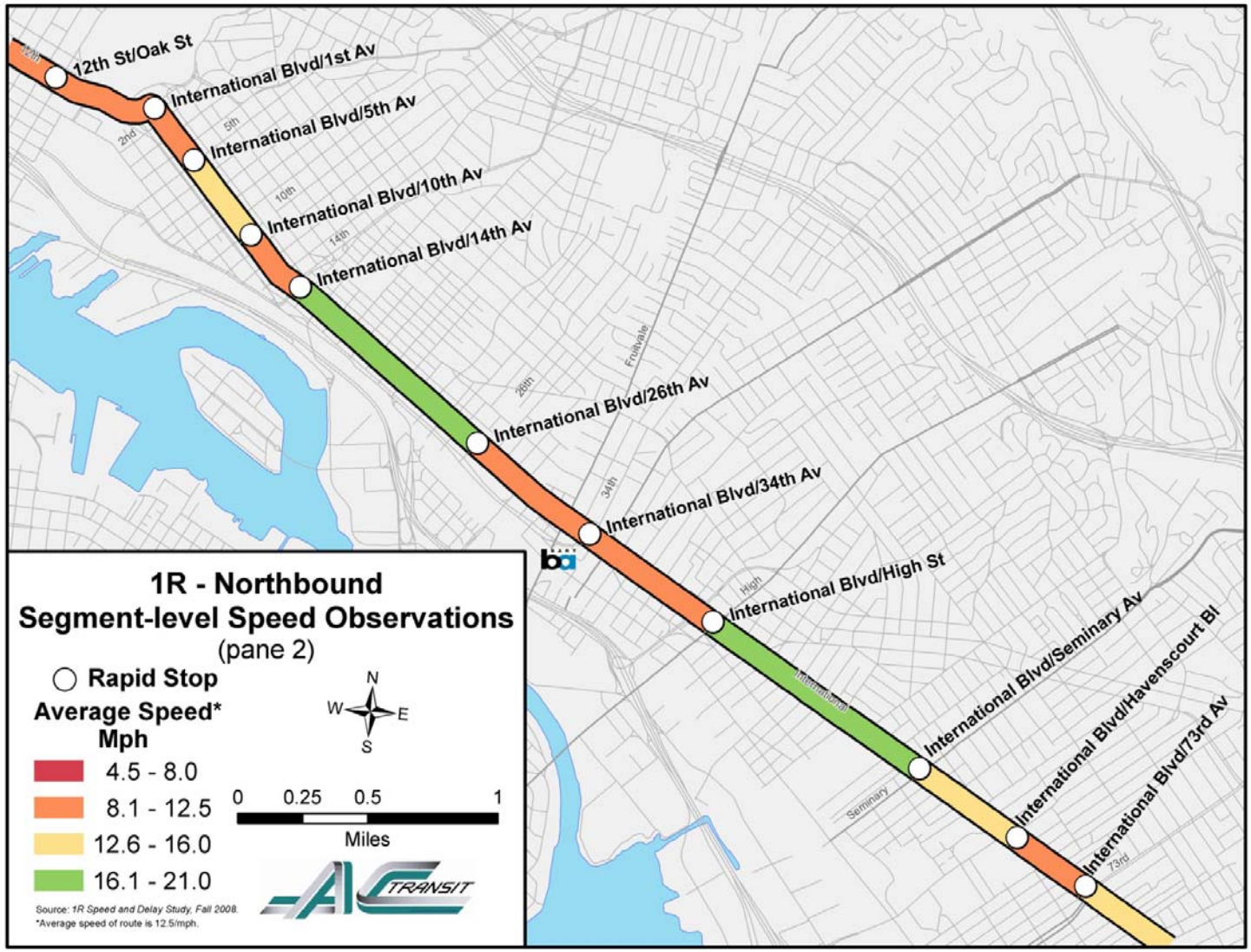


Figure 3.7 – Northbound Speed Observations (Downtown Oakland to Downtown Berkeley)

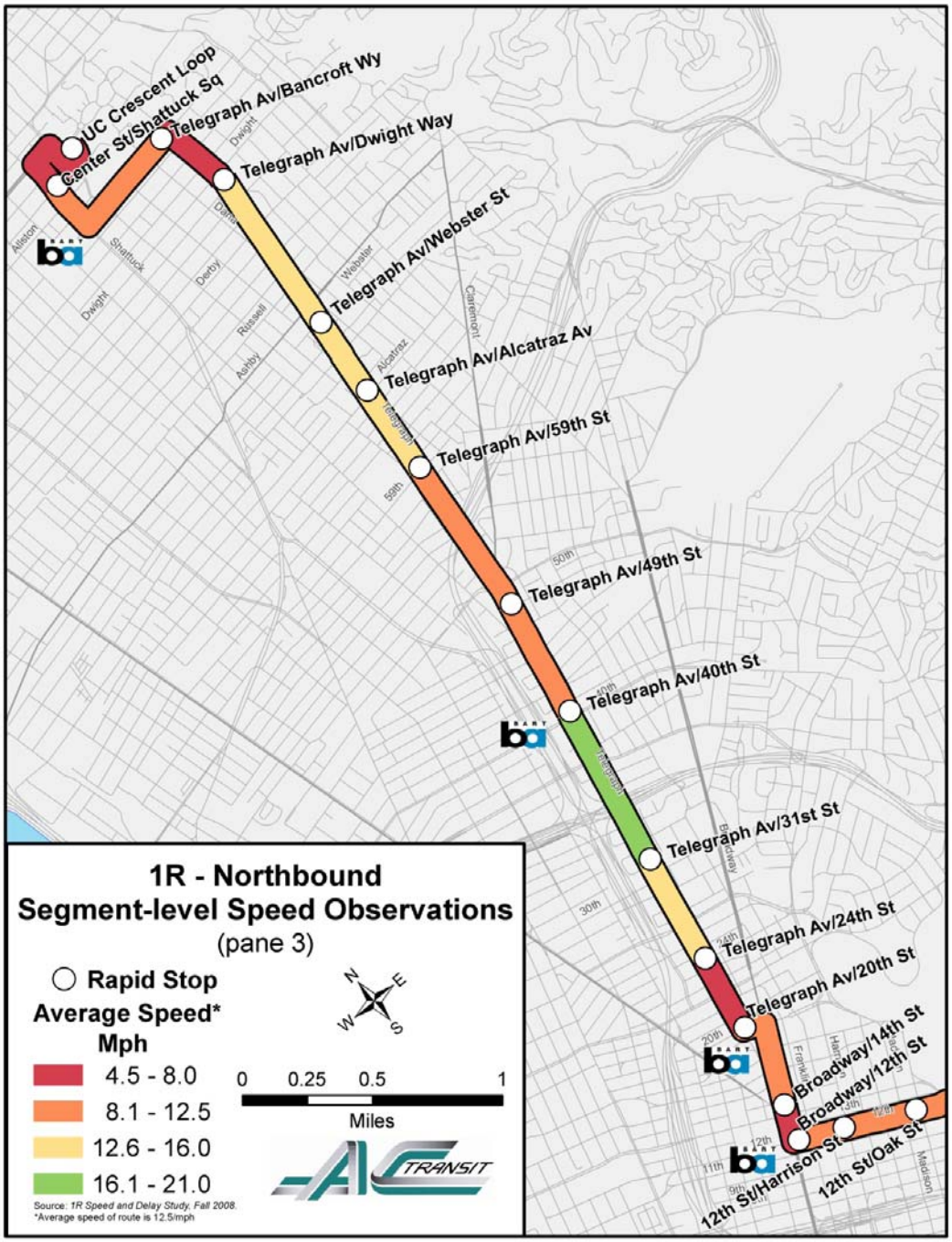


Figure 3.8 – Southbound Speed Observations (Downtown Berkeley to Downtown Oakland)

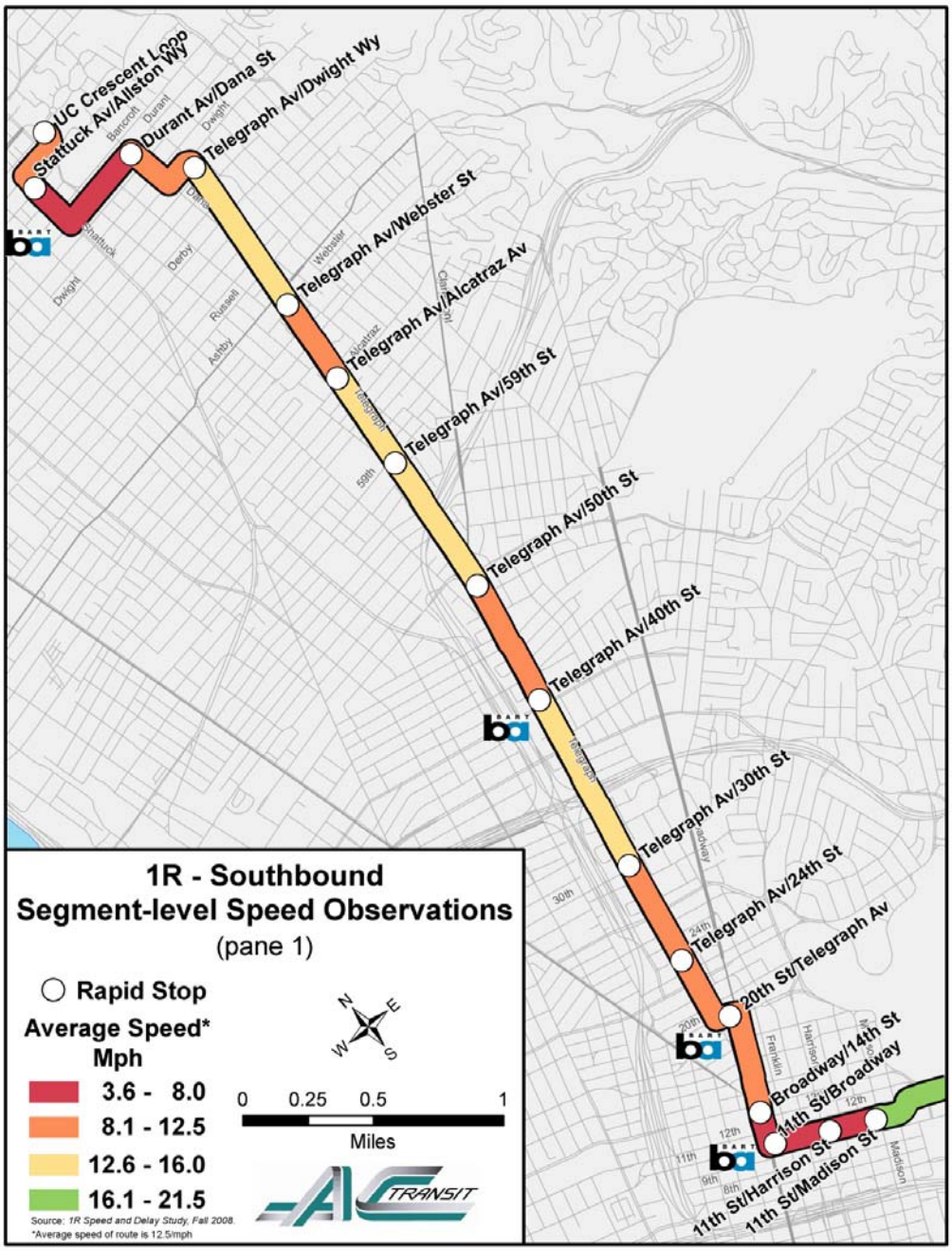


Figure 3.9 – Southbound Speed Observations (Downtown Oakland to Hegenberger Road)

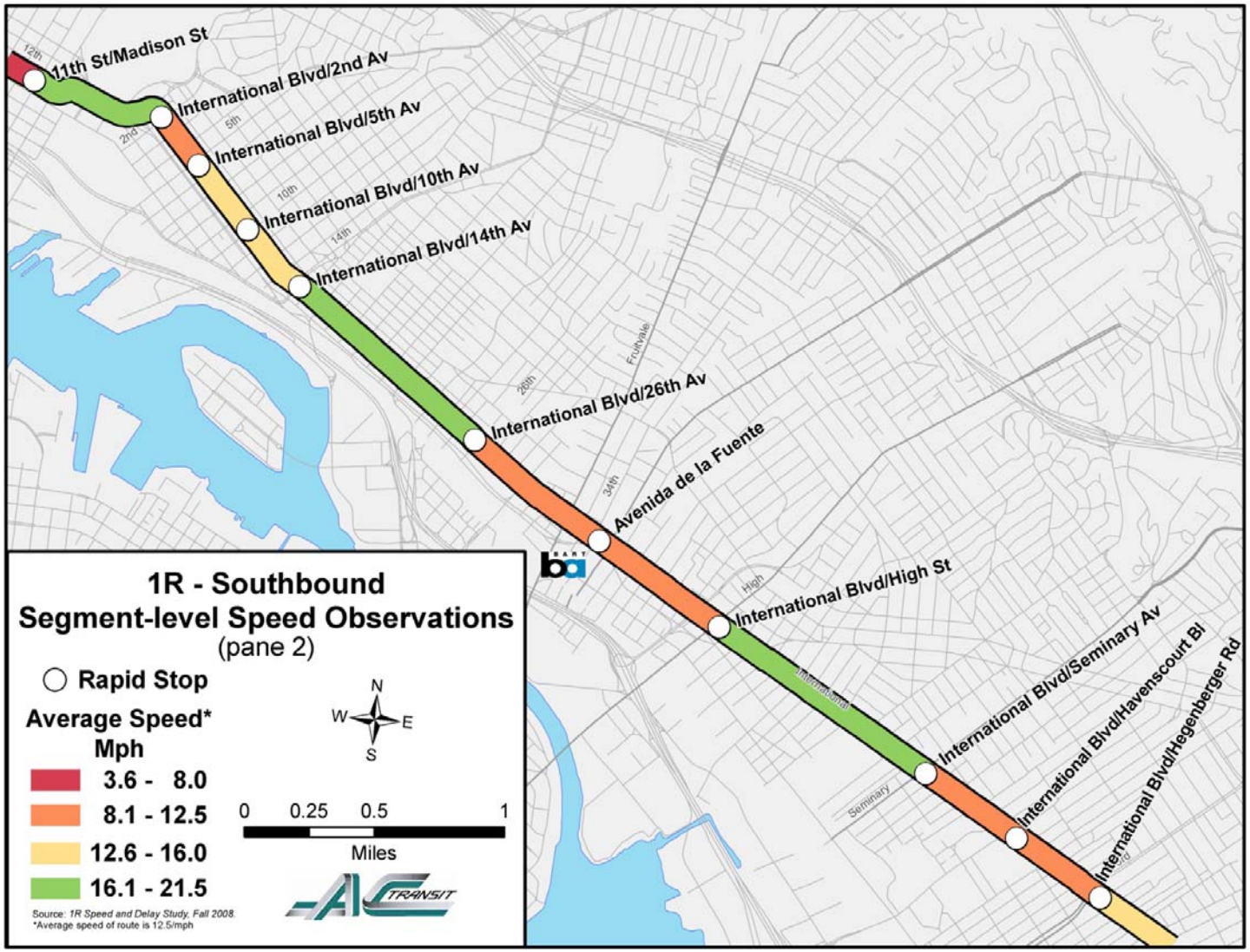
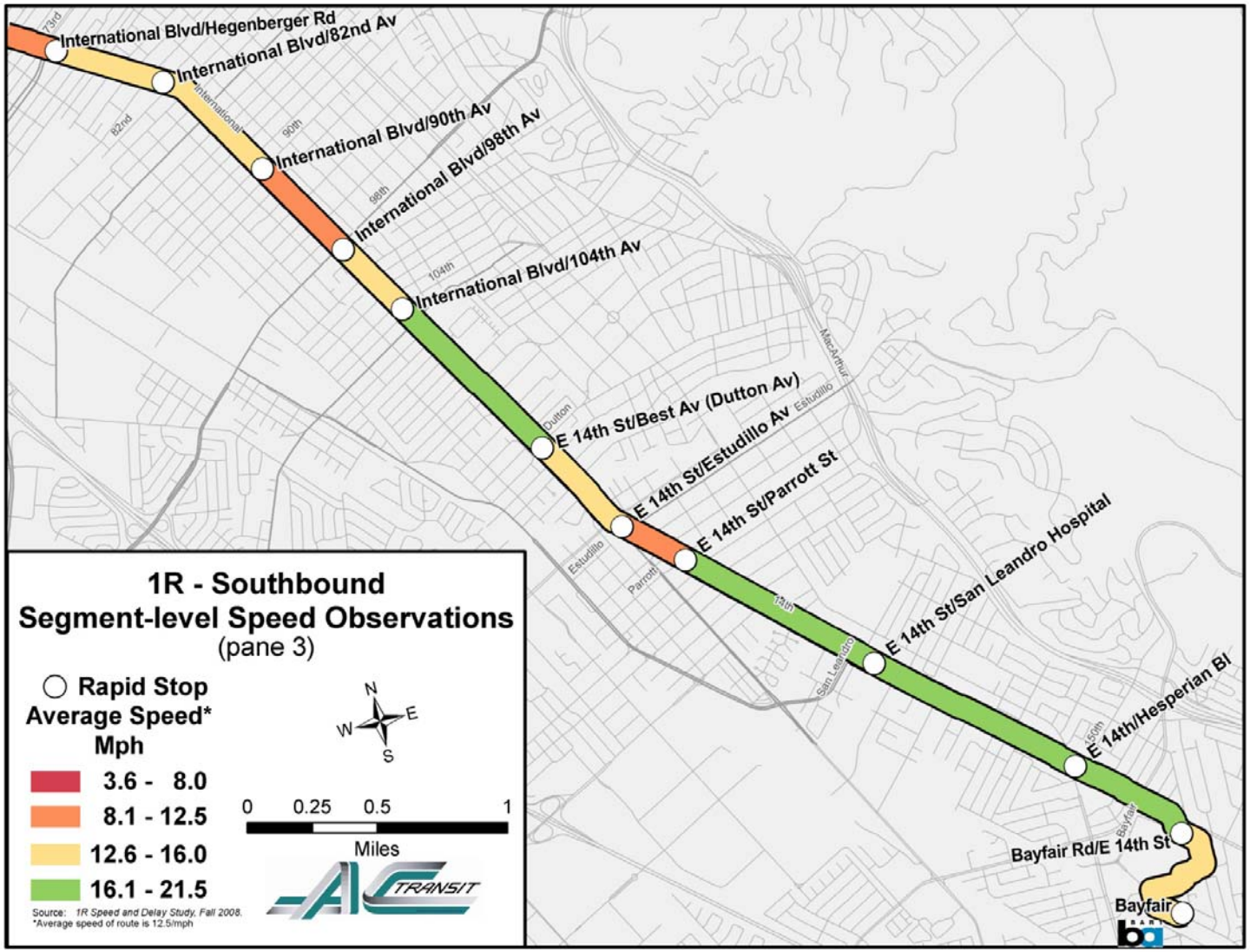


Figure 3.10 – Southbound Speed Observations (Hegenberger Road to Bay Fair BART)



3.6 Schedule Adherence/Headway Adherence

Headway is the interval of time between two vehicles running in the same direction on the same route. When a route is created, the corresponding schedule/timetable indicates what the headway should be and thus how far apart the buses on the route should be spaced. Schedule and headway adherence are important to a route's operation as they allow for consistent passenger loading and optimal use of TSP technology. The schedule and headway adherence analysis for Line 1R was also performed using the capabilities of the District's Automatic Vehicle Location (AVL) system.

In addition to examining travel times and speeds by time period and segment, it was important to confirm whether the sampled time points matched those in the published timetables (adhered to the schedule). Schedule adherence was measured as the percentage of runs that were completed not more than five minutes late or one minute earlier than scheduled.

Table 3.8 - Schedule Adherence by Time Period

Time Period	Average Deviation	On-Time Percentage
Early AM	0.3	63.1%
AM Peak	4.0	42.0%
Mid-day	7.5	29.0%
PM Peak	11.4	18.0%
Evening	7.5	32.7%

As shown in Table 3.8, schedule adherence is best in the early morning hours and the AM peak. The service substantially degrades starting in the mid-day and continuing into the PM peak. During the PM peak, only 18% of the trips are completed per the scheduled time.

It is important to note that there are only 2 published timepoints for the Line 1R, Downtown Berkeley and Bay Fair BART. The 4 additional locations below are considered "phantom timepoints" as they are not published for the public. These locations timepoints serve as guides to assist with the pacing of buses to aid in the maintenance of 12 minute headways for the service.

Table 3.9 - Schedule Adherence by Time Point

Time Point	Northbound		Southbound	
	Average Deviation	On-Time Percentage	Average Deviation	On-Time Percentage
UC West Crescent*	10.7	15.6%	-1.4	25.9%
Telegraph Ave at Alcatraz Ave	11.6	16.7%	7.3	32.0%
Broadway at 14th Street	7.6	33.4%	10.1	18.6%
International Boulevard at High St	6	45.3%	11	19.6%
International Boulevard at 98th Ave	4.6	59.4%	12.2	20.2%
Bay Fair BART station	2.6	64.1%	7	22.2%

*In August 2009 the end of the line in Berkeley was changed to Oxford and Berkeley Way. Prior to this change the end of the line was at the UC West Crescent.

Table 3.9 shows schedule adherence by individual time point. In the northbound direction, the on-time percentage falls as the bus travels the length of the corridor. As with any bus line, there is a tendency for on-time performance to diminish as the bus travels along the route, making it a particular challenge to manage long distance routes such as Line 1R. In the southbound direction, on-time performance is generally poor at most time points, including the first time point.

3.7 Headway Adherence

For a high frequency headway-based service such as the Line 1R, it is equally important to measure the actual amount of time observed between buses. This metric provides a "feel" for what the passenger experiences while waiting at a bus stop. It is also a useful way to capture "bus bunching" activity (when two or more buses platoon along a line and arrive at a stop at the same time).

For this analysis, a "normal," headway was defined as between 10 and 14 minutes, while a, "bunched," bus was defined as being within 2 minutes of the preceding bus. The scheduled headway on this route is every 12 minutes. Table 3.10 shows that bus bunching tends to increase later in the day. The AM peak is only bunched approximately 5% of the time, while the afternoon peak has almost 16.5% of the buses arriving within 2 minutes of each other. The Early AM bunched percent is disproporationately high due to reduced demand as well as reduced traffic as schedules are traditionally built to be operted during peak period times.

Table 3.10 - Headway Adherence by Time Period

Time Period	Average Deviation	Normal Percent	Bunched Percent
Early AM	2.0	65.9%	30.5%
AM Peak	4.2	36.6%	5.1%
Mid-day	5.8	27.3%	10.3%
PM Peak	8.3	14.8%	16.5%
Evening	7.3	19.5%	13.2%

In Table 3.10, headway adherence was then broken down by direction and refined by timepoint. In the northbound direction, Table 3.11 reflects the percentage of bunched buses increases after each time point except for the terminal location. In the southbound direction, Table 3.12 shows that a similar pattern is followed except for the first time point

General trends worthy of mention include the fact that the bunching builds over the line as it progresses along. The exception to this rule is in the outbound direction and the fact that the UC West Crescent has a disproportionately high bunching percentage. This is likely due to impacts associated with the location itself, as shortly after the line began operations, the direct entrance from Univeristy Avenue was closed, forcing vehicles to access the Crescent from Center Street.

Table 3.11 - Northbound Headway Adherence by Time Point

Time Point	Northbound		
	Average Deviation	Normal Percent	Bunched Percent
Bay Fair BART station	4.2	53.3%	6.8%
International Boulevard at 98th Ave	4.4	39.3%	8.5%
International Boulevard at High St	5.3	30.1%	9.9%
Broadway at 14th Street	6.3	23.9%	13.9%
Telegraph Ave at Alcatraz Ave	6.8	20.4%	16.0%
UC West Crescent	7.1	19.1%	15.7%

Table 3.12 - Southbound Headway Adherence by Time Point

Time Point	Southbound		
	Average Deviation	Normal Percent	Bunched Percent
UC West Crescent	7.0	19.0%	13.9%
Telegraph Ave at Alcatraz Ave	4.5	37.2%	7.5%
Broadway at 14th Street	5.6	28.1%	11.8%
International Boulevard at High St	6.9	22.5%	15.8%
International Boulevard at 98th Ave	7.6	19.3%	18.3%
Bay Fair BART station	8.2	18.3%	14.2%

3.8 Strollers, Wheelchairs, and Other Mobility Devices

Due to the number of comments received by staff concerning unusually high numbers of strollers and mobility devices on Line 1R (and their subsequent contribution to dwell time), staff undertook a brief survey to quantify mobility devices on the line. Ten one-way trips were surveyed on the line during January and February of 2009, during the busiest times of day; 12:00-4:00p.m. Staff surveyed strollers, wheelchairs, and other mobility devices by riding Line 1R, end-to-end, during the afternoon observing the boarding locations of strollers, wheelchairs, and other mobility devices.

The resulting data, presented in the two tables below, showed that there were a significant number of wheelchairs and other mobility devices on the line. The maximum load observed was a total of six strollers and four other mobility devices on the bus at one time.

As Tables 3.13 and 3.14 illustrate, certain locations seem to be more active for stroller use and customers with mobility devices than others, and the patterns differ by direction. The southbound portion of the line had a much higher incidence of passengers with these devices, with the bus stop at International Boulevard and 34th Avenue being a particularly heavily used stop by customers with strollers and other mobility devices.

Table 3.13 - Northbound Boardings of Strollers and Other Mobility Devices (noon to 4 pm)

Stop Name	Stroller	Other Mobility
Bay Fair BART	9	3
Bay Fair Drive at East 14th Street		
East 14th Street at 150th Avenue		
East 14th Street at San Leandro Boulevard		

Stop Name	Stroller	Other Mobility
East 14th Street at Dolores Avenue	3	
East 14th Street at Dutton Avenue		
International Boulevard at 104th Avenue		
International Boulevard at 98th Avenue		2
International Boulevard at 82nd Avenue		1
International Boulevard at 73rd Avenue	1	
International Boulevard at Havenscourt Boulevard		1
International Boulevard at Seminary Avenue	2	1
International Boulevard at High Street		
International Boulevard at 34th Avenue	5	4
International Boulevard at 26th Avenue		
International Boulevard at 14th Avenue	1	1
International Boulevard at 10th Avenue		
International Boulevard at 5th Avenue	2	
International Boulevard at 1st Avenue		
12th Street at Oak Street		
12th Street at Harrison Street	3	2
12th Street at Broadway		4
Broadway at 14th Street	6	5
20th Street at Telegraph Avenue		2
Telegraph Avenue at 24th Street		
Telegraph Avenue at 31st Street		
Telegraph Avenue at 40th Street		
Telegraph Avenue at 49th Street		
Telegraph Avenue at 59th Street	3	2
Telegraph Avenue at Alcatraz Avenue		
Telegraph Avenue at Webster Street		
Telegraph Avenue at Dwight Way		

Stop Name	Stroller	Other Mobility
Bancroft Way at Telegraph Avenue		
Center Street at Shattuck Avenue		
University of California Loop		
TOTALS	**36**	**30**

Table 3.14 - Southbound Boardings of Strollers and Other Mobility Devices

Stop Name	Stroller	Other Mobility
University of California Loop	1	1
Shattuck Avenue at Allston Way	1	
Durant Avenue at Dana Street		
Telegraph Avenue at Dwight Way	1	1
Telegraph Avenue at Webster Street		1
Telegraph Avenue at Alcatraz Avenue		
Telegraph Avenue at 59th Street	1	
Telegraph Avenue at 50th Street		
Telegraph Avenue at 40th Street	1	
Telegraph Avenue at 30th Street	5	3
Telegraph Avenue at 24th Street		2
20th Street at Telegraph Avenue	1	
Broadway at 14th Street	3	
11th Street at Broadway		3
11th Street at Harrison Street		
11th Street at Madison Street		
International Boulevard at 2nd Avenue	12	4
International Boulevard at 5th Avenue		2
International Boulevard at 10th Avenue		
International Boulevard at 14th Avenue	2	
International Boulevard at 26th Avenue	4	
International Boulevard at 34th Avenue	13	9

Stop Name	Stroller	Other Mobility
International Boulevard at Seminary Avenue	4	2
International Boulevard at Havenscourt Boulevard		
International Boulevard at Hegenberger Road	2	
International Boulevard at 82nd Avenue		1
International Boulevard at 90th Avenue	1	1
International Boulevard at 98th Avenue	1	2
International Boulevard at 104th Avenue		
East 14th Street at Best Avenue		
East 14th Street at West Estudillo Avenue	3	2
East 14th Street at Parrott Street	1	
East 14th Street at San Leandro Hospital	1	5
East 14th Street at Hesperian Boulevard		
Bay Fair Drive at East 14th Street		
Bay Fair BART station		
TOTALS	**58**	**39**

Staff was also able to determine an average loading time of 1 minute and 34 seconds for strollers, and 4 minutes and ten seconds for wheelchairs and other mobility devices. During the course of this data collection, staff witnessed the challenges faced by wheelchair patrons and stroller patrons due to space constraints. Bus operators on the trips sampled made several comments about the difficult position that they are put into by the lack of sufficient stroller and wheelchair accommodations aboard the buses on the Line 1R. staff undertook research to determine what course of action other agencies had taken to deal with similar issues. After researching TCRP and other Federal Transit Administration (FTA) documents, staff found that strollers are often classified as mobility devices by FTA. Furthermore, almost every document that discusses the Americans with Disabilities Act (ADA) speaks to guidelines for wheelchairs, strollers and other mobility devices. One article of note discussed the common practice in Europe of having a separate section of public transit coaches for strollers:

> *"Historically, the use of a designated 'compartment' in Europe goes back to the 1930's. The Subway system in Berlin, Germany, introduced a 'Mother and Child' section on each train, consisting of a large space with a central open area and seats along the walls facing the center. This arrangement accommodated several mothers with their strollers or those with young children and luggage…This design remains in use today (TCRP Synthesis 50; Use of Rear-Facing Position for Common Wheelchairs on Transit Buses. Federal Transit Administration. Washington, D.C. October 2003.)."*

4 Ride Check and Delay Data Analysis

While the District's AVL system is a useful tool for analyzing on-time performance rates, it cannot provide sufficient detail as to the causes of delays and bottlenecks on Line 1R. In order to identify the reasons for delay, a ride check, combined with an onboard speed and delay study, was conducted to determine sources, location and duration of delays that contributed to Line 1R's running time. The speed data that resulted from this study was discussed in Chapter 3.

4.1 Methodology and Data Sources

In Fall 2008, AC Transit Planning Department staff initaited a speed and delay study for the Line 1R over a series of four weeks. Over 40 one-way trips were observed, and a Visual Basic macro, designed to allow the quick capture of desired data, was used to record the speed and delay data. This data was later imported into a Microsoft Access database for summary and analysis.

4.2 Components of Running Time

The scheduled running time for a bus is typically broken into several components, including:

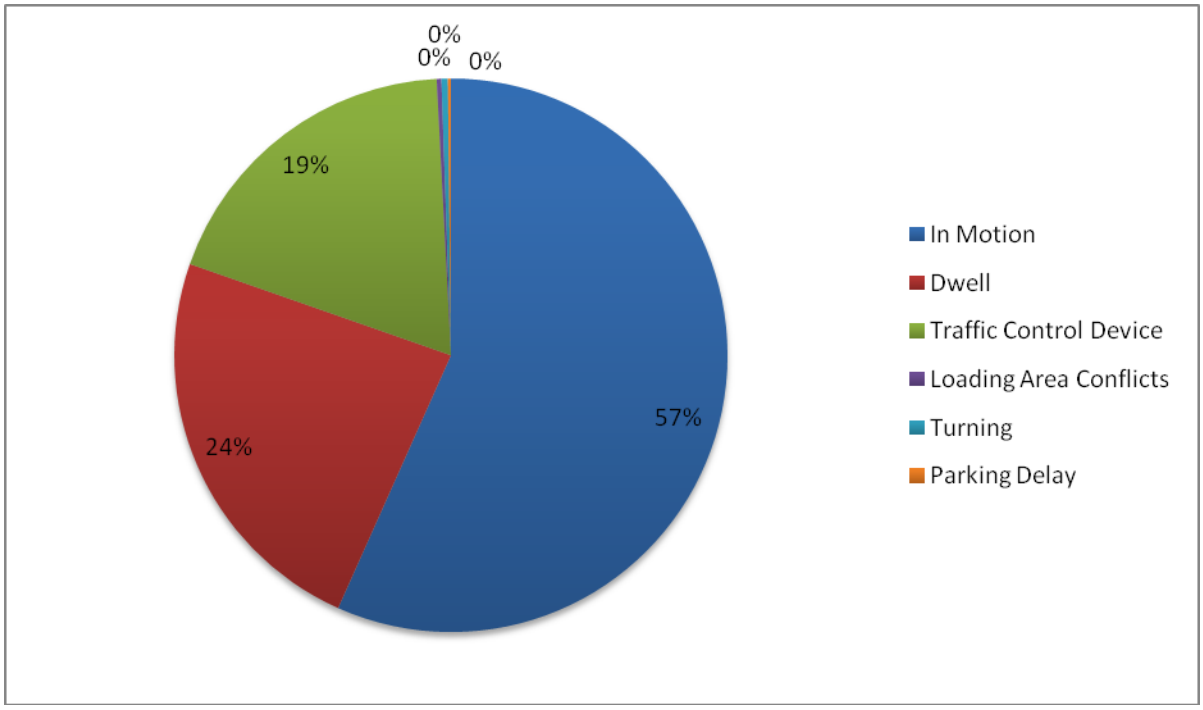
- The amount of time the bus is in motion
- The amount of time the bus is at a stop loading or discharging passengers, otherwise known as dwell time
- The amount of time the bus is delayed/slowed waiting for a signal to change, a car to turn left or right, stuck in traffic congestion, or any other delay
- The amount of time an operator has to take a break at the end of a line, otherwise known as recovery time, layover time, or "spot" time

For this study, the components of the end-to-end running time were analyzed for quantity, length, and geographic location of both delay and dwell time. The results of this analysis are presented later in this chapter.

4.3 Types of Delay

The most significant sources of delay for the line were traffic signals. Traffic signals accounted for 19% of the actual running time on this route. Most other delay sources were minimal including loading area conflicts, turning delays, etc. Traffic congestion was included as an unavoidable component of a vehicles in-motion time, but was impossible to quantify for the purposes of this exercise. The bus was observed to be "in-motion" only 57% of the time, and picking up or discharging passengers 24% of the time. More information on observed delays can be found in Figure 4.1.

Figure 4.1 - Components of Running Time and Types of Delay



4.4 Locations of Delay

In addition to categorizing the types of delay, it was important to geographically ascertain where delay was occurring. Delays were attributed to minor route segments, defined by the presence of an AC Transit bus pole and flag/sign. In this case, the minor segments correspond with the location of local Line 1 stops.

By far, the largest sources of delay corresponded to major signalized street intersections where multiple major arterials come together. Other sources of delay included congested locations with considerable pedestrian traffic, such as Downtown Oakland and Downtown Berkeley. Downtown San Leandro was also observed to be a bottleneck in areas where the roadway narrows to one lane of traffic in each direction.

It should also be noted that major construction delays were in effect for the segment north of the Uptown Transit Center, located at 20th Street and Telegraph Avenue, during the time that this data was collected. Table 4.1 illustrates the top delayed locations on the line.

Table 4.1 – Top 10 Delayed Locations

Direction	Segment Begin	Segment End	Average Duration of Delay (Seconds)
North	20th St and Telegraph Ave	Telegraph Ave and Grand Ave	105
South	UC West Crescent	Shattuck Ave and Allston Way	74
North	Center St and Shattuck Ave	UC West Crescent	65
North	Bay Fair Drive and E 14th St	E 14th St and 153rd Ave	61
South	Broadway and 14th St	11th and Broadway	48
North	Bancroft Way and Ellsworth St	Shattuck and Kittredge St	45
South	International Boulevard and 69th Ave	Int'l Boulevard and Hegenberger Rd	44
North	Shattuck Ave and Kittredge St	Center St and Shattuck Ave	43
North	International Boulevard and High St	International Boulevard and 40th Ave	43
North	International Boulevard and 100th Ave	International Boulevard and 98th Ave	42

As part of the geographic analysis of delay along Line 1R, maps were created that quantified delays observed by geographic segment of the line. Figures 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 depict segment-level average delay by direction, and allow staff to quickly identify and prioritize critical areas for improvement.

Figure 4.2 – Northbound Delay Observations (Bay Fair BART to 73rd Avenue)

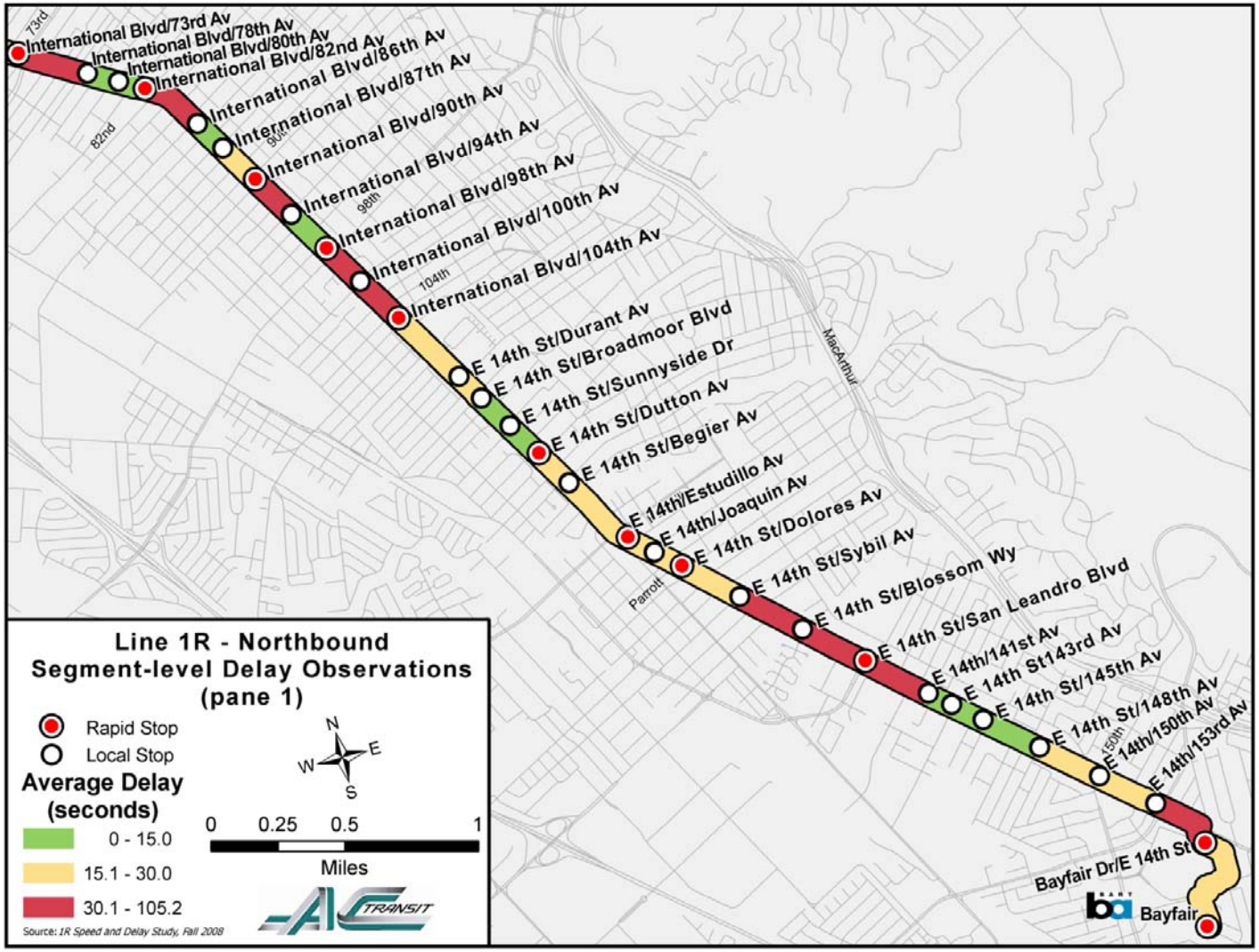


Figure 4.3 – Northbound Delay Observations (73rd Avenue to Downtown Oakland)

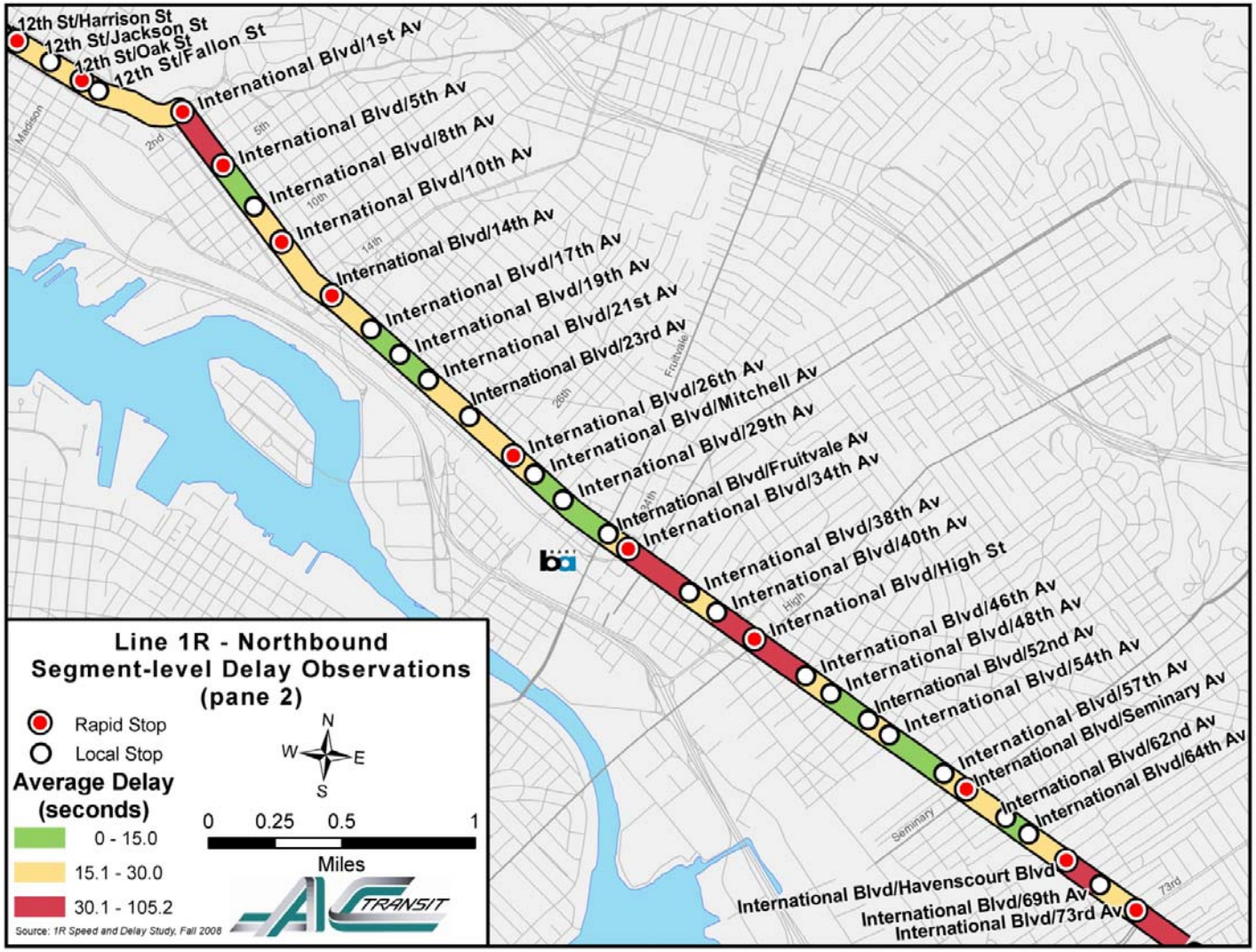


Figure 4.4 – Northbound Delay Observations (Downtown Oakland to Downtown Berkeley)

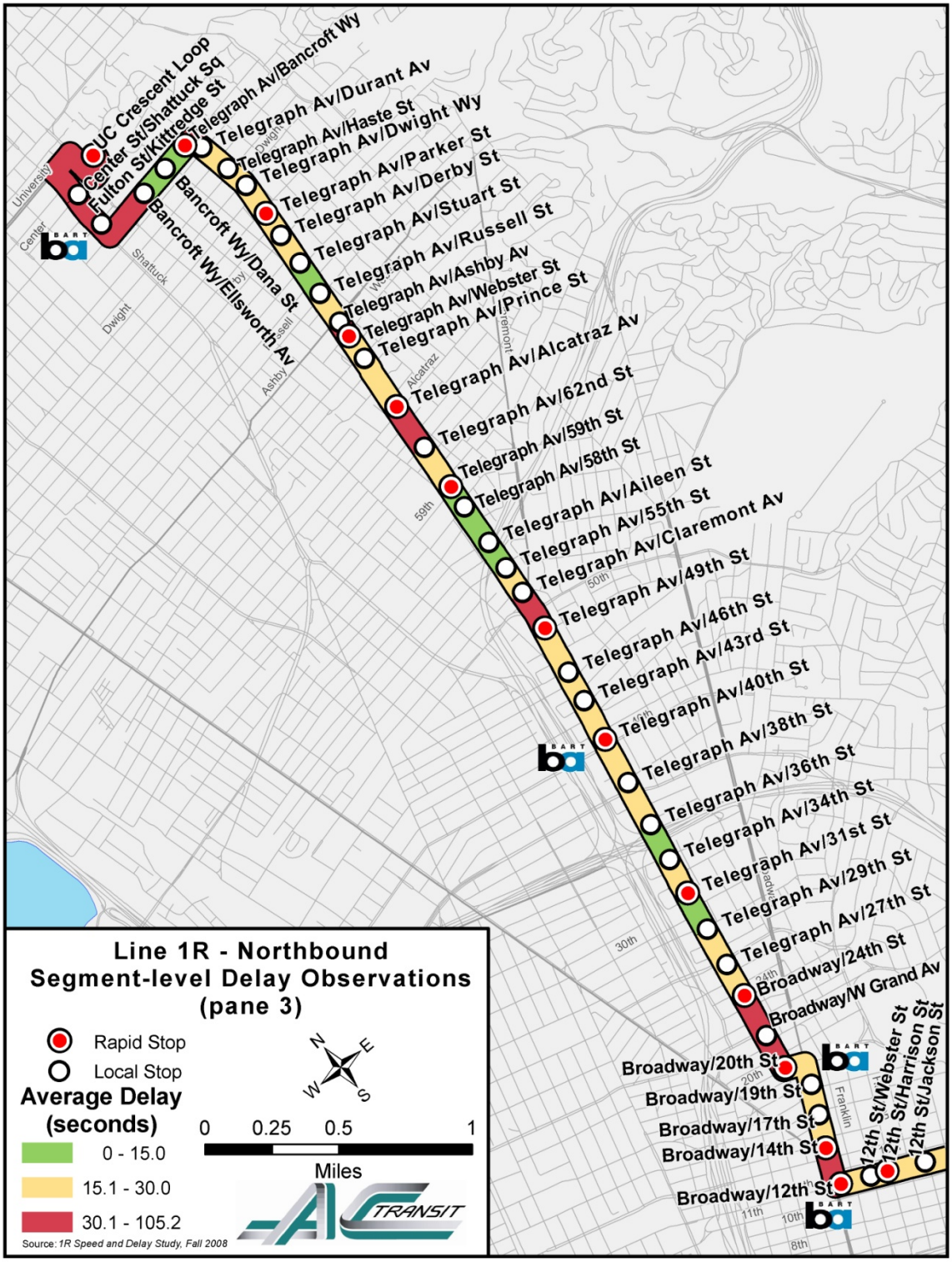


Figure 4.5 – Southbound Delay (Downtown Berkeley to Downtown Oakland)

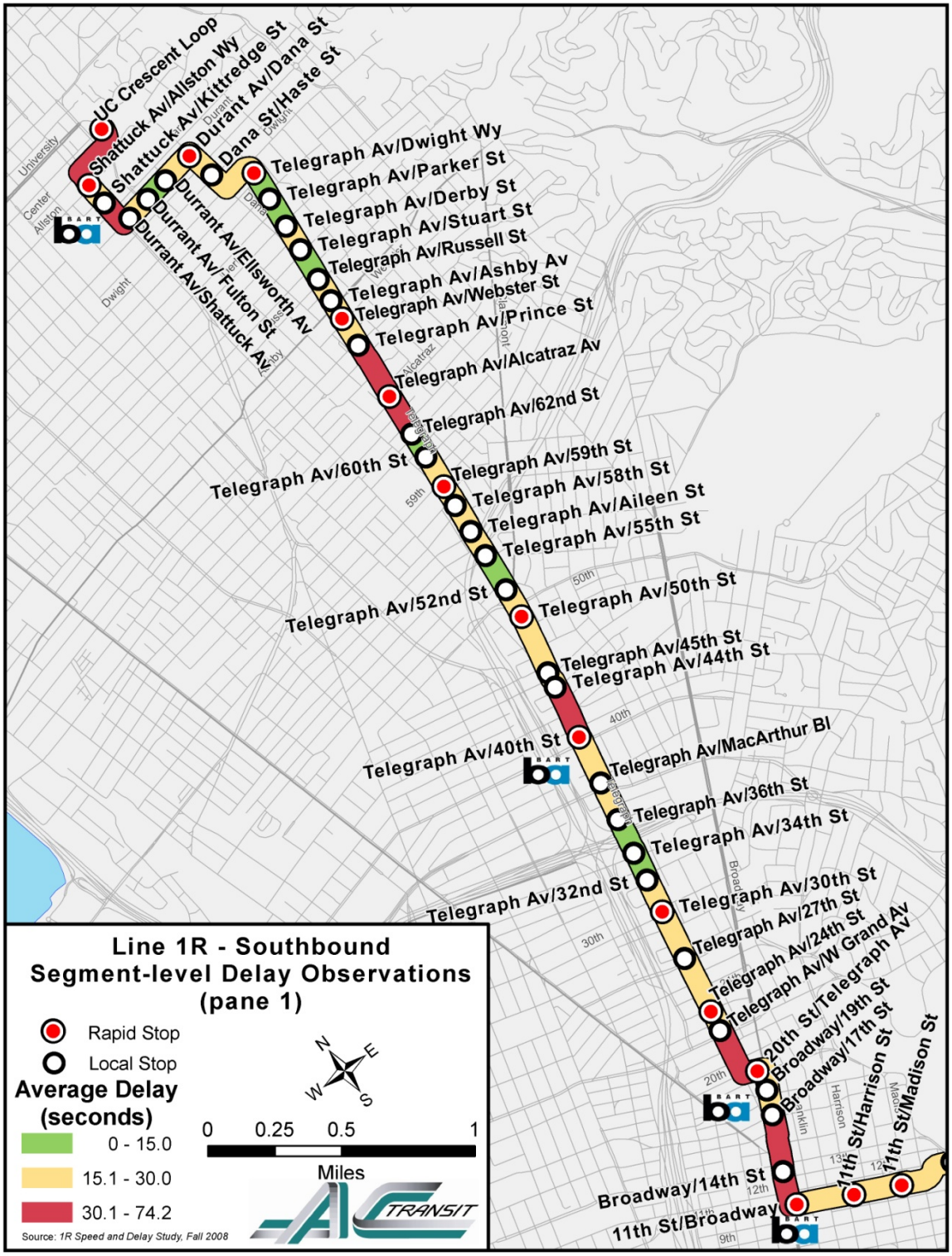


Figure 4.6 – Southbound Delay (Downtown Oakland to Hegenberger Road)

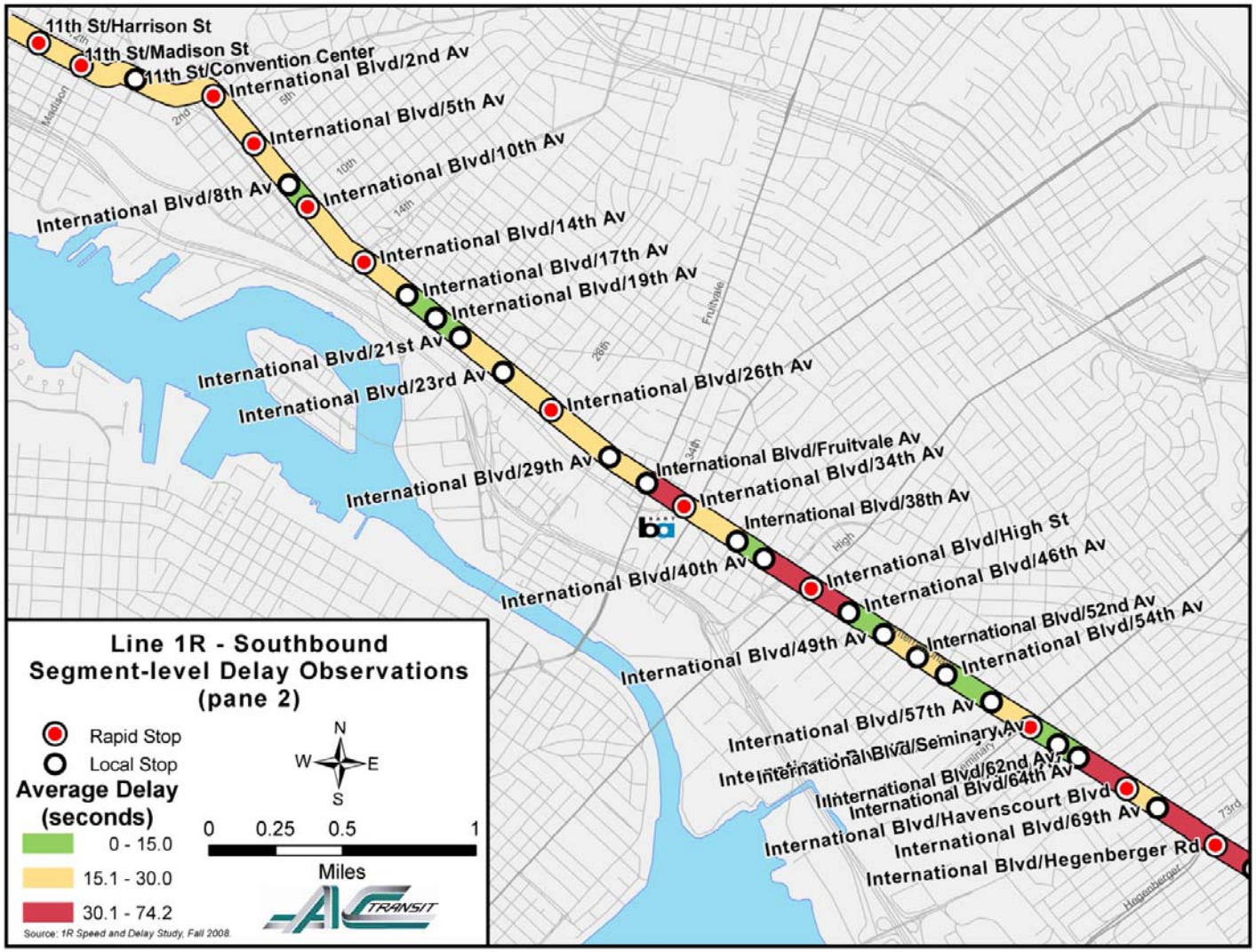
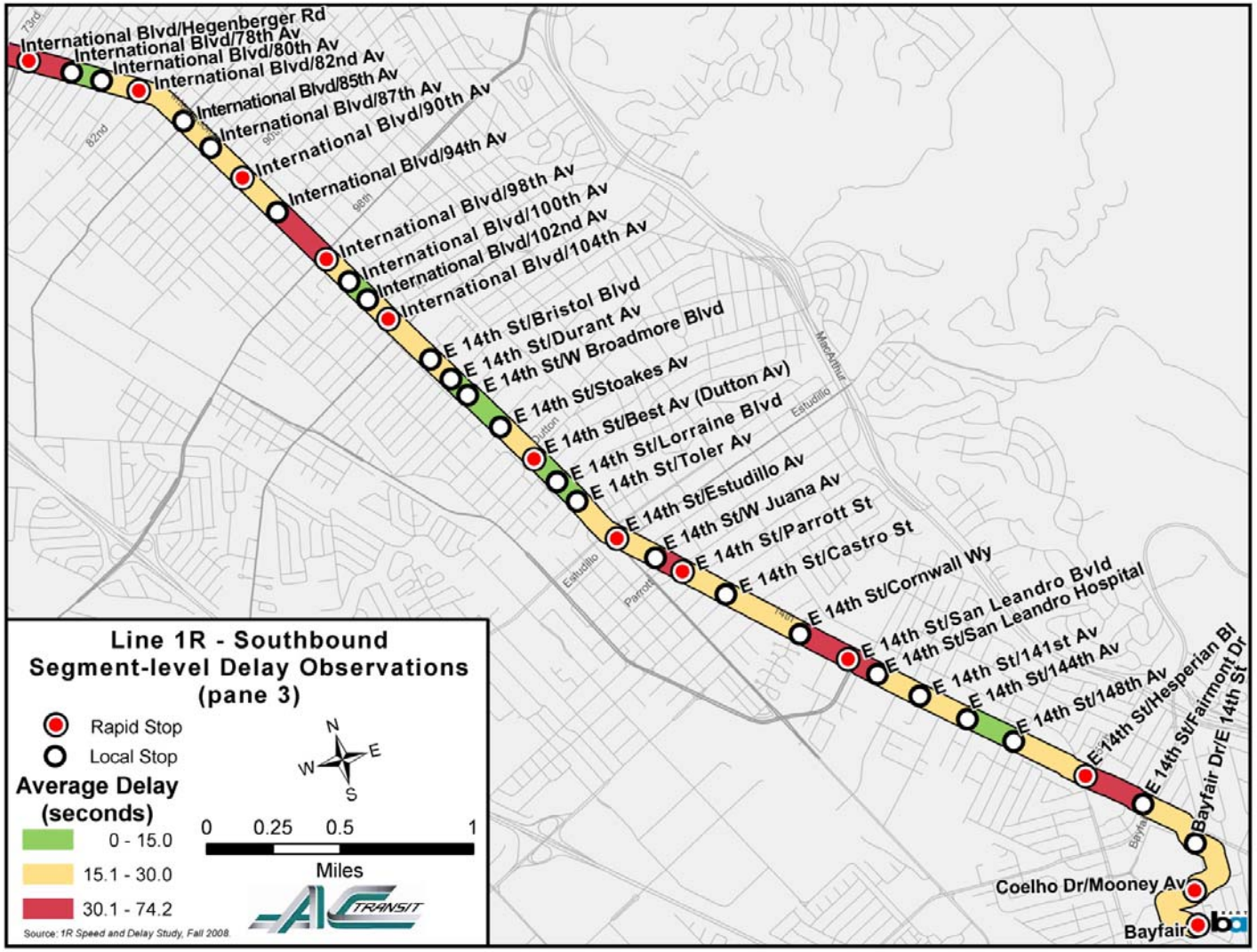


Figure 4.7 – Southbound Delay (Hegenberger Road to Bay Fair BART)



4.5 Sources of Dwell Time

As stated above, the amount of time a bus is at a stop loading, or discharging passengers is considered "dwell time." The largest sources of dwell time generally corresponded with the highest volume bus stops. Boarding activity is the largest contributor to dwell time, and it can be exacerbated by particular behavior that slows the boarding process. According to 2009 Nelson/Nygaard Study, 34% of 1R passengers pay with a cash fare, and 32% use a dunk pass (that is physically inserted into a reader on the farebox), such as the 31-day or 10-ride ticket.

Referencing the dwell time study conducted as part of the District's Line 51 Service and Reliability Study, each of these methods can take up to six seconds per passenger in boarding time. The use of the Clipper "smart card" as a fare payment method can reduce the boarding time per passenger to approximately two seconds. Only 3% of 1R passengers currently use the Clipper card; however 15% of passengers use the UC Berkeley class pass. The class pass is a "flash pass," and is also quick fare payment method.

Table 4.2 presents the stop locations that represent the highest average dwell time throughout the system. Additionally, Figures 4.8, 4.9, 4.10, 4.11, 4.12, 4.13 are graphic representations of dwell locations.

Table 4.2 - Top 10 Dwell Locations

Direction	Stop Name	Average Dwell (Seconds)
South	International Boulevard and 34th Ave	78
South	Broadway and 14th St	71
South	Shattuck and Allston Way	58
North	Bay Fair BART station	57
South	11th St and Broadway	53
North	International Boulevard and 34th Ave	48
North	International Boulevard and 98th Ave	42
South	Telegraph Ave and 40th St	42
North	International Boulevard and 82nd Ave	40
South	Telegraph Ave and 50th St	40

Figure 4.8 – Northbound Dwell (Bay Fair BART to 73rd Avenue)

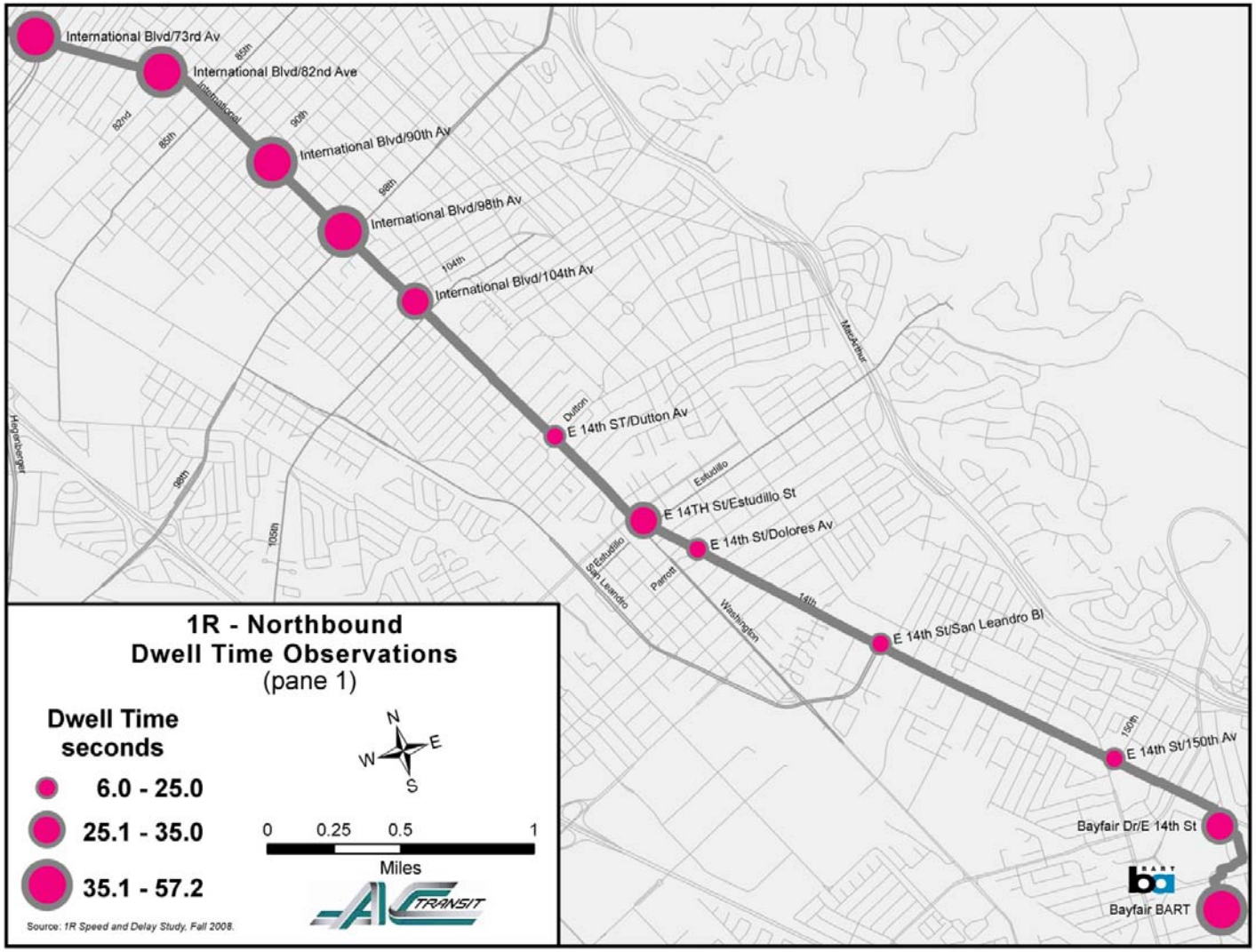


Figure 4.9 – Northbound Dwell (73rd Avenue to Downtown Oakland)

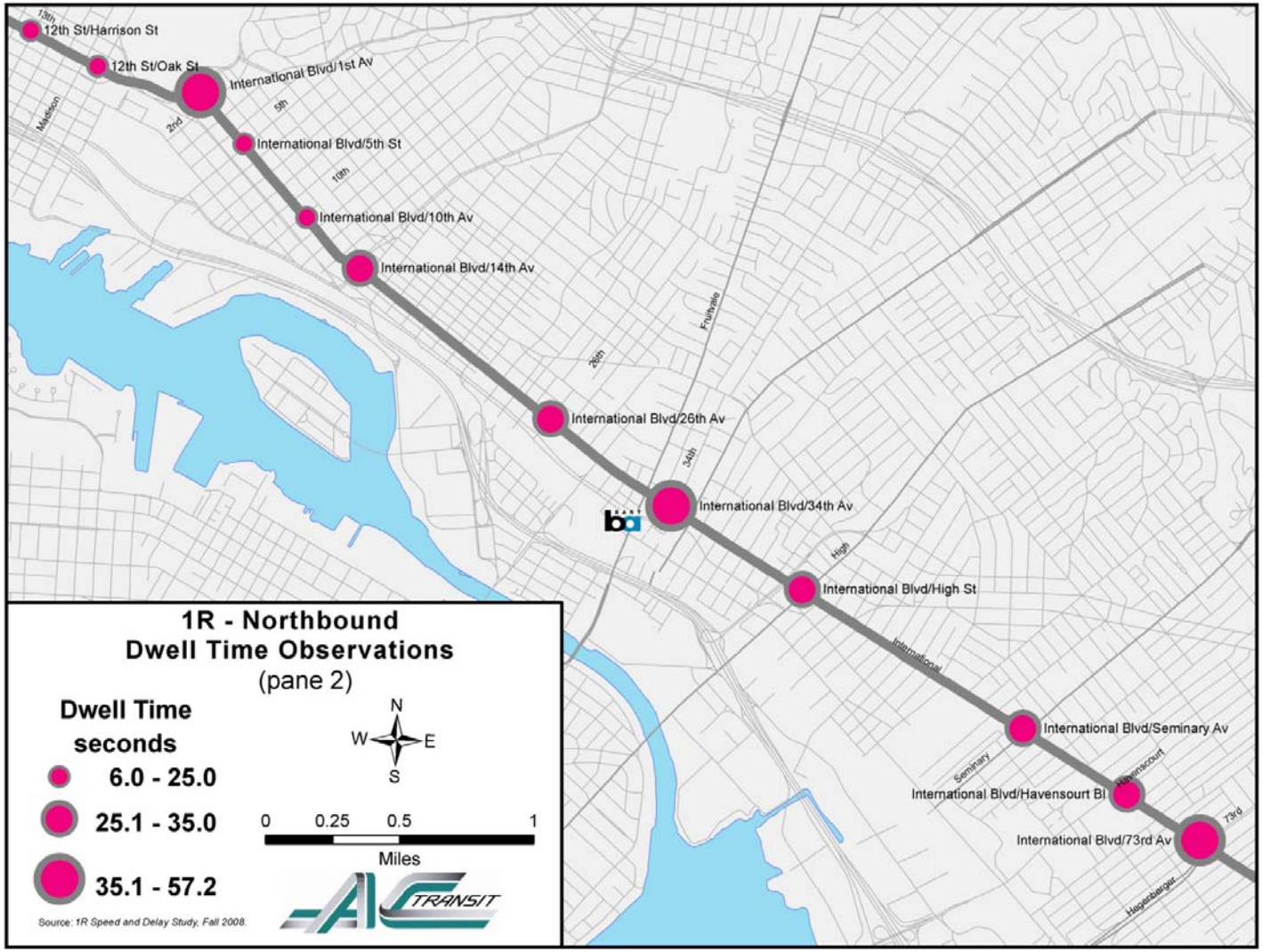


Figure 4.10 – Northbound Dwell (Downtown Oakland to Downtown Berkeley)

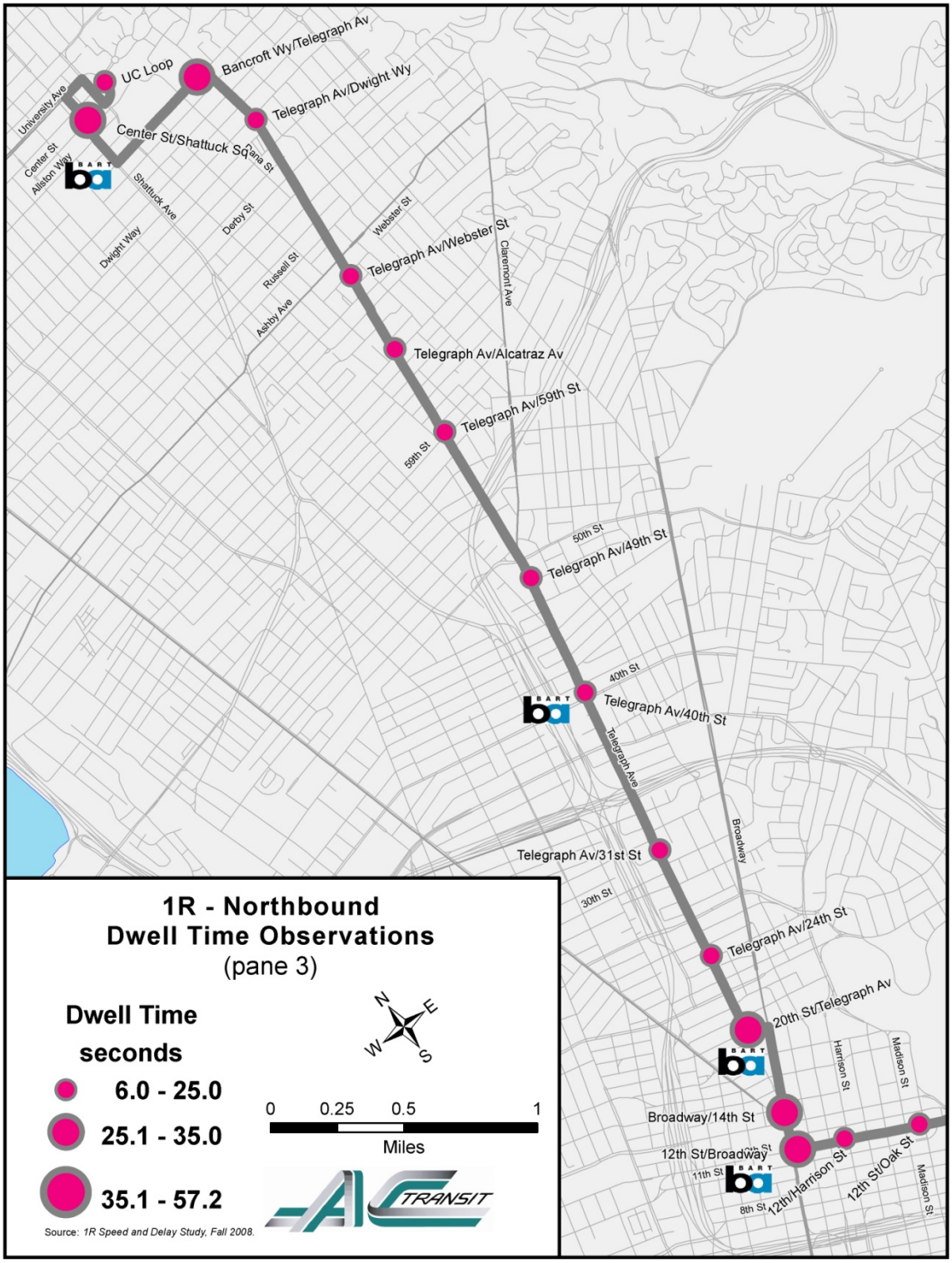


Figure 4.11 – Southbound Dwell (Downtown Berkeley to Downtown Oakland)

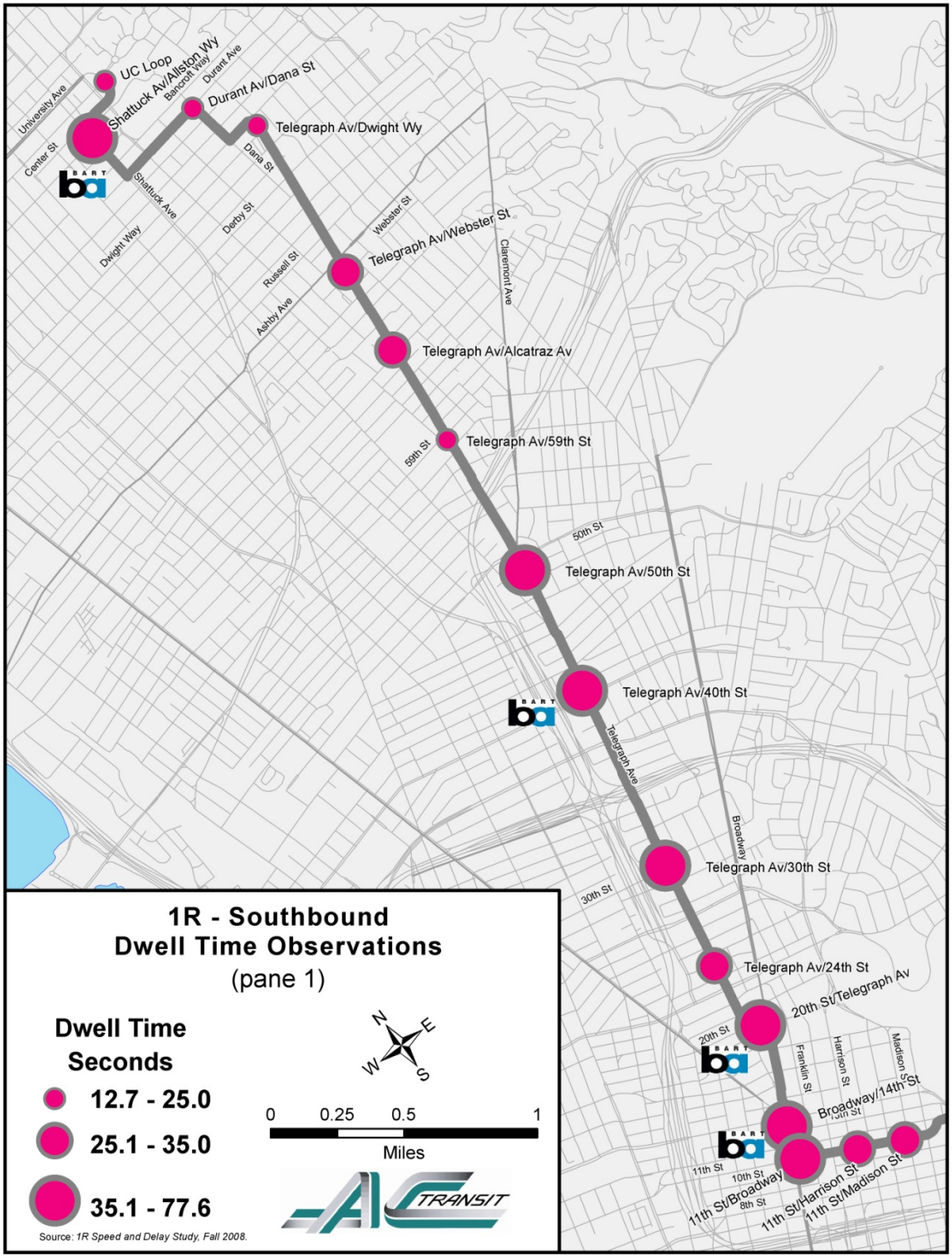


Figure 4.12 – Southbound Dwell (Downtown Oakland to 73rd Avenue)

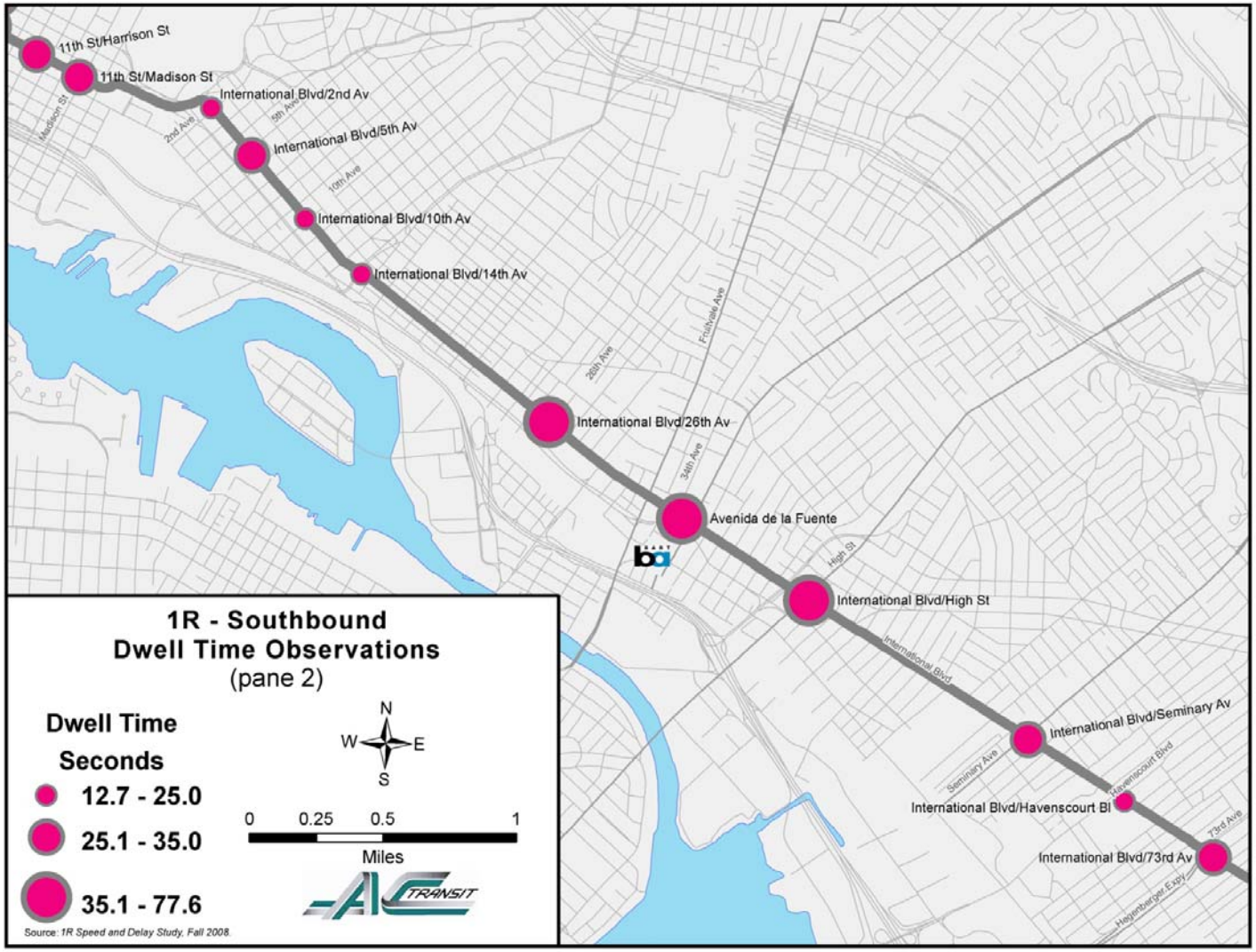
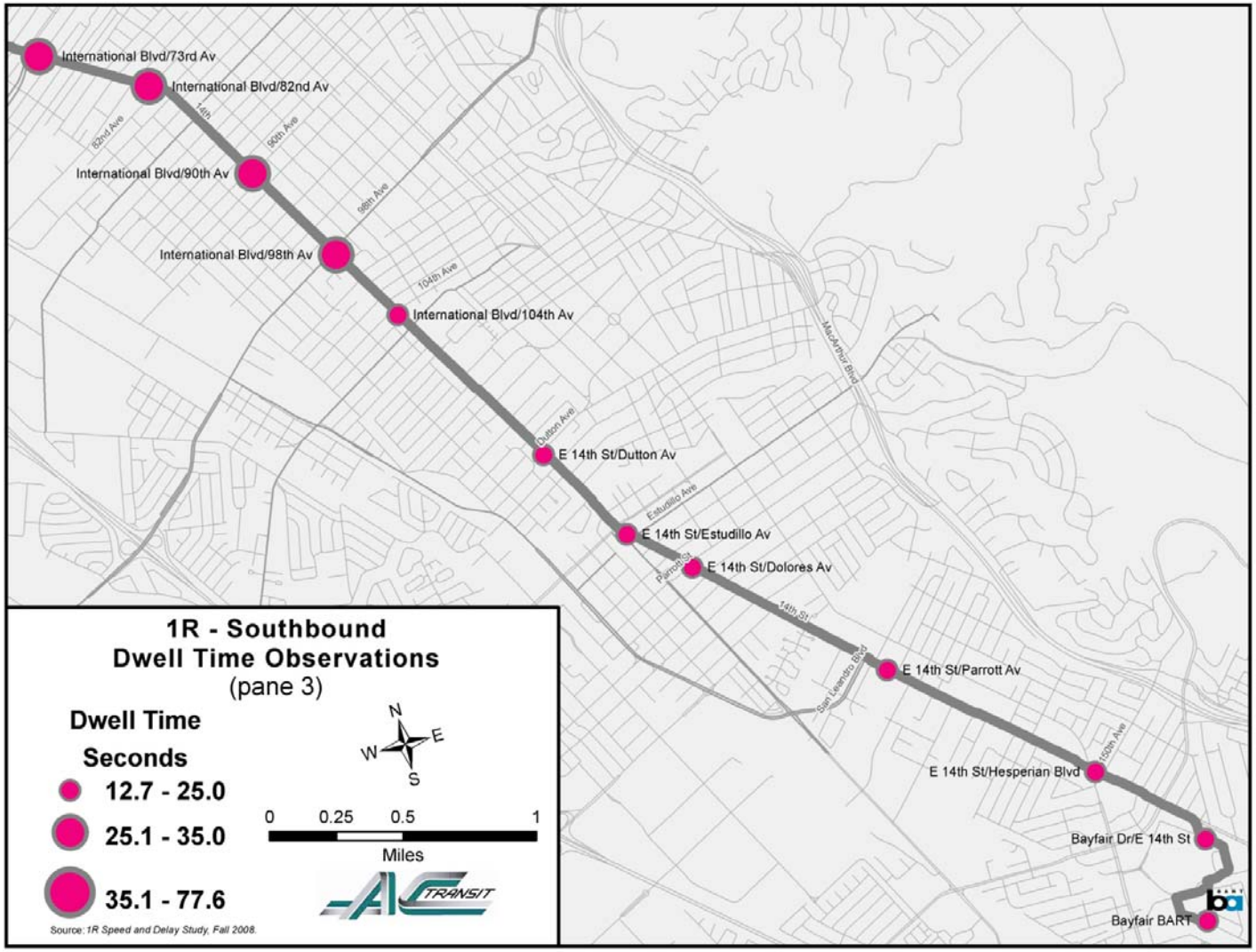


Figure 4.13 – Southbound Dwell (73rd Avenue to Bay Fair BART)



5 Findings and Recommendations

Based on the data collected during the course of the Study, staff has divided recommendations for improving Line 1R's operations and reliability into three key areas:

- Corridor-wide Recommendations –apply to the entire route as a whole
- City and Segment-Level Recommendations – apply to specific portions of the corridor
- Stop Level Recommendations – apply to individual bus stops.

Each of these areas of recommendation is discussed and presented in more detail in this chapter.

5.1 Corridor-wide Recommendations

Corridor-wide recommendations are applicable to the bus service on East 14th Street, International Boulevard and Telegraph Avenue as a whole. These include recommendations about signage, customer education, automatic vehicle announcements, operator training, operations management, fare payment, scheduling, fleet deployment, signal progression, and signal priority.

5.1.1 Signage and Customer Education

In order to reduce dwell times, staff recommends a customer education campaign, including signs posted on the buses, that would encourage passengers to observe the following protocols:

> **"Please Move to the rear of the bus."** The front doorway on the Rapid buses can become a bottleneck that prevents other intending passengers from boarding. Encouraging passengers to move to the rear of the bus after paying the fare should alleviate this condition.
> **"Please Help Keep the Aisles Clear."** Passengers should be encouraged to move strollers and other large carry-ons out of the aisles to aid with boarding and alighting.
> **Please Exit through the rear door."** Passengers should use the rear door to alight from the bus whenever possible. By using the rear door to exit the bus, the front door can be used primarily for passengers boarding the bus. In order to safely promote rear door exiting, the bus must have sufficient ability to be flush with the curb (The bus stop inventory in Chapter 2 highlights stops that need remediation to facilitate implementing this recommendation).

These signs should be available in multiple languages to reflect the diversity of Line 1R customers.

Additionally, the Automatic Vehicle Announcement (AVA) system should also be used to educate passengers regarding the above guidelines when riding the bus.

5.1.2 Stroller Policy

The District currently has a stroller policy that provides guidance to both patrons and operators regarding the use and transportation of strollers. Due to the high numbers of strollers on the route, and to reduce conflicts and safety hazards within the coach, staff recommends the following:

> **An enhanced stroller area should be created.** If two wheelchair securement areas are insufficient to accommodate the volume of strollers and other mobility devices on Line 1R, the use of flip seats, replacing standard seating, would allow for more of these devices on the Rapid buses. It is recommended that staff pursue cost and feasibility estimates for replacing a portion of seating in the 1R Rapid bus trailer area with flip seats that could either be used for seated passengers or flipped up to allow for more stroller and mobility device accommodation.
> **Operating Procedure changes.** Transportation is refining and clarifying existing operating procedures in the Districts Operator User Guide (OUG) concerning stroller and wheelchair policies, with an emphasis on safety and devices fitting within the available space.

5.1.3 Pavement Markings for Boarding Areas and Wheelchair Zone

Pavement markings should be used at 1R bus stops to mark the location of the front door and the middle zone on the Rapid buses with a wheelchair logo showing the location of where the wheelchair lift would deploy. These markings help to clearly to delineate loading zone, while providing disabled and special needs passengers clear loading zone locations, to facilitate quick access to the wheelchair ramp. This will help to decrease the time needed to board the bus since passengers will know where to wait to get on the bus. The markings should be placed properly to ensure that someone waiting in the accessible boarding zone does not impede patrons alighting the bus.

5.1.4 Operator Training and Orientation

Due to the unique operating characteristics of the Line 1R, and for operators to have a better understanding of the function of the Rapid route from both a passenger and operations perspective, Rapid training should be required for any operator wishing to sign runs operating either the Line 1R or 72R. Refresher training should be required on an annual basis in order to reinforce these skills. Both trainings should contain behind-the-wheel elements to ensure that operators are aware of the special driving circumstances required when driving a Rapid line.

Operators should be presented with a certificate and/or pin upon successful completion of the course material.

5.1.5 Line Management

The Division where Line 1R is assigned should ensure that all schedules on the line pull out of the yard on time to ensure a timely departure at the scheduled starting point and time. Late yard pulls can lead to on-time performance issues throughout the day, particularly on Rapid routes with short headways.

Supervision should use active line management to implement short turns, holds, or deadheads if the line is running late or early. Headways should be spaced and maintained consistently at 12 minutes. When two or more buses run back-to-back, passengers often have to wait for long intervals between the remaining buses, thus leading to overcrowding conditions. The effect often snowballs, with the remaining buses running later and later due to the heavy passenger loads.

The District currently employs the use of Closed-Circuit TV (CCTV) systems at both ends of the line to aid with line management. This approach should be evaluated for effectiveness, and if found to be inadequate alternative approaches should be defined. One alternative is to assign a road supervisor to *both* ends on the line. This is unfortunately cost prohibitive and staff intensive. As an alternate solution, the District should explore the use of a, "countdown clock," at each end of the line that would trigger a 12 minute countdown from the last bus departure. This option assumes that if an operator knows precisely when the prior vehicle left, spacing can be more regular without supervisor intervention.

As part of its AVL system, the District employs the use of mobile Computer Aided Dispatch (CAD) terminals via laptop. Supervisors assigned to the Rapid lines should be equipped and trained to use mobile CAD terminals. The proper use of these tools will enable supervisors to monitor bus spacing, delays, bunching from a route-wide perspective. Supervisors can then make informed decisions about when it is necessary to short turn or deadhead a schedule. In addition, a report should be developed that will allow a computer screen to be placed in dispatch offices that would display buses organized by those leaving in 5 minutes, those scheduled to leave, "now," and buses that are more than five minutes late in pulling from the yard. This type of report would assist operators and dispatchers alike in monitoring bus yard activity and avoiding potential late pulls.

5.1.6 Fare Payment

More efficient methods of fare payment should be encouraged in order to reduce dwell time at the bus stops.

Data from the Line 51 Task Force report showed that the use of contact-less forms of payment such as Clipper greatly reduce dwell time. Cash payment methods can vary, but it often takes much longer due to the need for the customer to hunt for appropriate change and unfold wrinkled dollar bills. Use of a, "dunk," pass takes six seconds to process per customer boarding the bus. Clipper cuts this time to two seconds. By encouraging regular 1R passengers to use Clipper in lieu of the "dunk" passes, dwell time could be significantly reduced. Currently, the District is working towards implementation of a complete Clipper conversion plan, to be completed in the near future.

In addition to Clipper, off-board cash fare payment should be encouraged at high volume transit stops by installing ticket vending machines (TVM) or single use Clipper tickets. These vending machines would reduce the need for cash paying riders to feed coins and bills into the farebox. This could greatly reduce dwell times at these stops. The machine

could issue a flash pass that could be shown to the operator upon boarding. A passenger incentive for using the TVM could be a discounted fare. There are security and fare evasion stratagies that would require further exploration should the District pursue this recommendation.

Staff recommends consideration of the following bus stops as possible test locations for TVMs along Line 1R:

- Downtown Berkeley (Shattuck Avenue at Allston Way)
- Uptown Transit Center (20th Street at Telegraph Avenue)
- Downtown Oakland (Broadway at 14th Street, 11th Street at Broadway, and 12th Street at Broadway)
- Chinatown (11th Street at Harrison Street, 12th Street at Harrison Street)
- Fruitvale commercial district (International Boulevard at 34th Avenue)
- Bay Fair BART

In recognition of the delays caused by various paper fare media, AC Transit's Marketing Department anticipates that all paper fare will be eliminated commensurate with total conversion to Clipper, with only transfers remaining in the, "dunk," format. Cash payments will, of course, still be accepted.

5.1.7 Fleet Deployment

Issues ranging from un-planned breakdowns to preventative maintenance have resulted in Non-Rapid equipment being deployed on the Line 1R. 15 buses are currently scheduled on this route, and 15 buses are equipped with Transit Signal Priority (TSP) emitters and Rapid logo branding.

The current 1R fleet has no spare ratio. When non-Rapid equipment is substituted on Line 1R, it can have a negative effect on the performance of the line. Rapid-branded buses have TSP emitters, and the non-Rapid buses are not so equipped. This inconsistency will lead to some schedules operating faster than others, which be another contributing cause to schedule unreliability and lead to bus bunching on the route.

In order to avoid these problems, staff recommends implementing a 20% spare ratio for the Line 1R. Each of these spare buses should be equipped with TSP emitter and Rapid branding. Implementation of this requirement would mandate the assignment of an additional four coaches to populate the spare fleet for the line; it is further recommended that five vehicles that are complementary to the existing line fleet be converted and added to the Rapid fleet.

The Division should be mandated to dispatch Rapid enabled buses on the route. Maintenance and Repair of Rapid Buses should be a prioritized to minimize out of service time.

5.1.8 Route Operation

Currently, the District's two Rapid Routes, 1R and 72R, do not operate in the same way. The Line 1R is promoted as a "headway-based" route, but has unpublished scheduled time points that the operators use as a guideline. In a typical local bus route, operators use time points as a location at which to stop and wait or accelerate as they gauge their progress along the route to that point. If the Line 1R is to continue to operate as a time point focused route, staff recommends the following:

- Time points should be created to ensure that there is a flow to the line that is timed to ensure that no operators will "post" at any time point location.
- Operators should be expected to meet Line 1R time points as scheduled.
- The Marketing Department should update the public timetables to include the scheduled time points as a guide to passengers in determining bus arrival.

Alternatively, it could be decided that the Line 1R will operate similar to the District's other Rapid route, Line 72R. On the Line 72R, the scheduled time points are designated as "shadow time points," bus operators are not disciplined for running ahead of schedule at these time points, but they are instructed to use them as pacing guides. Currently, Line 1R operators are disciplined for running ahead of the "phantom time points".

5.1.9 Service and Scheduling

Additional PM Peak Bus

Afternoon and PM peak 1R buses often run late and are unable to make the scheduled running time. As such, staff recommends the addition of another 1R bus to accommodate the longer running times necessitated by heavy passenger loads and traffic encountered in the afternoon on International Boulevard.

Scheduling Consistency

There are known and defined benefits to having a line operated consistently. When the same bus operator drives the line on a regular basis, certain nuances and issues with the line are known and a reciprocal relationship between the operator and customers can be established. Unfortunately, the opposite is also true, and the lack of a regular bus operator on a line can result in a disjointed operating situation, leading tounreliability and bunching. This situation is exacerbated due to the unique driving characteristics required for Rapid route operations. Currently, there is a high prevalence of fragmented pieces of work ("frags") on Line 1R, increasing the likelihood of an extraboard operator driving the route. Extraboard operators, by definition, are not likely to operate any one route on a daily basis. As such, they can not be in tune with a route and its nuances.

To address this situation, the Scheduling Department has estimated the number of platform hours required to convert the currently fragmented Line 1R runcut into a series of signed runs. Implementation of this strategy will requite an additional 2 platform hours per day. The District is planning implementation of this recommendation effective for the March 2010 signup.

5.1.10 Transit Signal Priority

Transit Signal Priority (TSP) is an integral piece of the Rapid lines. TSP allows the bus to hold a traffic signal in the green phase so that the bus can traverse an intersection with a minimum of delay. TSP is not effective unless both the emitter (on the bus) and receiver (on the signal) are working correctly. Regular quarterly maintenance should be conducted on both the emitters and receivers, including placement on a regularly scheduled Preventive Maintenance Inspection (PMI).

In order to proactively discover equipment problems on mobile and fixed-end equipment, emitters and receivers should be tested regularly as part of the District's PMI program. Additionally, the CMA's contractor should use a test vehicle to conduct quarterly tests on all TSP receivers (signals) on the Rapid corridor.

To utilize TSP-enabled signals, bus stops should be relocated to the farside of the intersection to enable the best use of signal priority. The emitters are always transmitting; therefore, they have a tendency to wear out after only a few years of use. The emitter gradually degrades until the signal power becomes very weak. The receivers, on the other hand, are mounted onto the traffic lights and can be damaged as a result of inclement weather conditions. High winds can push the receivers out of alignment such that the emitters will no longer be within the line-of-sight. The lenses are also susceptible to contamination by dirt, dust, or other debris. A regular cleaning of these lenses is needed for the system to remain functional.

5.2 Recommendations by City and Segment

While most recommendations were developed for the route as a whole or for specific stops, several bottlenecks were identified for improvement. These areas include downtown Berkeley and downtown San Leandro.

5.2.1 Downtown Berkeley

Left turn movements of Line 1R in downtown Berkeley often require several traffic signal cycles Specifically, delays were often encountered during the left turning movement in the southbound direction on Shattuck Avenue at Durant Avenue. The traffic signal should be equipped with a longer "protected turn" phase to expedite the movement of Rapid buses through this intersection. The District Traffic Engineer should work with the City traffic department to complete a traffic study of the area using "Synchro" to best determine adequate phasing.

5.2.2 Downtown San Leandro

Line 1R buses are often caught behind left turning vehicles in downtown San Leandro. In this area of San Leandro, only one through lane exists, often without left turn pockets. When an automobile needs to make a left turn, all other traffic must wait behind that car until the turning movement can be made. This can cause Line 1R buses to sit through an additional traffic signal cycle. Left turn restrictions should be considered on East 14th Street in areas where lane capacity is restricted, particularly during the peak commute hours. The left turn restrictions would be most useful in the northbound direction between

Estabrook Street and Juana Avenue. This area of East 14th Street is under Caltrans' jurisdiction. The District Traffic Engineer should work with the City and/or Caltrans' traffic department to complete a Synchro analysis of the area to best determine adequate phasing.

5.3 Stop Level Recommendations

Planning staff measured all Rapid stops on Line 1R corridor. Many stops were found to be deficient, with either not enough red curb or obstructions blocking the wheelchair ramp deployment area. The results of this bus stop survey as well as recommended remedies, are displayed in Tables 5.1 and 5.2. Many of the necessary improvements will require the loss of parking to accommodate the articulated coaches safely. For nearside stops (before traffic signal), 80 feet of unobstructed red curb is needed behind the pole to allow the 60 foot articulated buses to pull into the stop without delay. An additional 10-foot buffer from the crosswalk is also required in front of the pole. For farside stops (after traffic signal), 65 feet of unobstructed red curb is needed behind the pole, and an additional 15 feet of red curb is needed to pull out of the stop.

Consistent with mandates from the Americans with Disabilities Act, all stops also require a minimum 5 by 8 foot clear area near the middle door. The middle door on the District's buses is typically located 16 to 24 feet from the front of the bus. In accordance with AC Transit Board Policy 508, bus stops should be located to the farside of signalized intersections whenever possible. Farside stops are generally desirable because they require less curb space, and the operator is able to utilize the length of the intersection to pull safely and directly into the bus stop. Additionally, a farside stop allows the bus to freely continue down the road after picking up and discharging passengers without having to wait for a traffic signal to turn green.

Additionally, staff looked at the feasibility of, "de-coupling," several heavily used bus stops on the Line 1R where dwell times were highest. De-coupling is the process of splitting a single bus stop that serves both the Lines 1 and 1R into two locations and the following two locations were considered for this treatment:

- International Blvd at 34th Ave (Fruitvale BART)
- Harrison Street on both 11th and 12th Streets (Chinatown)

34th Avenue was selected due its high passenger volume and high stroller use and Harrison Street was selected for both its high passenger volumes and due to additional bus stop congestion caused by Line 40. In many cases, 1R buses were unable to pull into the coach stop because it was occupied by either a Line 1 or Line 40 coach.

Unfortunately, both of these locations are particularly constrained for available curb space. 34th Avenue and Harrison St have heavy parking demand and many parking meters. Decoupling the stop would mean the removal of all metered parking spaces on the entire block and that can be cost prohibitive as parking meters are also seen as revenue generators. Staff will keep exploring the potential for pilot implementation of decoupling at alternative locations to assess the efficacy of the strategy.

Table 5.1 – Northbound 1R Bus Stops

Name	Location	Stop Spacing (feet)	Stop Length (feet)	Stop Length (from pole, in feet)	Deficiency Exists	Suggested Remedy
Bay Fair BART station	At		151	151	No	N/A
Bay Fair Drive at East 14th Street	Midblock	2298	30	24	Yes	Move bus stop onto street outside mall
East 14th Street at 150th Avenue	Farside	3849	81	75	Yes	Move shelter back from curb 5 additional feet, repair sidewalk
East 14th Street at San Leandro Boulevard	Farside	5179	60	53	Yes	Relocate stop outside of intersection, repair sidewalk
East 14th Street at Dolores Avenue	Farside	4073	57	54	Yes	Move bus pole back 7 feet or lengthen red curb 23 feet, Move Nextbus sign, tree and bench further back from curb; 2 feet minimum
East 14th Street at Estudillo Avenue (cutout)	Farside	1213	89	61	Yes	Move trash can and other street furniture away from curb to minimum 2 feet distance
East 14th Street at Dutton Avenue	Farside	2436	95	80	No	N/A
International Boulevard at 104th Avenue	Nearside	3844	76	59	Yes	Extend red curb 14 feet (beyond driveway), move light- blocks wheelchair lift, repair sidewalk
International Boulevard at 98th Avenue	Farside	1853	119	122	Yes	Repair sidewalk and move tree box to at least 2 feet from curb
International Boulevard at 90th Avenue	Nearside	2035	64	46	Yes	Move bus pole to within 10 ft of crosswalk, extend red curb 26 feet, repair sidewalk
International Boulevard at 82nd Avenue	Farside	2883	91	88	Yes	Move bus pole back 7 feet

Name	Location	Stop Spacing (feet)	Stop Length (feet)	Stop Length (from pole, in feet)	Deficiency Exists	Suggested Remedy
International Boulevard at 73rd Avenue	Farside	2640	123	117	Yes	Move bus pole back 4 feet, move paper stand back at least 2 feet from curb
International Boulevard at Havenscourt Boulevard	Nearside	1669	106	57	Yes	Move bus pole to other side of driveway
International Boulevard at Seminary Avenue	Farside	2440	78	77	Yes	Removing loading zones behind bus stop and extend red curb at least 2 feet, move bike rack back from curb at least 2 feet
International Boulevard at High Street	Farside	5136	44	42	Yes	Extend red curb 36 feet beyond current bus pole location, move bus pole to 10 feet from new red curb terminus
International Boulevard at 34th Avenue (bus bulb)	Farside	3061	80	64	No	N/A
International Boulevard at 26th Avenue	Nearside	2929	61	49	Yes	Extend red curb beyond driveway (29 additional feet), move street furniture back from curb at least 2 feet, sidewalk badly needs repair
International Boulevard at 14th Avenue	Nearside	4760	94	87	Yes	Move bus pole back 3 feet, move trash can at least 2 feet from curb
International Boulevard at 10th Avenue (bus bulb)	Nearside	1489	76	63	Yes	Lengthen bus bulb and/or red curb 14 feet, move tree box back from curb 2 feet
International Boulevard at 5th Avenue (bus bulb)	Farside	1906	46	40	Yes	Lengthen red curb to crosswalk and extend red curb for 34 total additional feet of red curb, repair sidewalk

Name	Location	Stop Spacing (feet)	Stop Length (feet)	Stop Length (from pole, in feet)	Deficiency Exists	Suggested Remedy
International Boulevard at 1st Avenue	Nearside	1320	67	55	Yes	Remove two parking spaces behind bus stop and extend red curb 23 feet
12th Street at Oak Street	Farside	2218	80	68	Yes	Move bus pole 3 feet to north, and 2 feet from curb, move bus shelter an additional 5 feet from curb
12th Street at Harrison Street	Farside	1506	74	64	Yes	Remove one parking space ahead of bus stop (to north) and extend red curb 6 feet, move trash can back from curb 1 foot more
12th Street at Broadway	Nearside	957	90	68	Yes	Move bus pole forward 12 feet, large part of curb is missing and needs repair
Broadway at 14th Street	Farside	844	65	50	Yes	Remove loading zone ahead of bus stop and maintain red curb to 80 feet, move bus pole to within 10 feet of new northern terminus of stop, bench and trash can must move back 5 feet more (block lift), repair sidewalk
20th Street at Telegraph Avenue	Nearside	2124	83	81	Yes	Extend red curb beyond driveway for 7 feet of additional bus stop length
Telegraph Avenue at 24th Street	Farside	1681	87	67	Yes	Remove old parking meter pole (no meter) that is blocking lift access, this stop could really use some amenities and lighting
Telegraph Avenue at 31st Street	Farside	2312	107	102	Yes	Move bus pole and shelter back 10 feet and move all street furniture at least 2 feet from curb, repair sidewalk

Name	Location	Stop Spacing (feet)	Stop Length (feet)	Stop Length (from pole, in feet)	Deficiency Exists	Suggested Remedy
Telegraph Avenue at 40th Street	Farside	3461	174	87	Yes	Move street furniture at least 2 feet from curb, move bench an additional 5 feet from curb
Telegraph Avenue at 49th Street	Farside	2474	68	39	Yes	Bound by crosswalks- can't lengthen (do not recommend moving stop now), move street furniture back from curb at least 2 feet and repair sidewalk
Telegraph Avenue at 59th Street	Farside	3347	69	59	Yes	Extend red curb beyond driveway for 11 additional feet of red curb, move bus shelter back 1 foot more from curb, repair sidewalk, move landscaping and streetscapes back to 2 feet from curb
Telegraph Avenue at Alcatraz Avenue	Farside	1913	79	59	Yes	Extend red curb 1 foot, move bus pole 10 feet north, move landscaping and streetscape back to 2 feet from curb, repair sidewalk
Telegraph Avenue at Webster Street	Nearside	1679	77	62	Yes	Remove one parking space behind bus stop and extend red curb 13 feet, repair sidewalk
Telegraph Avenue at Dwight Way	Nearside	3609	83	55	Yes	Remove one parking space behind bus stop and extend red curb 7 feet, move bus pole to within 10 feet of crosswalk, move shelter back an additional 5 feet from curb, move street furniture back to 2 feet from curb, repair sidewalk
Bancroft Way at Telegraph Avenue	Farside	1585	153	78	No	N/A

Name	Location	Stop Spacing (feet)	Stop Length (feet)	Stop Length (from pole, in feet)	Deficiency Exists	Suggested Remedy
Shattuck Avenue at Center Street	Nearside	3271	105	87	Yes	Move shelter and bench back to 8 feet from curb for lift access

Table 5.2 – Southbound 1R Bus Stops

Name	Location	Stop Spacing	Stop Length	Stop Length (from pole)	Deficiency Exists	Suggested Remedy
Shattuck Avenue at Allston Way	Nearside		147	141	No	N/A
Durant Avenue at Dana Street	Nearside	2886	83	70	Yes	Remove one parking space behind bus stop and extend red curb 7 feet, repair large crack in shelter and move to 8 feet from curb, move trash can to 8 feet from curb
Telegraph Avenue at Dwight Way	Farside	1785	38	31	Yes	Extend red curb 42 feet, move bus shelter back an additional two feet from curb
Telegraph Avenue at Webster Street	Nearside	3371	103	81	No	N/A
Tele graph Avenue at Alcatraz Avenue	Nearside	1801	109	70	Yes	Move bus pole three feet south (to edge of driveway) and 2 feet from curb, move bench and trash cans to 8 feet from curb for wheelchair lift access, repair sidewalk

Name	Location	Stop Spacing	Stop Length	Stop Length (from pole)	Deficiency Exists	Suggested Remedy
Telegraph Avenue at 59th Street	Farside	2095	77	66	Yes	Extend red curb 3 feet to south and move bus pole 3 feet south and two feet from curb
Telegraph Avenue at 51st Street	Nearside	3001	89	83	Yes	Extend red curb four feet, move bus pole four feet north, repair sidewalk
Telegraph Avenue at 40th Street	Nearside	2620	77	70	Yes	Move bus pole 4 feet north, remove loading zone to north of stop and extend red curb for bus stop 13 feet, move trash can to 8 feet from curb, repair sidewalk
Telegraph Avenue at 30th Street	Nearside	3846	61	54	Yes	Bound by crosswalks- can't lengthen (don't recommend moving now), move bus pole to within 10 feet of crosswalk and 2 feet from curb, move shelter to 8 feet from curb, move trash can to 8 feet from curb, repair very large pothole in front of stop
Telegraph Avenue at 24th Street	Farside	2195	86	61	Yes	Move bus pole south 15 feet, move tree five feet back from curb or remove (blocking lift), remove parking regulation sign from bus stop, repair curb and sidewalk, move shelter back to 8 feet from curb
20th Street at Telegraph Avenue	Midblock	1663	49	49	Yes	Extend red curb for bus stop 31 feet
Broadway at 14th Street	Farside	2227	204	150	Yes	Shelters and streetscape need to moved 8 feet from curb for lift access

Name	Location	Stop Spacing	Stop Length	Stop Length (from pole)	Deficiency Exists	Suggested Remedy
11th Street at Broadway	Farside	804	162	145	Yes	Trash can, light pole and newsstand need to be moved to 8 feet from curb for lift and door access
11th Street at Harrison Street	Farside	1120	84	78	Yes	Move bus pole north 3 feet, repair cut pavement and street damage near bus pole's current location, replace dirt areas with concrete or landscaping
11th Street at Madison Street	Nearside	963	90	78	Yes	Move bus pole forward 2.5 feet, move bus shelter back an additional 2 feet from curb, repair sidewalk
International Boulevard at 2nd Avenue	Nearside	2874	61	57	Yes	Remove two parking spaces behind/north of stop and extend red curb 29 feet, move bus pole 6 feet north and 2 feet from curb, move trash can 2 feet from curb, replace dirt with concrete or landscaping, this stop could really use some amenities and lighting
International Boulevard at 5th Avenue (bulb)	Farside	1239	68	68	Yes	Extend red curb beyond driveway to north to lengthen stop by 12 feet, move bus pole 6 feet north, move shelter back 3 additional feet from curb and newsstand back 6 additional feet
International Boulevard at 10th Avenue (bulb)	Nearside	1634	69	52	Yes	Move bus pole two feet back from curb, extend red curb to north 38 feet or remove tree box to north and replace bus pole at 10 feet from red curb origin with a 21 foot extension of red curb to the south, trees need to be moved 8 feet from curb; blocking lift

Name	Location	Stop Spacing	Stop Length	Stop Length (from pole)	Deficiency Exists	Suggested Remedy
International Boulevard at 14th Avenue	Farside	1590	64	52	Yes	Move bus pole 6 feet closer to driveway and 2 feet from curb, extend red curb beyond driveway to lengthen stop 16 feet, move trash can 2 feet from curb
International Boulevard at 26th Avenue	Nearside	1672	91	85	Yes	Move pole back 4 feet, difficult to cross
International Boulevard at 34th Avenue	Farside	3267	65	63	Yes	Bound by crosswalk and bus bulb-can't lengthen, move trash can back additional 6 feet from curb for lift access, bench would be useful
International Boulevard at High Street	Farside	2968	77	71	Yes	Move pole back 4 feet or extend red curb 3 feet to south, very high use stop; could use some amenities
International Boulevard at Seminary Avenue	Farside	5160	99	92	Yes	Move pole back 2 feet, move trash can 2 feet back from curb
International Boulevard at Havenscourt Boulevard	Farside	2274	104	76	Yes	Pole needs to be replaced and moved 2 feet from curb, move shelter back 3 feet
International Boulevard at Hegenberger Road	Farside	2061	104	90	Yes	Move bus pole forward 3 feet and 2 feet from curb, move light pole and trash can 8 feet from curb (blocking lift), repair sidewalk
International Boulevard at 82nd Avenue	Nearside	2256	49	19	Yes	Extend red curb behind stop to make a 90 foot long stop; excluding crosswalks, bus pole should be 10 feet from crosswalk and 2 feet from curb, all street furniture in this area needs to be 8 feet from curb, repair sidewalk

Name	Location	Stop Spacing	Stop Length	Stop Length (from pole)	Deficiency Exists	Suggested Remedy
International Boulevard at 90th Avenue	Farside	2764	56	53	Yes	Blue zone was removed, red curb should be extended- where blue was- 23 feet, bus pole should be moved to ten feet from new red curb terminus and 2 feet from curb, shelter, newsstands and trash can need to move to 8 feet from curb for lift and door access, repair sidewalk
International Boulevard at 98th Avenue	Farside	2268	78	71	Yes	Extend red curb beyond bus pole 3 feet, move fire hydrant, trash can and far tree 8 feet from curb for lift and door access, repair large lifts in sidewalk
International Boulevard at 104th Avenue	Nearside	1690	65	47	Yes	Move bus pole towards crosswalk 8 feet and 2 feet from curb, move shelter and tree to 8 feet from curb, extend red curb 25 feet, repair sidewalk
East 14th Street at Dutton/Best Avenue	Farside	4016	91	62	Yes	Move bus pole forward 19 feet (beyond tree) and 2 feet from curb, move bench and trash 8 feet from curb
East 14th Street at W Estudillo Ave	Nearside	2268	291	205	Yes	Move bus pole to 10 feet from crosswalk and 2 feet from curb, move both trash cans 8 feet from curb
East 14th Street at Parrott Street	Farside	1452	57	45	Yes	Remove parking spaces in front of bus stop and extend red curb 23 feet, move bus pole to 10 feet from new red curb terminus and 2 feet from curb, move trash can, Nextbus sign and bench 8 feet from curb, repair sidewalk

Name	Location	Stop Spacing	Stop Length	Stop Length (from pole)	Deficiency Exists	Suggested Remedy
East 14th Street at San Leandro Hospital/136th	At	4363	127	73	Yes	Replace bus pole with Rapid Pole and move up 15 feet (just before Nextbus sign) and 2 feet from curb, move telephone pole and support that are blocking lift area; eight feet back or not at 16' and 24'- from pole- boarding and lift areas
East 14th Street at Hesperian Boulevard/150th	Farside	4602	30	26	Yes	Move stop to other side of 150th Ave., note that light pole and bench are blocking lift in interim; move 8 feet back of stop does not move for a while
Bay Fair Drive at East 14th Street	Midblock	3815	62	57	Yes	Move stop onto street outside of mall, note that lift area is blocked in interim by shelter and trash; move back to 8 feet
Bay Fair BART station	At	3053	51	35	Yes	Bus flag should be clear that stop is 1R alighting, extend stop to accommodate 60 foot length of articulated bus

5.4 Stop Removal and Consolidation Recommendations

Stops were identified for elimination, consolidation, or relocation based on ridership and minimum stop spacing guidelines.

The following 1R stops should be considered for either removal or relocation, based upon their distance from adjoining stops and/or their passenger activity. According to Board Policy 508, stop spacing for Rapid routes should be between 1700 and 5000 feet. Stops that did not meet these criteria were analyzed for possible removal. Similarly, Line 1R stops that had passenger activity far below the typical average of 160 boardings and 160 alightings were considered for removal.

Dolores Avenue (northbound) – The stop at Dolores Avenue should be removed due to low ridership and stop spacing guidelines. Dolores Avenue is only 1213 feet from Estudillo Avenue. With its removal, there will be 3649 feet between stops which is within the guidelines set by Policy 508. There are 44 daily boardings and 28 alightings at this stop.

Parrott Street (southbound) – The stop at Parrott Street should be removed due to low ridership and stop spacing guidelines. Parrott Street is only 1452 feet from the next stop at San Leandro Hospital. With its removal, there will be 3720 feet between stops which is within the guidelines set by Policy 508. There are 27 daily boardings and 70 alightings at this stop.

26th Avenue – The pair of 26th Avenue stops should be relocated to a signalized intersection at 23rd Avenue to provide connectivity with Line 62. The current stop location is deficient with no stoplight or other traffic control. A signalized intersection would make it easier for passengers to cross International Boulevard. In the northbound direction, this stop has 165 boardings per day and 151 alightings per day; the southbound direction has 163 boardings per day and 175 alightings per day. The new stops would provide for a more even spacing of approximately 3600 feet between stops.

5th Avenue and 10th Avenue (westbound) – In order to improve stop spacing, the 5th Avenue and 10th Avenue stops should be removed. For stop spacing purposes, a new 1R stop should be placed at the 1 local stop at 8th Avenue. The existing westbound 5th Avenue stop is only 1320 feet from the stop at 1st Avenue. The stop at 5th Avenue has 132 boardings per day and 96 alightings per day, while the stop at 10th Avenue has 112 boardings per day and 85 alightings per day. With the proposed new stop spacing, there would be approximately 2300 feet between stops.

5th Avenue and 10th Avenue (eastbound) – As in the westbound direction, the eastbound stops should also be removed with a new Rapid stop placed at 8th Avenue. The existing eastbound stops at 2nd Avenue and 5th Avenue are only 1239 feet apart. The stop at 5th Avenue has 134 boardings per day and 107 alightings per day, while the stop at 10th Avenue has 86 boardings per day and 62 alightings per day. With the proposed new stop spacing, there would be approximately 2300 feet between stops.

1st Avenue (westbound) – the westbound 1st Avenue stop should be relocated to 2nd Avenue to make it easier for buses to make the left turn at 1st Avenue.
11th and 12th Street at Broadway – The bus stops on 11th Street at Broadway and 12th Street at Broadway incur signfiicant delays from right-turning vehicles and pedestrian crossings. The westbound stop at 12th St at Broadway should be moved to the farside of Franklin Street in order to reduce the impact of this congestion. In addition, stop consolidation with the stop at Harrision Street should be considered in order to reduce delays along 11th and 12th Street. If stop consolidation is approved, the new stop would be located at Webster Street with the stops at Broadway and Harrison Street retained for local bus service only.

5.5 Line Split or Restructure

The final section of this chapter deals with the option of truncating or splitting Line 1R into two or more routes. At 17.4 miles, Line 1R is one of the longest routes in AC Transit's service Area. Typically, longer routes are more difficult to manage than shorter ones, since there are, statistically, more opportunities for problems and performance issues to arise. However, each individual route must be considered and evaluated based upon its ridership patterns and service needs.

Staff evaluated the possiblity of splitting the 1R route to help improve its reliablity, however Staff determined that the detriminental effects of splitting the route would outweigh the potential benefits of a shorter route.

A large number of passengers were observed to be "pass through" riders on the 1R route. When analyzing the ridership data, Staff discovered that 28% of passengers that board in East Oakland have destinations along the Telegraph Avenue corridor. Splitting the route in downtown Oakland would require these passengers to transfer.

Staff also looked at the feasiblity of reallocating platform hours from the Telegraph Ave segment of the route to the International Blvd segment. Staff has heard concerns regarding overcrowded buses along International Blvd, but an oversupply of service on Telegraph Ave in Berkeley.

While the demand on Telegraph Ave is lower than along International Blvd, Telegraph Ave continues to be fastest growing segment of the entire route. Many passengers in North Oakland and Berkeley appear to value the higher level of service provided by the 1R Rapid bus in this corridor. In fact, in order to preserve the convenience of limited stop service along Telegraph Ave, this reallocation of service would likely save only 28 hours of platform time, thus leading Staff to deduce that it was not justified to truncate the Line at this time.

In additon, when evaluating the passenger per hour metric of the Telegraph Ave segment, it was determined that this value is only marginally lower than the passenger per hour

observed along International Blvd. The more crowded buses on International Blvd can be explained by more passengers traveling longer distances than on Telegraph Ave. Longer trips contribute to more crowded buses since the passenger turnover on the bus is lower. Passengers travel an average of 7 miles on Line 1R along the International Blvd corridor, while the AC Transit systemwide average is closer to half this rate.

6 Cost Benefit Matrix

Staff used a matrix method to evaluate the cost and benefit of each of the proposed recommendations. The approximate costs and benefits were estimated in order to prioritize the implementation of the recommendations presented in this report.

Each recommendation was evaluated to determine the cost of the program and the estimated benefit. Similar to the method used in the Line 51 Report, the benefit was determined based on a qualitative value which took into consideration four factors. Improvement to reliability was of highest value, followed by time savings, increased ridership, and improve comfort/convenience to passengers. The improvements were grouped into four categories: roadway improvements, programs, resource management, and transit management.

Each program category is defined below:

Program (P)
The program category identifies policies and programs to improve reliability. One example is implementing service announcements using the Automatic Vehicle Annoucement (AVA) system.

Resource Management (RM)
The resource management category identifies methods of resource allocation that can improve the reliability on the route. These items tend to increase supporting or supplemenental services such as adding an additional bus on the route or increasing the vehicle spare ratio.

Roadway Improvement (RI)
The roadway improvement category includes changes to the larger transportation network and encompasses the bulk of the recommendations. These changes include recommendations to improve the traffic signal network, transit signal priority, and turn restrictions.

Transit Management (TM)
The fourth program category is transit management. This category primarily identifies internal AC Transit operational changes such as increased supervision and line management.

Table 6.1 depicts the cost-benefit analysis for each recommendation. The table classifies the recommendations in one of the four categories noted above. A brief description of the recommendation is given in the second column. Lead agencies are identified in the third column.

Table 6.1 Cost Benefit Matrix

Project #		Project Description	Lead Agency	COST	BENEFIT	Impact to Service: Reliability	Impact to Service: Reduction in Travel Time	Impact to Service: Ridership	Impact to Service: Comfort/ Convenience	Time Frame
1	P	Encourage Clipper use for ease and prompt boarding.	AC Transit	$	++++	+	+	+	+	Short
2	P	Rear Door Alighting Guideline allows for improved circulation on the bus and reduces conflicts at the front door between boarding and lighting passengers.	AC Transit	$	+++	+	++	N	+	Short
3	P	Upate Operator User Guide (OUG) to reflect proposed change in stroller policy	AC Transit	$	+++	++	+	N	++	Short
4	P	Distribute Clipper Cards via Middle and High Schools	AC Transit & OUSD	$	++	++	N	N	++	Completed
5	P	Ticket Vending Machines (TVM) at high volume bus stops	AC Transit	$$	+++	++	+	N	+	Long
6	P	Automatic Vehicle Announcements (AVA) to encourage passenger to move to the back, alight from the rear, and fold strollers	AC Transit	$	+++	+	++	+	++	Medium
7	RI	Prohibit left turns at certain locations along corridor, especially on single lane roads, to reduce incidents of turning vehicles impeding traffic flow.	Caltrans & City of San Leandro	$$	++	++	++	N	N	Medium
8	RI	Traffic Signal Timing improves/updates equipment in traffic signals to improve and regulate overall flow.	ACTC	$$$$	++++	++	++	+	N	Long
9	RI	Remove or respace bus stops to be in accordance with Rapid Bus Stop Guidelines of 1700 feet with a maximum spacing of 5000	AC Transit & City	$	++	+	+	–	N	Short
10	RI	Lengthen bus stops to be appropriate length to accommodate ADA access, reduce impact on traffic, and enable buses to pull in and out without blocking crosswalks or traffic.	AC Transit & City	$	+++	++	+	N	+	Short
11	RI	Define clear areas at bus stops and identify areas where wheelchair lifts or bus ramps should be deployed to allow for quick and easy boarding for all passengers.	AC Transit & City	$	+++	+	+	N	N	Short
12	RI	Transit Signal Priority (TSP) and Communications Maintenance	ACTC	$$$	+++	N	++	N	N	Short
13	RI	Provide for longer left turn green time at Shattuck/Durant. Extend left turn pocket as necessary.	City of Berkeley	$	++	+	+	N	N	Medium
14	RM	Add an additional bus in order to accommodate additional time needed to match schedules with observed travel time *	AC Transit	$$$$	++++	++	N	+	N	Completed
15	RM	Increase to a 20% vehicle spare ratio	AC Transit	$	+++	++	N	+	++	Partially Completed
16	RM	Remove seats and reconfigure coach interior for more strollers and other mobility devices.	AC Transit	$$	+++	++	+	N	–	Medium
17	TM	Operator/Dispatch procedures encourages communication to central dispatch when buses are bunched and creates protocol to spread buses out.	AC Transit	$	++	+	N	N	+	Medium
18	TM	Retiming schedules as appropraite to reallocate running time from one segmetn to another to improve on-time performance	AC Transit	$	++	++	N	+	++	Short
19	TM	OperatorAnnual Recurrence Training on the Rapid routes	AC Transit	$$	++	+	N	N	+	Short
20	TM	Use of a "Countdown Clock" to enforce headway-based scheduling	AC Transit	$$	++	++	N	N	N	Medium
21	TM	Supervisor Training and monitoring equipment	AC Transit	$	+++	++	N	N	N	Short
22	TM	Modify route operation by elminating use of timepoints	AC Transit	$	+	–	++	N	–	Completed
23	TM	Active Line Management uses in field supervisors to control buses and make dynamic changes to maintain quality of service. **	AC Transit	$$$$	++++	++	N	+	+	Long

* Requires O&M cost of bus annually.

** Requires O&M cost of roughly 2 FTE. Estimated cost $300K

– –	–	N	+	++
Impact high	Impact low	Neutral	Benefit - low	Benefit - high

P	Programs
RI	Roadway Improvements
RM	Resource Management
TM	Transit Management

Cost

$<50k

$$ 50-100k

$$$ 100-300k

$$$$ >300k

Time Frame

Short - less then 6 months

Medium - under 2 years

Long - more then 2 years

7 Public Outreach

Planning Department Staff implemented a public outreach plan to inform riders and receive feedback on the Report's findings and recommendations.

The external outreach effort was designed to keep passengers informed regarding Staff's recommendations and any proposals to change the operation of the route or stop locations. In addition, staff conducted an internal outreach effort across various departments at AC Transit to present the report and receive additional feedback.

7.1 Internal Outreach

Outreach efforts were coordinated for operators at Division 4 in East Oakland (the bus yard for Line 1R). Division staff set up interviews with specific operators from Line 1R. The feedback and recommendations received from operators helped guide the initial stages of this study.

Since many of the proposed recommendations pertained to changes to internal department procedures, the internal outreach effort was especially important for this Report.The draft copy of this report was provided to Division staff, Supervision, Marketing, Scheduling, and to all Planning Department Staff. Planning Staff provided visual aids to internal department meetings that included maps of dwell time, delay, speed, and potential bus stop consolidation and relocation.

7.2 External Outreach

Staff designed a workshop format geared towards bus passengers and the public. A single workshop was conducted at the AC Transit General Offices on February 25, 2010.

The workshop presented the findings from the report, solicited feedback on all the recommended changes, including proposed bus stop changes, operational and schedule adjustments.

The empahsis for the workshop was to provide maximum time for Planning Department Staff to interact with Line 1R passengers. A short presentation on the report findings and recommendations served as an introduction to the workshop. Promptly afterwards, attendees were encourages to fill out comment cards and talk to Staff members on a one-on-one basis. Each Staff member recorded comments using forms on clipboards as passengers discussed their concerns.

25 passengers attended the workshop, and 9 of these passengers provided comment cards to Staff. In additon, staff members recorded verbal comments for the record.

8 Updates and Next Steps

Since the initial draft of this report, Staff has implemented several of the recommendations presented in Chapter 5 of this report.

8.1 Implemented Recommendations

- Line 1R was moved to Division 6 in Hayward. New operators are now driving the route. Planning and Training staff has conducted training sessions at the Hayward Division to educate these new operators on the route. (5.1.4)

- The Operations Control Center now has a dedicated Supervisor to monitor the 1R and 72R at a central location. This person is responsible for ensuring schedule adherence and making decisions necessary to respace the buses on a day-to-day basis. (5.1.5)

- Paper passes have now been discontinued systemwide. Clipper cards are now being distributed for youth customers at middle and high schools throughout the District. (5.1.6)

- Four additional Van Hool articulated buses have been deployed to the route to bolster the spare ratio of the 1R fleet (Coach numbers 2196 through 2199). However, two buses from the original 1R fleet are inoperable and have been relocated to CMF. Therefore, there are only 17 vehicles available for deployment on the 1R, yet the route now has a peak vehicle requirement of 16 coaches. (5.1.7)

- Line 1R timepoints are now designated as "shadow timepoints," whereby operators are not disciplined for running ahead of schedule, but they are instructed to use them as pacing guides to maintain consistency with the 72R. (5.1.8)

- An additional bus was deployed on the Line 1R starting with the March 2010 signup. Time was added to the schedule in order to match the observed actual running time. Over 80% of 1R trips are now able to make their scheduled timepoints no more than five minutes after their scheduled arrival time. (5.1.9)

- Less than 13% of Line 1R trips are now scheduled to run off the extraboard. This contrasts with almost 50% of Line 1R trips without a regular operator when the Line 1R study began. (5.1.9)

- The westbound bus stop at International and 1st Ave was moved in August 2010 to accommodate the 12th Street dam construction project. This allowed AC Transit to implement the recommendation to move this stop to 2nd Ave. (5.4)

- In June 2009, the northern terminal of the 1R was moved to Berkeley Way at Oxford Street in Berkeley. This helped to reduce delays by providing a more convenient and closer restroom facility for the Line 1R operators.

8.2 Next Steps

- The final Line 1R report will be presented to the AC Transit Board of Directors in February 2011.

- Starting in March 2011, additional frag pieces will be removed from the Line 1R schedule to ensure a regular team of operators on the route. With more regularly scheduled runs, this should provide for more consistent and predictable operation.

- The Running Time Analyzer will be used to continually update and revise the scheduled travel time for Line 1R to improve schedule reliability as conditions change.

- Bus stop consolidations and relocations will be implemented with the June 2011 service changes.

- The next version of the Operator User Guide (OUG) will be updated to reflect a change in stroller policy.

- Planning Staff will meet with City Staff to provide adequate red curb for Line 1R bus stops. In addition, wheelchair deployment areas will be kept clear of obstructions to allow for faster boarding and alighting.

- Additional recommendations will be implemented as funding becomes available.

Appendix

- **Road and Traffic Signal Configuration Tables**

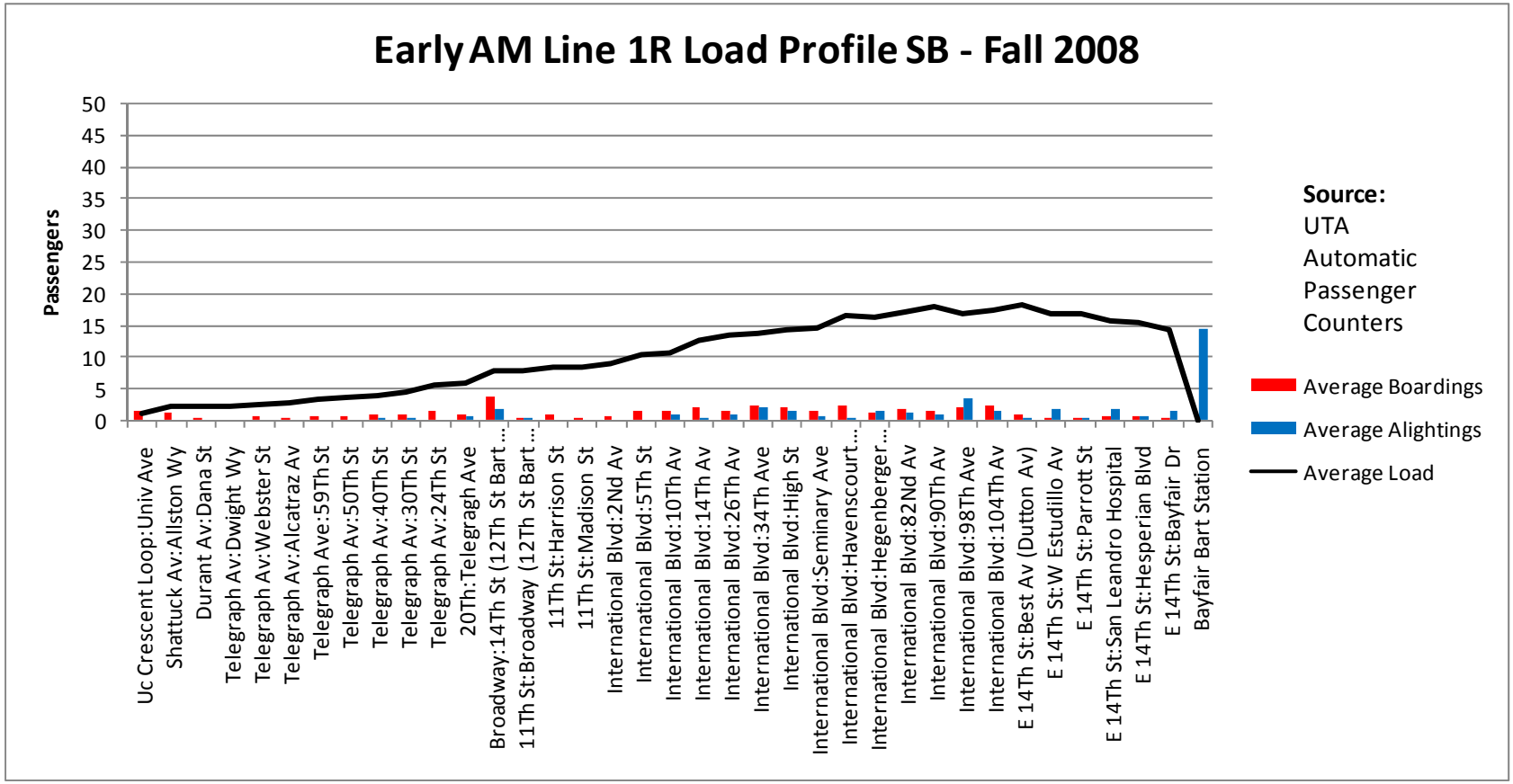
CMA Controller #	Primary Street	Cross Street	Owner	TSP Equipped
7002	East 14th Street	Bay Fair Drive	Caltrans	Yes
7001	East 14th Street	Fairmont Drive	Caltrans	Yes
7007	East 14th Street	150th Avenue	Caltrans	Yes
7008	East 14th Street	Bancroft Avenue	Caltrans	Yes
7009	East 14th Street	148th Avenue	Caltrans	Yes
7010	East 14th Street	143rd Avenue	Caltrans	Yes
TBD	East 14th Street	138th Avenue	Caltrans	TBD
7011	East 14th Street	136th Avenue	Caltrans	Yes
6008	East 14th Street	Estabrook Street	Caltrans	Yes
6007	East 14th Street	Sybil Street	Caltrans	Yes
6006	East 14th Street	Dolores Street	Caltrans	Yes
6005	East 14th Street	Juana Avenue	Caltrans	Yes
6004	East 14th Street	Joaquin Avenue	Caltrans	Yes
6003	East 14th Street	Estudillo Avenue	Caltrans	Yes
6002	East 14th Street	Davis Street	Caltrans	Yes
6001	East 14th Street	Hays Street	Caltrans	Yes
5009	East 14th Street	Dutton Avenue	Caltrans	Yes
5008	East 14th Street	Broadmoor Boulevard	Caltrans	Yes
5007	International Boulevard	Durant Avenue	Caltrans	Yes
5006	International Boulevard	105th Avenue	Caltrans	Yes
TBD	International Boulevard	104th Avenue	Caltrans	TBD
5005	International Boulevard	98th Avenue	Caltrans	Yes
5004	International Boulevard	94th Avenue	Caltrans	Yes
5003	International Boulevard	90th Avenue	Caltrans	Yes
5002	International Boulevard	85th Avenue	Caltrans	Yes
5001	International Boulevard	82nd Avenue	Caltrans	Yes
4009	International Boulevard	73rd Avenue	Caltrans	Yes
4008	International Boulevard	69th Avenue	Caltrans	Yes
4007	International Boulevard	66th Avenue	Caltrans	Yes
4006	International Boulevard	62nd Avenue	Caltrans	Yes

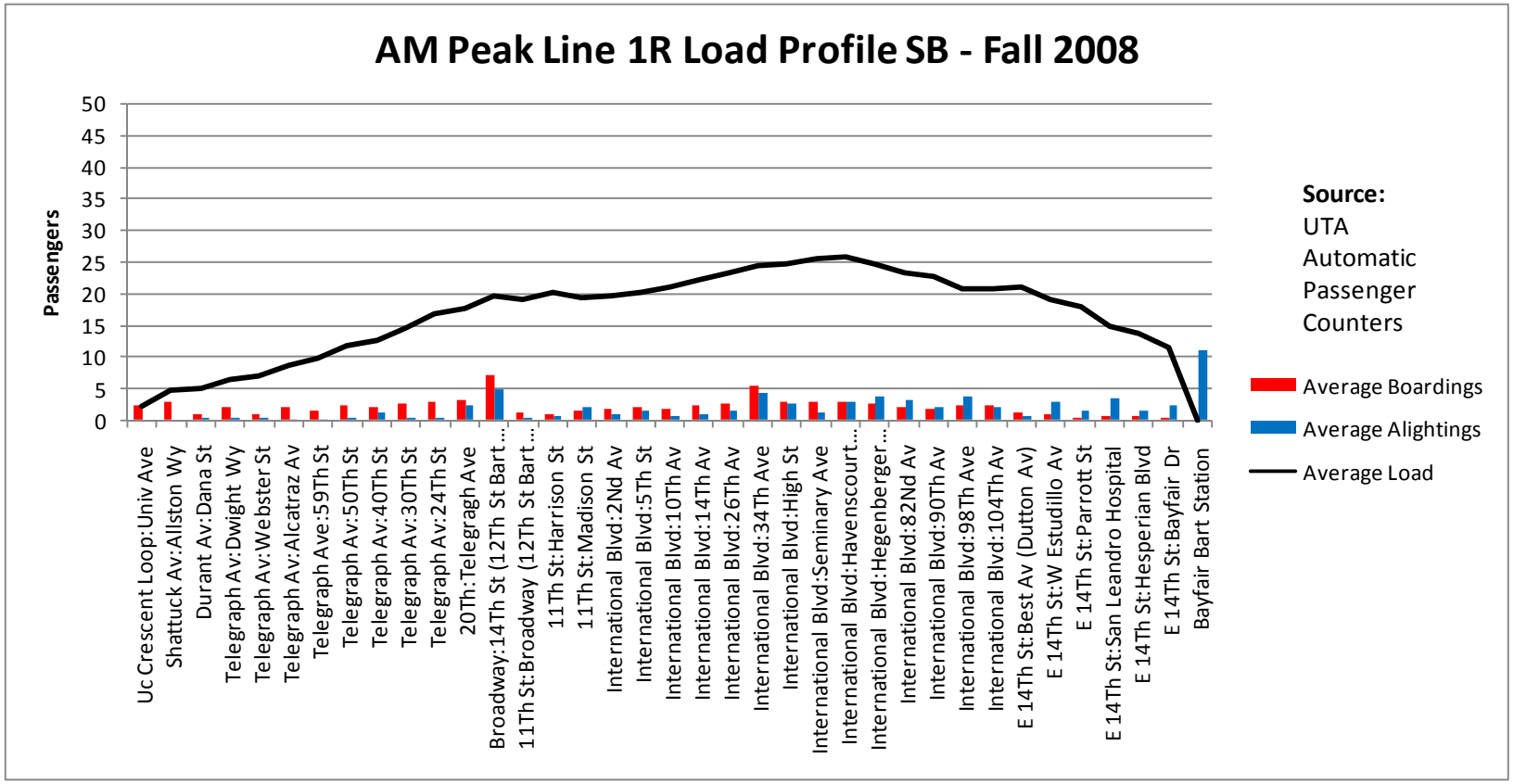
CMA Controller #	Primary Street	Cross Street	Owner	TSP Equipped
4005	International Boulevard	Seminary Avenue	Caltrans	Yes
4004	International Boulevard	53rd Avenue	Caltrans	Yes
4003	International Boulevard	46th Avenue	Caltrans	Yes
4002	International Boulevard	High Street	Caltrans	Yes
4001	International Boulevard	42nd Avenue	Caltrans	Yes
13064	International Boulevard	38th Avenue	City of Oakland	Yes
13063	International Boulevard	35th Avenue	City of Oakland	Yes
13062	International Boulevard	34th Avenue	City of Oakland	Yes
13065	International Boulevard	Fruitvale Avenue	City of Oakland	Yes
13061	International Boulevard	29th Avenue	City of Oakland	Yes
13060	International Boulevard	27th Avenue	City of Oakland	Yes
13059	International Boulevard	25th Avenue	City of Oakland	Yes
13058	International Boulevard	23rd Avenue	City of Oakland	Yes
13057	International Boulevard	22nd Avenue	City of Oakland	Yes
13055	International Boulevard	21st Avenue	City of Oakland	Yes
13054	International Boulevard	16th Avenue	City of Oakland	Yes
13053	International Boulevard	14th Avenue	City of Oakland	Yes
13052	International Boulevard	10th Avenue	City of Oakland	Yes
13051	International Boulevard	8th Avenue	City of Oakland	Yes
13050	International Boulevard	5th Avenue	City of Oakland	Yes
13049	International Boulevard	4th Avenue	City of Oakland	Yes
13048	International Boulevard	2nd Avenue	City of Oakland	Yes
TBD	International Boulevard	1st Avenue	City of Oakland	No
13046	12th Street	Oak Street	City of Oakland	No
13045	12th Street	Madison Street	City of Oakland	No
13044	12th Street	Jackson Street	City of Oakland	No
13041	12th Street	Alice Street	City of Oakland	No
13043	12th Street	Harrison Street	City of Oakland	No

CMA Controller #	Primary Street	Cross Street	Owner	TSP Equipped
13047	12th Street	Webster Street	City of Oakland	No
13042	12th Street	Franklin Street	City of Oakland	No
13039	11th Street	Madison Street	City of Oakland	No
13038	11th Street	Jackson Street	City of Oakland	No
13037	11th Street	Harrison Street	City of Oakland	No
13040	11th Street	Webster Street	City of Oakland	No
13036	11th Street	Franklin Street	City of Oakland	No
13086	Broadway	11th Street	City of Oakland	No
13032	Broadway	12th Street	City of Oakland	No
13024	Broadway	14th Street	City of Oakland	No
13025	Broadway	15th Street	City of Oakland	No
13056	Broadway	17th Street	City of Oakland	No
13034	Broadway	19th Street	City of Oakland	No
13035	Broadway	20th Street	City of Oakland	No
13066	Telegraph Avenue	20th Street	City of Oakland	Yes
13014	Telegraph Avenue	W Grand Avenue	City of Oakland	Yes
13067	Telegraph Avenue	24th Street	City of Oakland	Yes
13068	Telegraph Avenue	26th Street	City of Oakland	Yes
13069	Telegraph Avenue	27th Street	City of Oakland	Yes
13070	Telegraph Avenue	29th Street	City of Oakland	Yes
13071	Telegraph Avenue	30th Street	City of Oakland	Yes
13072	Telegraph Avenue	34th Street	City of Oakland	Yes
13084	Telegraph Avenue	W MacArthur Boulevard	City of Oakland	Yes
13073	Telegraph Avenue	40th Street	City of Oakland	Yes
13074	Telegraph Avenue	42nd Street	City of Oakland	Yes
13075	Telegraph Avenue	45th Street	City of Oakland	Yes
13076	Telegraph Avenue	48th Street	City of Oakland	Yes
13077	Telegraph Avenue	50th Street	City of Oakland	Yes
13078	Telegraph Avenue	51st Street	City of Oakland	Yes
13085	Telegraph Avenue	52nd Street	City of Oakland	Yes
13079	Telegraph Avenue	55th Street	City of Oakland	Yes
13080	Telegraph Avenue	56th Street	City of Oakland	Yes
13082	Telegraph Avenue	Aileen Street	City of Oakland	Yes
13081	Telegraph Avenue	59th Street	City of Oakland	Yes
13083	Telegraph Avenue	Alcatraz Avenue	City of Oakland	Yes
TBD	Telegraph Avenue	66th Street	City of Oakland	TBD
12143	Telegraph Avenue	Woolsey Street	City of Berkeley	Yes
12144	Telegraph Avenue	Webster Street	City of Berkeley	Yes
12145	Telegraph Avenue	Ashby Avenue	City of Berkeley	Yes
12146	Telegraph Avenue	Russell Street	City of Berkeley	Yes
12147	Telegraph Avenue	Stuart Street	City of Berkeley	Yes
12148	Telegraph Avenue	Derby Street	City of Berkeley	Yes
12149	Telegraph Avenue	Blake Street	City of Berkeley	Yes
12150	Telegraph Avenue	Dwight Way	City of Berkeley	Yes
TBD	Telegraph Avenue	Haste Street	City of Berkeley	TBD
TBD	Telegraph Avenue	Channing Way	City of Berkeley	TBD
12081	Telegraph Avenue	Durant Avenue	City of Berkeley	TBD
12036	Telegraph Avenue	Bancroft Way	City of Berkeley	No
12156	Bancroft Way	Fulton Street	City of Berkeley	Yes

CMA Controller #	Primary Street	Cross Street	Owner	TSP Equipped
12084	Dana Street	Haste Street	City of Berkeley	No
12091	Durant Avenue	Dana Street	City of Berkeley	No
12066	Durant Avenue	Ellsworth Street	City of Berkeley	No
12034	Durant Avenue	Fulton Street	City of Berkeley	No
12055	Shattuck Avenue	Durant Avenue	City of Berkeley	No
12054	Shattuck Avenue	Bancroft Way	City of Berkeley	No
12051	Shattuck Avenue	Kittredge Street	City of Berkeley	No
12053	Shattuck Avenue	Allston Way	City of Berkeley	No
12119	Shattuck Avenue	Center Street	City of Berkeley	No

- **1R Passenger Load Profiles**




AM Peak Line 1R Load Profile SB - Fall 2008
Passengers
50
45
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15
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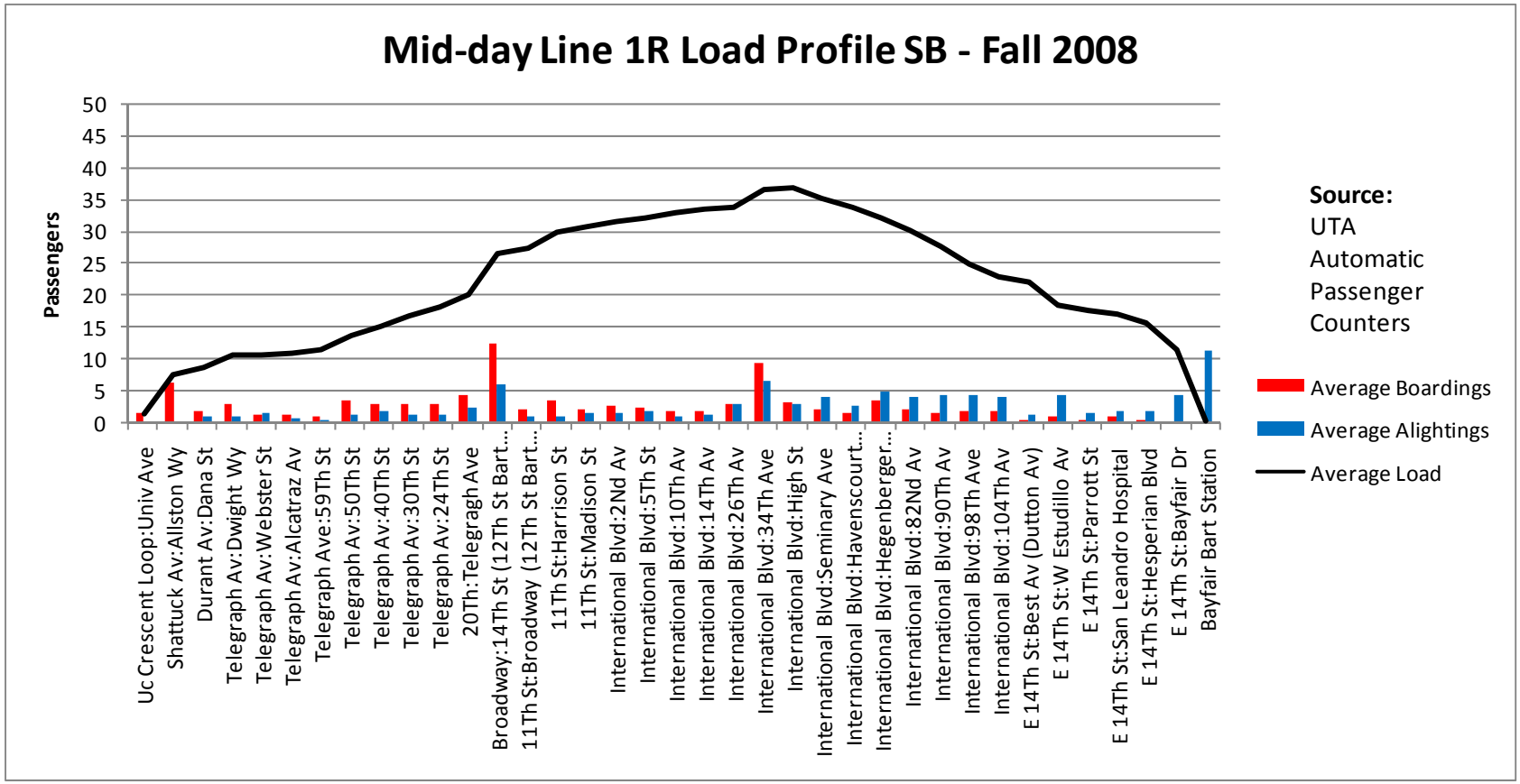
Uc Crescent Loop:Univ Ave
Shattuck Av:Allston Wy
Durant Av:Dana St
Telegraph Av:Dwight Wy
Telegraph Av:Webster St
Telegraph Av:Alcatraz Av
Telegraph Ave:59Th St
Telegraph Av:50Th St
Telegraph Av:40Th St
Telegraph Av:30Th St
Telegraph Av:24Th St
20Th:Telegragh Ave
Broadway:14Th St (12Th St Bart...
11Th St:Broadway (12Th St Bart...
11Th St:Harrison St
11Th St:Madison St
International Blvd:2Nd Av
International Blvd:5Th St
International Blvd:10Th Av
International Blvd:14Th Av
International Blvd:26Th Av
International Blvd:34Th Ave
International Blvd:High St
International Blvd:Seminary Ave
International Blvd:Havenscourt...
International Blvd:Hegenberger...
International Blvd:82Nd Av
International Blvd:90Th Av
International Blvd:98Th Ave
International Blvd:104Th Av
E 14Th St:Best Av (Dutton Av)
E 14Th St:W Estudillo Av
E 14Th St:Parrott St
E 14Th St:San Leandro Hospital
E 14Th St:Hesperian Blvd
E 14Th St:Bayfair Dr
Bayfair Bart Station
Source:
UTA
Automatic
Passenger
Counters
Average Boardings
Average Alightings
Average Load


Mid-day Line 1R Load Profile SB - Fall 2008
Passengers
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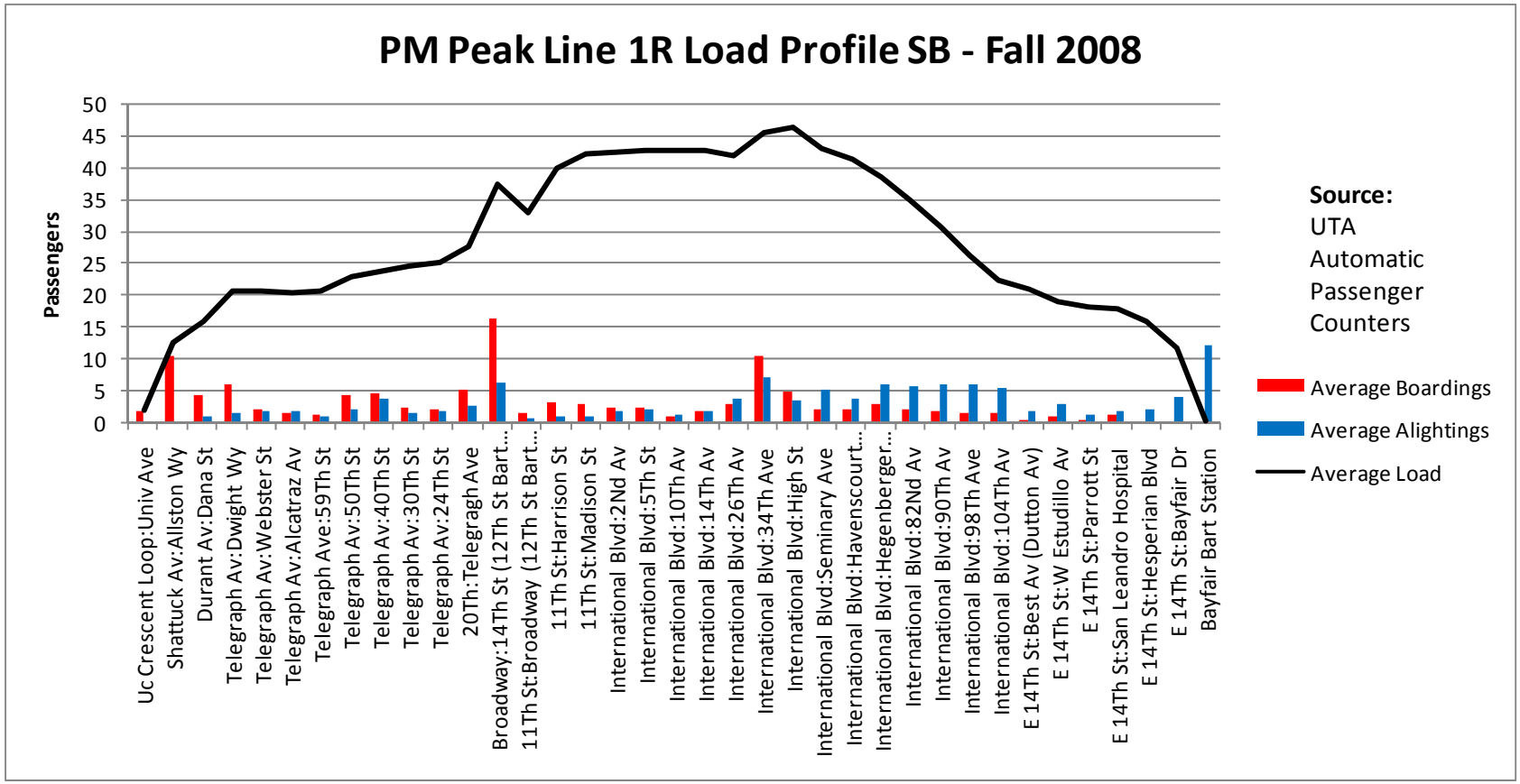
Uc Crescent Loop:Univ Ave
Shattuck Av:Allston Wy
Durant Av:Dana St
Telegraph Av:Dwight Wy
Telegraph Av:Webster St
Telegraph Av:Alcatraz Av
Telegraph Ave:59Th St
Telegraph Av:50Th St
Telegraph Av:40Th St
Telegraph Av:30Th St
Telegraph Av:24Th St
20Th:Telegragh Ave
Broadway:14Th St (12Th St Bart...
11Th St:Broadway (12Th St Bart...
11Th St:Harrison St
11Th St:Madison St
International Blvd:2Nd Av
International Blvd:5Th St
International Blvd:10Th Av
International Blvd:14Th Av
International Blvd:26Th Av
International Blvd:34Th Ave
International Blvd:High St
International Blvd:Seminary Ave
International Blvd:Havenscourt...
International Blvd:Hegenberger...
International Blvd:82Nd Av
International Blvd:90Th Av
International Blvd:98Th Ave
International Blvd:104Th Av
E 14Th St:Best Av (Dutton Av)
E 14Th St:W Estudillo Av
E 14Th St:Parrott St
E 14Th St:San Leandro Hospital
E 14Th St:Hesperian Blvd
Bayfair Bart Station
Source:
UTA
Automatic
Passenger
Counters
Average Boardings
Average Alightings
Average Load


PM Peak Line 1R Load Profile SB - Fall 2008
Passengers
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Uc Crescent Loop:Univ Ave
Shattuck Av:Allston Wy
Durant Av:Dana St
Telegraph Av:Dwight Wy
Telegraph Av:Webster St
Telegraph Av:Alcatraz Av
Telegraph Ave:59Th St
Telegraph Av:50Th St
Telegraph Av:40Th St
Telegraph Av:30Th St
Telegraph Av:24Th St
20Th:Telegragh Ave
Broadway:14Th St (12Th St Bart...
11Th St:Broadway (12Th St Bart...
11Th St:Harrison St
11Th St:Madison St
International Blvd:2Nd Av
International Blvd:5Th St
International Blvd:10Th Av
International Blvd:14Th Av
International Blvd:26Th Av
International Blvd:34Th Ave
International Blvd:High St
International Blvd:Seminary Ave
International Blvd:Havenscourt...
International Blvd:Hegenberger...
International Blvd:82Nd Av
International Blvd:90Th Av
International Blvd:98Th Ave
International Blvd:104Th Av
E 14Th St:Best Av (Dutton Av)
E 14Th St:W Estudillo Av
E 14Th St:Parrott St
E 14Th St:San Leandro Hospital
E 14Th St:Hesperian Blvd
E 14Th St:Bayfair Dr
Bayfair Bart Station
Source:
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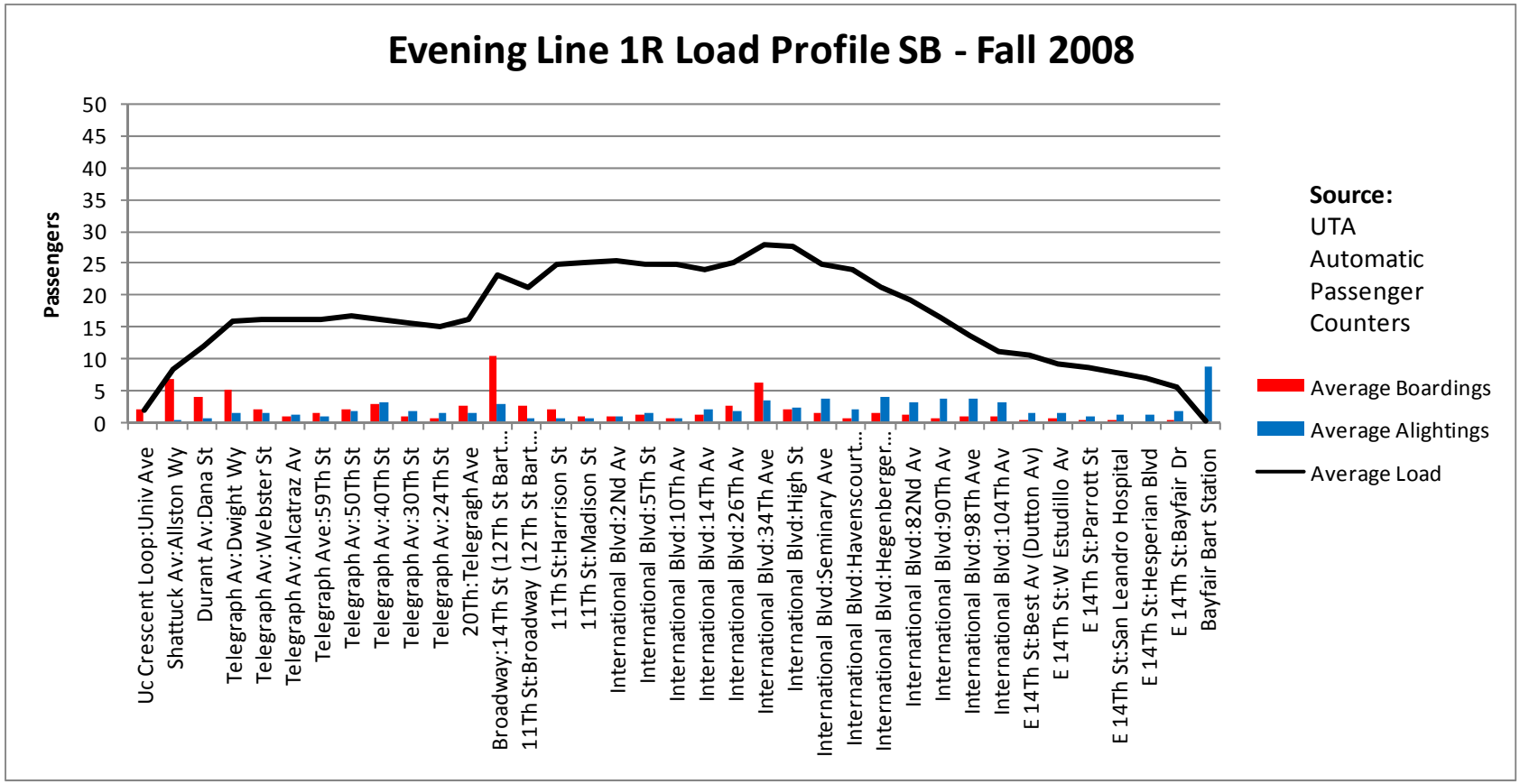
Average Boardings
Average Alightings
Average Load


Evening Line 1R Load Profile SB - Fall 2008
Passengers
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Uc Crescent Loop:Univ Ave
Shattuck Av:Allston Wy
Durant Av:Dana St
Telegraph Av:Dwight Wy
Telegraph Av:Webster St
Telegraph Av:Alcatraz Av
Telegraph Ave:59Th St
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Telegraph Av:24Th St
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Broadway:14Th St (12Th St Bart...
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International Blvd:2Nd Av
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International Blvd:Havenscourt...
International Blvd:Hegenberger...
International Blvd:82Nd Av
International Blvd:90Th Av
International Blvd:98Th Ave
International Blvd:104Th Av
E 14Th St:Best Av (Dutton Av)
E 14Th St:W Estudillo Av
E 14Th St:Parrott St
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E 14Th St:Hesperian Blvd
E 14Th St:Bayfair Dr
Bayfair Bart Station
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Average Alightings
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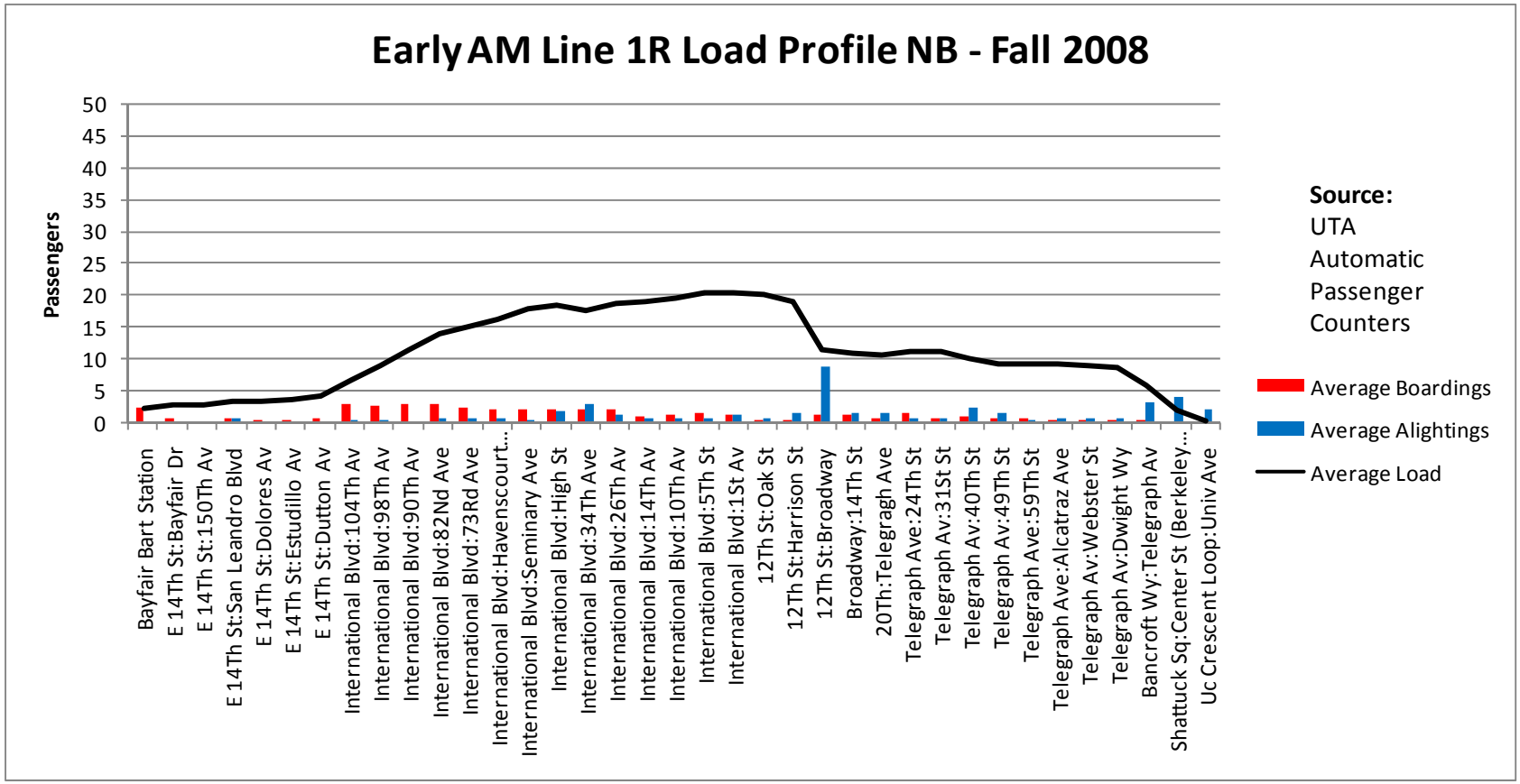
Early AM Line 1R Load Profile NB - Fall 2008
Passengers
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Bayfair Bart Station
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E 14Th St:Estudillo Av
E 14Th St:Dutton Av
International Blvd:104Th Av
International Blvd:98Th Av
International Blvd:90Th Av
International Blvd:82Nd Ave
International Blvd:73Rd Ave
International Blvd:Havenscourt...
International Blvd:Seminary Ave
International Blvd:High St
International Blvd:34Th Ave
International Blvd:26Th Av
International Blvd:14Th Av
International Blvd:10Th Av
International Blvd:5Th St
International Blvd:1St Av
12Th St:Oak St
12Th St:Harrison St
12Th St:Broadway
Broadway:14Th St
20Th:Telegragh Ave
Telegraph Ave:24Th St
Telegraph Av:31St St
Telegraph Av:40Th St
Telegraph Av:49Th St
Telegraph Ave:59Th St
Telegraph Ave:Alcatraz Ave
Telegraph Av:Webster St
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Bancroft Wy:Telegraph Av
Shattuck Sq:Center St (Berkeley...
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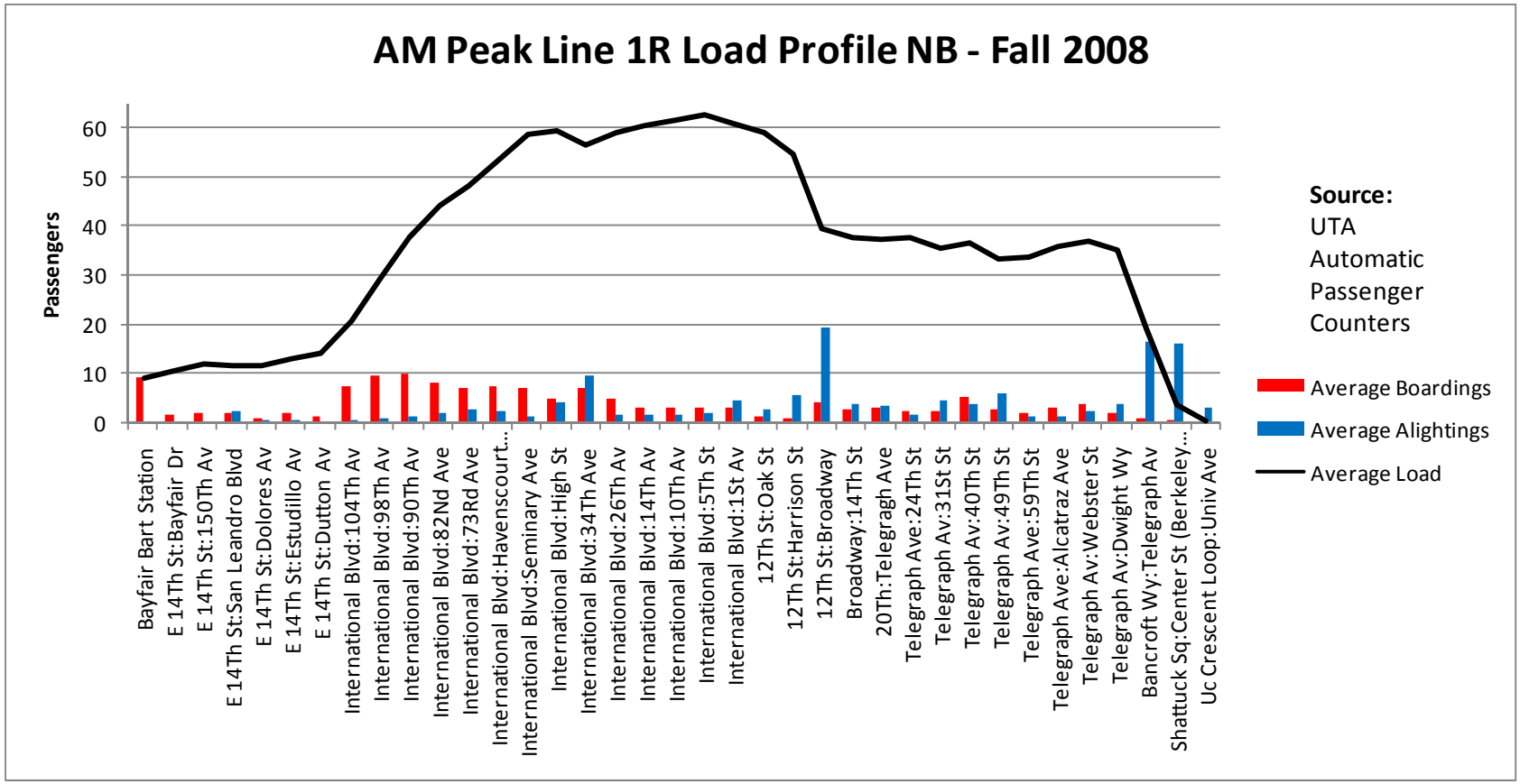
AM Peak Line 1R Load Profile NB - Fall 2008
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Telegraph Ave:24Th St
Telegraph Av:31St St
Telegraph Av:40Th St
Telegraph Av:49Th St
Telegraph Ave:59Th St
Telegraph Ave:Alcatraz Ave
Telegraph Av:Webster St
Telegraph Av:Dwight Wy
Bancroft Wy:Telegraph Av
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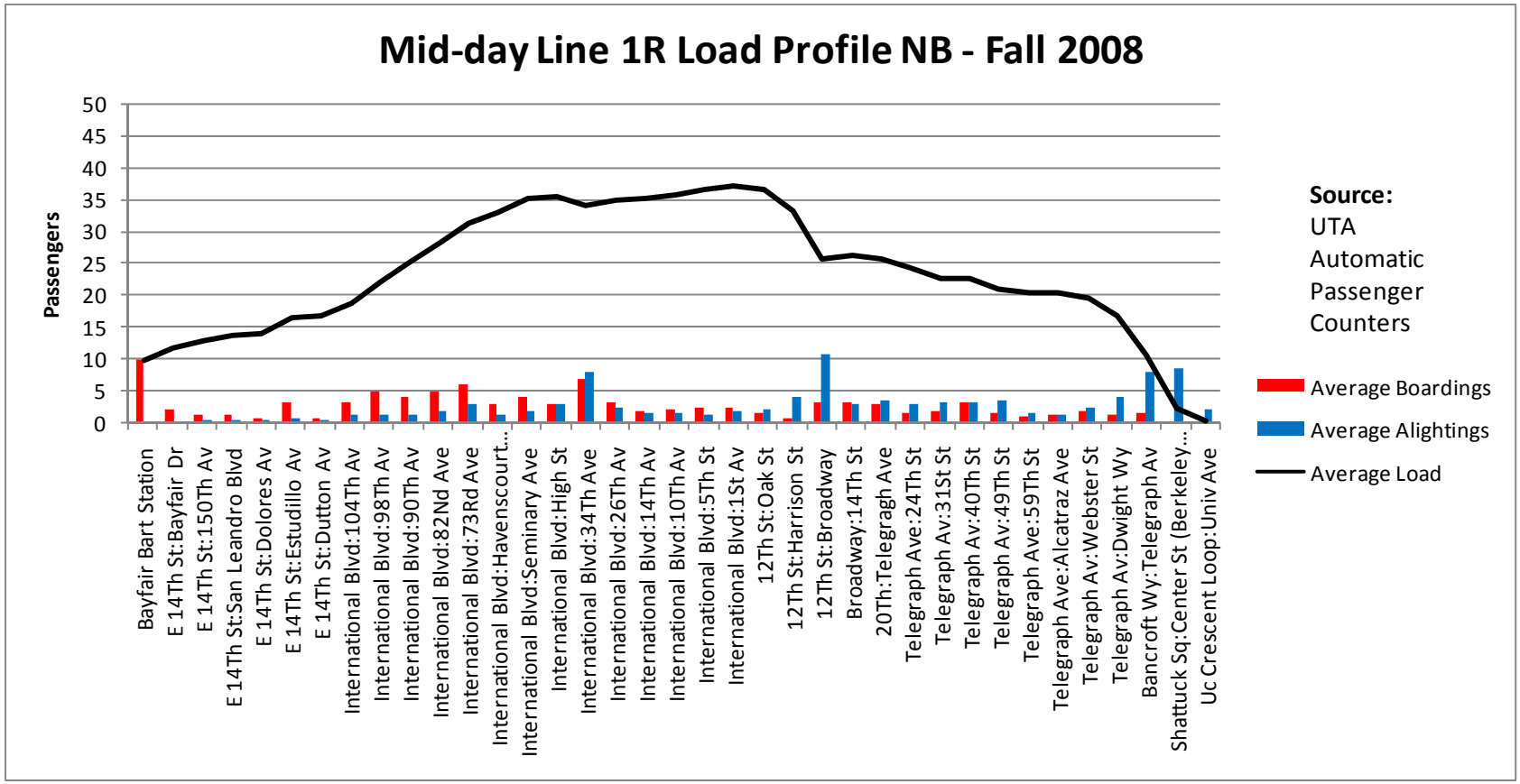
Mid-day Line 1R Load Profile NB - Fall 2008
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Telegraph Ave:Alcatraz Ave
Telegraph Av:Webster St
Telegraph Av:Dwight Wy
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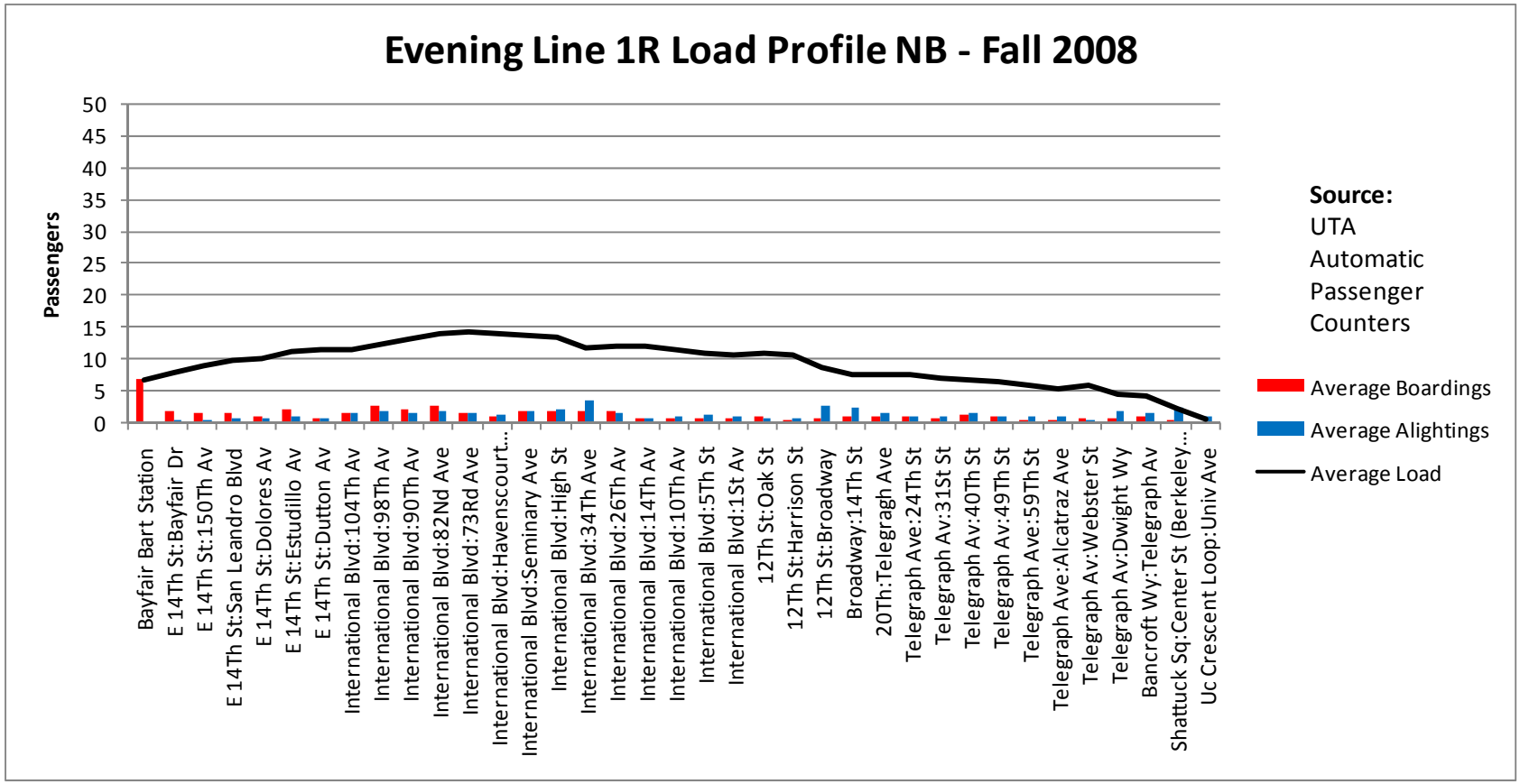
Evening Line 1R Load Profile NB - Fall 2008
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International Blvd:82Nd Ave
International Blvd:73Rd Ave
International Blvd:Havenscourt...
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International Blvd:34Th Ave
International Blvd:26Th Av
International Blvd:14Th Av
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International Blvd:5Th St
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12Th St:Oak St
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20Th:Telegragh Ave
Telegraph Ave:24Th St
Telegraph Av:31St St
Telegraph Av:40Th St
Telegraph Av:49Th St
Telegraph Ave:59Th St
Telegraph Ave:Alcatraz Ave
Telegraph Av:Webster St
Telegraph Av:Dwight Wy
Bancroft Wy:Telegraph Av
Shattuck Sq:Center St (Berkeley...
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Source:
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Average Load