

# Pass Program Background Report



September 2006

## EXECUTIVE SUMMARY

The Pass Program Background Report serves as a starting point for a discussion of pass programs at BART. The report includes material on existing policy guidance, pass programs in general and at other agencies, and options for BART including a zone system and smart card technology.

The main points of the report are as follows:

### Existing Policy Guidance

- In determining which District goals a pass program should help achieve, the Board-adopted Fare Policy supports
  - increasing ridership and enhancing customer satisfaction, including rewarding frequent riders and attracting new riders with innovative pilot programs,
  - and
  - maintaining and improving BART's financial health so the District can provide the quality service that our customers value and expect.

### Pass Programs in General and at Other Agencies

- Transit riders buy passes principally for two reasons:
  - To save money—BART's experience supports national studies that show heavy-rail patrons are not very sensitive to changes in price
  - For convenience—BART's magnetic stripe ticket already offers the convenience of a multi-use ticket.
- Passes result in ridership increases that do not offset revenue losses, although for a flat-fare transit agency, group deep discount pass programs can generate ridership and revenue.
  - When New York City Transit introduced discounts with its mag-stripe MetroCard, it budgeted for and realized fare revenue losses along with ridership gains.
  - WMATA offers one-day and weekly passes that attract relatively few riders as they account for 2.5% of WMATA's total fare revenue.
    - WMATA has stopped offering a monthly pass due to low sales and high distribution costs.
  - Houston METRO is currently proposing to eliminate its passes for fraud, equity, and revenue reasons and replace them with a smart card that provides free rides based on the number of trips taken.
  - AC Transit with its flat fare has group deep discount programs with UC Berkeley and the City of Berkeley that generate revenue and ridership.
    - The discounted pass is bought for or by all group members (for example, all UC Berkeley students), which more than offsets revenue lost from giving existing riders the discount, and new ridership does not require additional service.

### **Monthly Pass Options for BART Magnetic-Stripe Ticket Technology**

- For BART to offer a monthly pass program with magnetic-stripe ticket technology means aggregating stations into zones or fares into groups.
  - Staff grouped stations into a ten-zone Linear Zone System that has a monthly pass priced so that all trips after 40 trips per month are free, with a base fare of \$1.40 for travel within one zone and \$0.75 added for each zone boundary crossed.
  - For non-pass trips, the current station-to-station distance-based fare structure is assumed to remain.
- Pass-based fares are calculated using the aggregated zone-to-zone fare structure, which is less detailed than the existing fare structure that has 94 unique fare values based on distances between 43 stations.
  - Thus for some riders the zone-based fare will be lower but for other riders it will not be, which means that some patrons benefit from the zone system and others do not.
- Offering passes could increase ridership, with current riders taking more trips and new riders being attracted by cost savings.
- With a Linear Zone System pass, estimated annual net fare revenue loss is \$5.4 million.
  - Lower revenue collected from current riders who save money by switching from a distance-based fare to the pass is not offset by an estimated 1% ridership increase.
- Estimated implementation costs for a Linear Zone System pass program range from \$2.7 million to \$5.9 million.

### **Smart Card Technology**

The benefits of smart card technology include the following:

- Offers BART's customers pass-like convenience
- Is more flexible in rewarding frequent usage than a zone system, for example, by giving free trips after the rider takes a certain number of trips
- Provides opportunities for innovative pilot programs to attract new riders
- Lets BART monitor and quickly respond to any pass-related ridership and financial impacts
- Is being investigated as a means to pay for parking
- Is being tested in the Stanford University demonstration program for use by employees and graduate students taking work trips

## 1. INTRODUCTION

In response to interest expressed by several BART Board members about the feasibility of offering passes as a fare payment option for BART, this report provides background information for a discussion of pass program options at the September 14, 2006 Board meeting. It covers these topics:

- Pass program overview, including programs in general and specific programs in New York City, Washington, D.C., Berkeley, and Houston
- Pass pricing and ridership
- Pass program options for BART, including a zone system and smart card technology

Together with information on the above topics, BART's adopted Fare Policy is useful when considering a question basic to a policy-level discussion: what District goals should a pass program help achieve? The Fare Policy addresses the following areas that fares can influence: customer satisfaction, ridership growth, financial health, seamless interagency travel, and optimal system usage.

Fare Policy goals are structured to be considered as a whole, with no one goal taking precedence to the exclusion of another, when making fare-related decisions for the District. The goals are:

- A. Ensure and enhance customer satisfaction.
  - B. Increase ridership while meeting the goals of the District's Financial Stability Policy.
  - C. Maintain and improve the District's financial health, in accordance with BART's Strategic Plan and Financial Stability Policy.
  - D. Promote seamless interagency travel.
  - E. Optimize system usage and asset management.
- The complete Fare Policy is included as Attachment A.

## 2. PASS PROGRAM OVERVIEW

### 2.1 Pass Advantages and Disadvantages

Passes offer advantages and disadvantages for both the rider and the transit agency. The following table summarizes the advantages and disadvantages of passes as described in *Fare Policies, Structures, and Technologies*, an FTA-sponsored Transit Cooperative Research Program (TCRP) report.

	Pass Advantages	Pass Disadvantages
<b>For the Rider</b>	<ul style="list-style-type: none"> <li>• Save on transit costs (depending on usage level)</li> <li>• Make unlimited trips for one price</li> <li>• Make a convenient, single purchase for a month (or other period) of travel</li> </ul>	<ul style="list-style-type: none"> <li>• Purchase price may be too high for very low-income individuals (this disadvantage may be mitigated by offering passes good for periods shorter than a month)</li> <li>• Losing a pass can be the same as losing cash</li> </ul>
<b>For the Transit Agency</b>	<ul style="list-style-type: none"> <li>• Generate increased ridership and rider loyalty</li> <li>• Reduce the use of cash in the system</li> <li>• Improve cash flow through the float from the initial payment</li> <li>• Decrease boarding times for pass users, depending on type of fare collection equipment and form of the pass</li> </ul>	<p>Per the TCRP report, passes present significant problems to transit agencies, chiefly in terms of lost revenue.</p> <ul style="list-style-type: none"> <li>• Forgone revenue from riders taking considerably more trips than the 'breakeven' trip rate is the biggest loss</li> <li>• Other sources of revenue loss are pass "abuse" (illegal sharing of a pass with non-pass buyers) and counterfeiting (primarily an issue for flash passes)</li> </ul>

The transit rider finds a pass to be most advantageous when he or she saves money by using the pass instead of paying the regular fare. The measure the rider uses to decide if the pass is a money-saver is known as the "breakeven" rate. The breakeven rate is the equilibrium point at which it costs the rider the same whether he or she pays for each trip separately or uses a pass. All trips over the breakeven rate are essentially "free" for the rider. Typical breakeven rates range between 30 and 40 trips per month. Riders who make more trips than the breakeven trip rate are the most likely to buy passes.

For a monthly pass, forty trips is a reasonable breakeven rate that is based on a rider's taking five roundtrips per week for four weeks. Thus, if a rider usually takes 44 trips per month, that rider is much more likely to buy a pass priced with a breakeven rate of 40 trips (i.e., priced at 40 times the cash fare) than is a rider who takes less than 40 trips per month. The rider taking 44 trips per month using a

pass gets four trips at no additional cost, while the rider taking less than 40 trips per month saves money by paying for each trip separately.

A key revenue and ridership issue for passes is how many trips riders would have taken if they did not have the pass, and how many trips are induced because they have the pass. Trips riders would have taken anyway that are now free with the pass result in *forgone*, or lost, revenue to the agency. Forgone revenue is a transit agency disadvantage noted in the table above; revenue is lost when a rider buys a pass, for example, priced at a breakeven rate of 40 trips per month and then makes the 45 trips that he or she usually takes in a month. That rider essentially gets five free trips for which he or she used to pay the agency. In addition, if the pass induces enough ridership so that the agency must add service, the agency's costs go up.

Pass pricing is more complex for transit agencies that have a range of fares in contrast to agencies that have flat fares. A noteworthy item not mentioned in the TCRP report is the potential for substantial capital costs to modify fare media and equipment to accept the pass. Additionally, operating and capital costs can increase if the pass generates enough ridership growth to require additional service levels to match the increased demand.

## **2.2 Pass Programs at Other Agencies**

The following sections describe actual pass programs recently undertaken at three agencies: New York City Transit, WMATA, and AC Transit. The last section describes Houston METRO's proposal to eliminate its passes.

### **New York City Transit**

For over 90 years, the fare structure for New York's subways and buses was very simple: a flat fare with no zonal charges and, with few exceptions, an additional full fare to transfer between subway and bus. Between 1994 and 1997, New York City Transit (NYCT), the subway and bus systems operator, installed automated fare collection equipment in its subways and buses and introduced MetroCard, a magnetic stripe ticket. NYCT's current farebox operating ratio is about 59%; however, unlike most other transit agencies, NYCT calculates its farebox operating ratio by including fare reimbursements from New York State and New York City (for example, to cover NYCT school bus passes and to partially offset the revenue loss due to the senior discount) in addition to fare revenue.

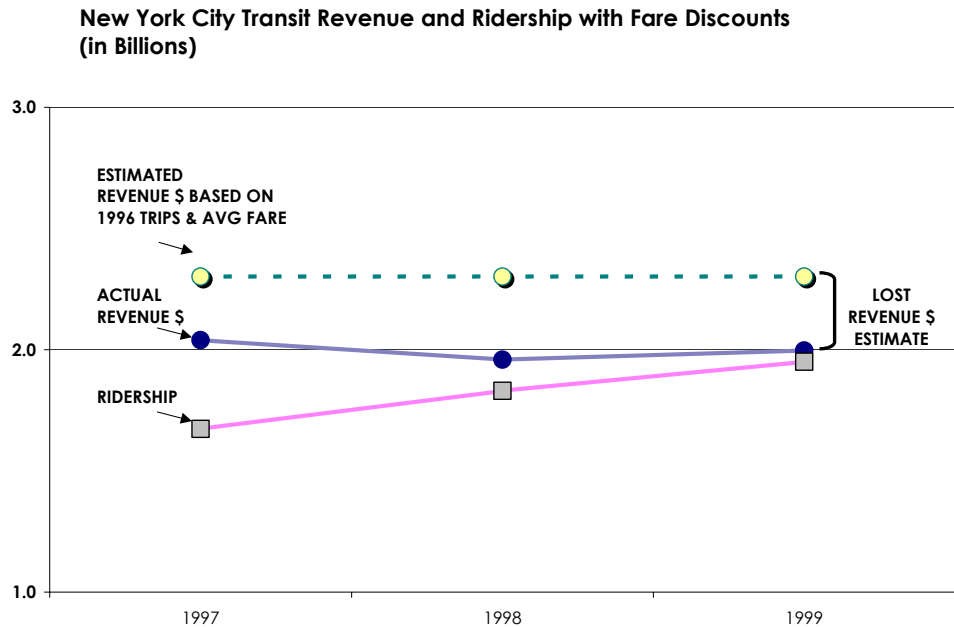
## NYCT MetroCard

Between 1997 and 1999, NYCT introduced a range of fare discounts that MetroCard made possible, as follows:

<b>Date Introduced</b>	<b>Ticket Type</b>	<b>Description</b>	<b>Current Price</b>
July 1997	Free transfers between subway and bus	Using MetroCard, one fare pays for trip made using both bus and subway	\$2 flat fare per trip (includes transfer)
January 1998	Bonus MetroCard	“Bonus” value given based on dollar value loaded on MetroCard	20% bonus if \$10 or more is loaded; e.g., spend \$20 and \$24 is loaded onto MetroCard
July 1998	7-day pass 30-day pass	Unlimited ride MetroCard good for a week or month from first use	\$24 7-day pass (breakeven = 12 trips) \$76 30-day pass (breakeven = 38 trips)
January 1999	1-day “fun pass”	Unlimited ride MetroCard good for one day from first use; geared to tourists	\$7 1-day pass (breakeven = 3 trips)

Between 1997 and 1998 when passes were introduced, ridership grew 9.4% while fare revenue fell 3.9%. Thus, New York achieved its public policy goal of increasing ridership. Regarding the revenue impacts, NYCT budgeted for a bigger fare revenue loss than actually occurred as a result of offering the discounts. The revenue loss was less than expected because ridership increased more than projected, spurred by MetroCard discounts and convenience as well as a strong local economy. At the same time, the budget benefited from a sharp increase in transit-dedicated tax revenues and operating expenses that were kept under control.

In 1998 the average fare per bus and subway trip was \$1.12, down from a peak of \$1.44 in 1996, or at its lowest level in more than a decade adjusted for inflation--riders made more trips but less fare revenue was collected. The graph to the right shows actual NYCT ridership and fare revenue



for 1997 through 1999, as well as an estimated \$300 million annual average fare revenue loss. The revenue loss was estimated based on comparing actual fare revenue to the amount of revenue that would have been generated if MetroCard had not been introduced, which is simulated by holding 1996 trips and 1996 average fare constant.

The declining trend for average fare has continued. Between 1994 and 2003, the nominal base fare rose from \$1.25 to \$2.00, or 60%; however, during that period the average fare paid per trip grew less than 10% to \$1.24 from \$1.14. Since 1994, the average fare paid per trip, adjusted for inflation, has fallen around 14%.

**NYCT Holiday Fare Discount Program**

NYCT’s holiday discount program is a recent fare discount program of note. Last winter, from Thanksgiving to January 2<sup>nd</sup>, NYCT offered a variety of fare discounts including half-price fares on subways and buses on holidays, weekends and during the last week of December, and a holiday MetroCard good for 40 days that cost the same as a 30-day MetroCard.

The holiday bonus program was budgeted for \$50 million to pay for these fare discounts and other incentives. Funding for the program came from a large budget surplus the Metropolitan Transit Authority (MTA), which oversees NYCT, had received, mostly from an increase in real estate taxes paid by the ten New York counties it serves.

The MTA issued a report analyzing the holiday bonus program, with findings that include the following:

- The holiday fare discount program cost about \$46 million in lost revenue and administrative expenses, \$4 million less than budgeted.

- The program may have induced more people to use the system to go shopping or for leisure travel, but few customers in the program changed “their ticket-purchasing behavior.” The main benefit was in cost savings to regular riders of the subways, buses, and commuter railroads.
- MTA printed 250,000 of the 40-day MetroCards and sold 114,000, less than half.
- Customers said they liked the program, and that it had saved them money.

For the upcoming 2006 holiday season, MTA has decided not to offer holiday fare discounts. Instead, MTA will take the \$50 million set aside to cover the loss of income from the discounts and use it to help cover shortfalls that will accrue from MTA’s decision to postpone a 5% fare increase from January 2007 to September 2007.

### **Washington Metropolitan Area Transit Authority (WMATA) Metrorail**

WMATA Metrorail riders can pay for their trips with a magnetic stripe farecard, SmarTrip (WMATA’s smart card), or a magnetic stripe pass. Metrorail fares currently range from \$1.35 to \$3.90 in the peak, and \$1.35 to \$2.35 in the off-peak (including weekends). WMATA’s farebox recovery ratio is about 60%.

WMATA passes are activated the first time they are used in the fare gate, and their validity is measured from that time. WMATA currently offers the following passes:

<b>Metrorail Pass</b>	<b>Description</b>	<b>Price</b>	<b>Breakeven Rate Range</b>
<b>1-Day Pass</b>	Valid for 1 day of unlimited travel on weekdays after 9:30 a.m. or all day on Saturdays, Sundays or federal holidays.	\$6.50	2 to 5 trips per day
<b>7-Day Short Trip Pass</b>	Valid for 7 consecutive days for trips costing up to \$2.20 on weekdays between 5:30-9:30 a.m. and 3-7 p.m. Pass is valid for any rail trip at other times. If trip costs more than \$2.20, additional fare must be paid at add fare machine.	\$22.00	10 to 16 trips per week
<b>7-Day Fast Pass</b>	Valid for 7 consecutive days of unlimited travel.	\$32.50	9 to 25 trips per week

The range of trips that a rider needs to take to breakeven and thus make the pass cost-effective for him or her varies due to WMATA's range of fares. The higher the fare, the more cost-effective the pass. For low to mid-range fares, passes are not cost-effective. Even for the highest fares, the two 7-day passes require that riders take five roundtrips per week (e.g., by using WMATA to commute to work each weekday) before they get any "free" trips.

On a monthly basis, WMATA carries over 18 million trips while selling about 46,000 1-day passes, 9,000 7-day short trip passes, and 13,300 7-day fast passes. The three passes account for about 2.5% of WMATA's total fare revenue.

In the past, WMATA offered a one-month pass, which it stopped selling due to low sales and high distribution costs. The price of that pass was \$100, which resulted in a breakeven rate range of 31 to 90 trips per month (based on the then-fare range of \$1.10 to \$3.25).

WMATA's SmarTrip smart card does not currently accommodate its passes, although there are plans to incorporate them in the future. Up to \$300 can be loaded onto SmarTrip, and patrons must use the SmarTrip card to pay the parking fees at Metrorail stations.

## **AC Transit**

AC Transit has group deep discount pass programs with UC Berkeley for the university's students and employees and the City of Berkeley for eligible city employees. AC Transit has a flat adult local cash fare of \$1.75 and a farebox recovery ratio of about 17%.

### **AC Transit–UC Berkeley**

#### **Class Pass**

At the beginning of each school year, about 32,000 UC Berkeley (UCB) undergraduate and graduate students pay a \$37 fee for an AC Transit Class Pass. They can use the AC Transit Class Pass for unlimited rides on AC buses including Transbay trips during the academic year. In comparison, AC's regular 31-day local ride pass costs \$70. In 2005, after pooling the \$37 student fees, UCB paid AC Transit about \$1.2 million for the Class Pass program.

Based on survey data collected in 2000 after the Class Pass program was implemented, the percentage of students using AC Transit was estimated to increase from 5.6% to 14.1%. Before Class Pass, the maximum revenue AC could have received from the 5.6% of UCB students using its buses was about \$84,000 per month (this maximum amount is based on the simplifying assumption that each of these students bought an AC monthly pass). With Class Pass, AC receives \$1.2 million from UCB for a ten-month academic year, so AC now gets about \$36,000 more per month, or \$360,000 per academic year. Since AC Transit's buses had enough existing capacity, it did not need to add service to accommodate the approximately 2,700 new student riders.

The Class Pass has increased AC Transit's revenues, and AC's existing bus service was able to absorb the increase in ridership so that no new service was required. In addition, the potential for fraudulent use (selling, sharing, or transferring) of the Class Pass was minimized because the pass consists of a sticker affixed to the student's ID card.

### **Bear Pass**

In 2004, the Bear Pass program became available to UCB's faculty and staff who live in the East Bay AC Transit service area, or almost 8,600 employees. These employees can buy a Bear Pass for \$20 per month and get unlimited rides on AC Transit, including Transbay trips. In 2005, UCB paid AC Transit \$450,000 for the program, a flat rate based on the number of employees who live in the AC Transit service area. UCB and AC Transit have agreed to renew the Bear Pass for the 2006-2007 year; with this agreement, program eligibility has been expanded to also include faculty and staff who live outside the borders of the East Bay AC Transit service area.

### **AC Transit – City of Berkeley**

#### **EcoPass**

The City of Berkeley (COB) provides about 1,400 eligible employees with an AC Transit EcoPass at no charge to the employee; the AC EcoPass is good for unlimited rides on AC Transit buses. Since the EcoPass became available in 2001, the rate of bus usage by COB employees increased from 6.2% to 13.8%. AC Transit farebox data for 2004 shows that about 55% of unique EcoPass holders used their EcoPass on an occasional basis: boarding AC Transit buses between 1 and 10 times per month. About 28% of unique users boarded AC Transit buses more than 21 times a month.

Respondents to a 2005 survey of COB employees stated that if the AC EcoPass were not available to them, 59% would reduce their use of AC Transit services, including 25% who would stop using AC Transit services completely.

The COB recently acted to continue the EcoPass program for calendar year 2006, agreeing to pay AC Transit an amount not to exceed \$100,000 annually for the program, which comes to about \$5.50 per employee per month. The price of AC's regular 31-day ticket is \$70 (equivalent to a breakeven rate of 40 trips per month for the rider based on a cash fare of \$1.75).

It is estimated that before the EcoPass, AC Transit collected about \$29,000 per year from about 120 COB employees; some of these employees rode infrequently (one to ten times per month) and some rode almost every day. Thus, for 2006, AC will receive up to \$71,000 more in annual fare revenue with the EcoPass than without it. As with the UCB Class Pass, AC Transit did not have to add service to accommodate the extra trips the EcoPass generated.

## Houston METRO

Houston METRO provides bus and light rail service to the Houston metropolitan area. METRO staff is currently proposing to restructure its fare policy in a number of ways, including the elimination of all period passes.

METRO currently issues daily, weekly, monthly, and annual passes. Passes will be replaced with a smart card that will provide free rides based on the number of rides taken, regardless of how much money is invested on the card at a given transaction. METRO staff is proposing to eliminate passes for the following reasons:

- Reduce fraud in the system. Passes should be used by one person only; however, they can easily be passed among numerous people, significantly increasing the number of uses per period and resulting in significant revenue loss to the agency. This issue applies to any transit agency that issues unlimited use passes.
- Improve social equity of the system. Passes are sold at a discount and the longer the time period (and hence the more expensive the instrument), the larger the discount. In general, less affluent riders cannot afford to invest in longer-term passes and, therefore, cannot capture the deeper discounts. While the discount structure could be even across all period passes, deeper discounts for higher price passes is typical practice at many U.S. transit agencies.
- Increase revenue without increasing the base fare. Passes result in each ride being sold at a significant discount from the base fare (depending on how much the pass is used). METRO is experiencing significant revenue loss from its passes and wants to increase revenue without increasing its base fare, because, among other reasons, base fare increases tend to be felt most by those least able to pay.

The METRO Board will consider the proposed pass elimination and other proposed changes in December 2006.

## 3. PRICING AND RIDERSHIP

As the TCRP report *Fare Policies, Structures, and Technologies* notes, pass price and convenience are the two principal advantages a pass offers riders. Most transit riders buy passes because they save money when compared to paying the regular fare, and riders calculate their cost savings based on the breakeven rate described in Section 2.1 above. Since BART is already offering the pass-like convenience of a ticket good for many trips, this section focuses on how riders react to pricing changes in order to get a sense of how BART riders could respond to the discount a pass could offer.

The TCRP report *Transit Pricing and Fares* confirms the inelasticity of rider response to fare changes, both increases and decreases. “Inelastic response” is an

economic term that simply means consumers are not very responsive to either a price increase or decrease; for transit, that means a percentage change in fares causes a smaller percentage change in ridership. Because of transit riders' inelastic response, regarding fare decreases the report states:

“A reduction in transit fare levels will nearly always generate more ridership, but will also result in lowered fare revenues. Therefore, if a transit system reduces fare levels to increase ridership, success can be reasonably assured, but at a cost of revenue reduction.”

The TCRP report notes that ridership response to fare changes can vary considerably under different situations, but it is relatively consistent when expressed as an average. The average elasticity for bus fare increases and decreases equates to about -0.40, while the average elasticity for heavy rail transit, such as BART, is typically much less, with heavy rail elasticities averaging about -0.17 to -0.18, or about half the bus fare elasticities in the same cities.

For planning purposes, BART uses a more conservative elasticity factor of -0.22. That is, the District projects that if fares are increased or decreased, the following would occur:

- A 10% fare **increase** results in about a 2.2% ridership loss and a 7.8% net revenue gain
- A 10% fare **decrease** results in about a 2.2% ridership gain and a 7.8% net revenue loss

	Fare Change	
	Increase 10%	Decrease 10%
Revenue	+7.8%	-7.8%
Ridership	-2.2%	+2.2%

In actual experience, however, the District raised fares by 45% between 1995 and 1997 and saw a 3.4% increase in ridership between FY94 and FY98. This is due to the strong influence on ridership of factors besides fare pricing, such as increased road congestion, a strong local economy, and extension station openings.

A free trip, or a 100% discount, is the ultimate example of a discount. BART has experience with two kinds of free trips: Spare the Air Days and the ING morning-commute free ride. For Spare the Air Days, notice is given the afternoon before that trips are free the next morning or, as of 2006, all day, while the ING free morning trips promotion was advertised ahead of time. The table on the next page shows the ridership impact of providing these free rides.

	Estimated Ridership Increase
<b>FREE RIDES, Spare the Air Days</b>	
<b>2004</b>	
<b>On only BART in the AM:</b>	
9/7	8%
9/8	7%
<b>2005</b>	
<b>On regional operators in the AM:</b>	
7/26	0%
<b>2006</b>	
<b>On regional operators ALL DAY:</b>	
6/22	10%
6/23	5%
6/26	9%
7/17	8%
7/20	9%
7/21	6%
<b>FREE Morning Commute, underwritten by ING</b>	
<b>2003</b>	
12/04	0%

Ridership grew more on the 2004 Spare the Air days than the day in 2005 when there was no noticeable increase because in 2004 only BART offered the free morning commute. In 2005, nearly all Bay Area transit agencies offered free trips in the morning, thus diluting the impact on BART ridership virtually to zero. For the free morning commute underwritten by ING, ridership also showed virtually no change.

In 2006, there were six Spare the Air Days when trips were free all day on nearly all operators, as compared to only in the morning. The all-day free trips resulted in slightly greater increases in BART's ridership than the BART-only AM rides in 2004. These examples of the impact of free trips point to price as one factor in increasing ridership, but not the most motivating factor in people's decisions to change their tripmaking habits.

#### 4. PASS PROGRAM OPTIONS FOR BART

BART's 43 stations generate 473 station-pair fares, or 94 unique fare values. Since offering 94 passes is impractical, having a BART pass that uses magnetic stripe technology would require grouping stations into zones and then setting fares between groups of stations, or aggregating fares into ranges, with a pass good for each fare range. Pass pricing would be based on these grouped fares and a breakeven rate. Considering these parameters, staff developed two zone systems and one fare aggregation system for BART.

Before detailing the BART-specific zone system, a brief description is provided of how several other operators' zone systems work. Two systems are local, Caltrain and Golden Gate Transit, and two are peer rail systems, Metra in Chicago and SEPTA in Pennsylvania. Fare changes at two other peer systems, MetroLink in Los Angeles and MARTA, are also worth noting. As a means to generate more revenue, MetroLink is replacing its zone system with a distance-based fare structure. MARTA, which this summer completed installing its computerized "Breeze" smart card fare gate system, now has the technology it needs to consider replacing its flat fare structure with a distance-based structure so that it can charge more for longer trips.

#### **4.1 Zone Systems at Other Agencies**

##### **Caltrain and Golden Gate Transit Zone Systems**

For the two local systems, a rider's fare is based on how many zones he or she travels through--the more zones crossed, the higher the fare. Zones serve as a proxy for distance-based pricing. There are six zones each in the Caltrain and Golden Gate Transit systems. The zones are laid out linearly with San Francisco at one end.

For Caltrain, each time a zone is crossed, \$1.50 is added to the base cash fare of \$2.25. Caltrain monthly passes are priced with a breakeven rate of 27 trips, so a pass for travel within one zone is \$59.75. Caltrain's farebox recovery ratio is about 31%.

For Golden Gate Transit, the additional charge for crossing a zone ranges from \$0.40 to \$2.20, with a minimum cash fare of \$3.00. Golden Gate Transit does not offer passes; instead, it sells 20-ride Ride Value Ticket Books that give a 20% discount to adult cash fares. Golden Gate Transit's farebox recovery ratio is about 24%.

##### **Metra and SEPTA Zone Systems**

Each zone system of the two peer rail agencies is centered on its downtown, Metra on Chicago and SEPTA on Philadelphia, with rail lines radiating out from these centers. To make a trip between a system's radial lines requires going first through the center, and so is really two trips with a transfer and a fare equal to the sum of the two legs.

Metra has a maximum of 12 zones on each of its 14 radial lines out of Chicago. The regular cash fare is \$1.95, with the increment for crossing a zone boundary ranging from \$0.20 to \$0.90. Metra monthly passes are priced at a breakeven rate of 27 trips, so for example a pass for travel within one zone is \$52.65. Metra's farebox recovery ratio is about 44%.

SEPTA has six zones and eight rail lines that radiate out from Center City Philadelphia. Each regional rail station is assigned one of the six zone numbers,

based on how far the station is from Center City Philadelphia, which is its own zone. The regular one-way cash fare varies from \$3.00 for the shortest trip to \$7.00 for the longest trip. Passes are priced on a breakeven rate of about 28 trips per month. SEPTA's farebox recovery ratio is about 48%.

## 4.2 BART Zone System

Staff developed three pass system scenarios, two zone systems (centroid and linear) and a price-point system in which fares are grouped. The centroid zone system has a central zone that includes the stations from Daly City through Embarcadero, and three zones radiating out from it, with the rest of BART's 43 stations located in one of the three radial zones. The ten-zone Linear Zone System aggregates into zones stations that are physically close together, as shown on the map on page 17. The pricing structure for both zone systems has a forty-trip breakeven rate, a base fare of \$1.40 for travel within one zone, and \$0.75 added for each zone boundary crossed. The price-point system groups BART's 94 unique fare values into four ranges with four passes, each pass good for trips up to a maximum fare. This is similar to WMATA's two-tier price-point system, which offers a pass good for short trips and a pass good for all trips, but accounts for BART's much wider range of fares.

The Linear Zone System (LZS) was selected for further analysis because it better captures the current station-to-station system's necessary detail compared to the centroid zone system, and the LZS is easier for customers to understand than the price-point system.

As the map on page 17 shows, the LZS has ten zones (one of the zones accounts for Transbay trips and has no stations in it). Monthly pass prices are based on a 40-trip breakeven rate, with a fare of \$1.40 for travel within any one zone and \$0.75 charged each time a zone boundary is crossed. For example, a monthly pass good for trips between Fremont and 19<sup>th</sup> Street is \$116, based on 40 times \$2.90 (\$1.40 base fare plus \$1.50 because the rider crosses two zone boundaries). The LZS has seven different passes, because a rider could travel within one zone and through a maximum of seven zones. If a rider takes a trip that traverses more zones than the pass that he or she has purchased covers, the rider would use the add-fare machine to pay the difference in order to exit the system.

Riders who did not wish to purchase a pass would still be able to pay for their trips using the current station-to-station fare structure. Thus BART would have two co-existing fare structures: today's station-to-station structure and an LZS pass-based structure.

The table on the next page shows examples of trips and LZS pass prices, which are based on the number of zones the trip covers and a 40-trip breakeven rate. The last column shows the distance-based fare range that corresponds to zone-based trips. For example, for a trip made within one zone, the lowest distance-based fare is \$1.40 and the highest distance-based fare is \$3.90 for the zone 4 trip between Fremont and Dublin/Pleasanton (see map on page 17). The pass price for both these

trips is \$56, which equals \$1.40 per intrazonal trip multiplied by a 40-trip breakeven rate.

Trip is Made within:	Trip Example & Distance-based Fare	Monthly LZS Pass		Distance-based Fare Range within Zones
		Pass Price (40 trip breakeven rate)	Fare per Trip (if 40 trips are taken)	
<b>1 zone</b>	Balboa Park to Embarcadero \$1.45	\$56	\$1.40	\$1.40-\$3.90
<b>2 zones</b>	El Cerrito Plaza to 19 <sup>th</sup> Street \$1.85	\$85	\$2.15	\$1.40-\$3.95
<b>3 zones</b>	MacArthur to Civic Center \$2.95	\$116	\$2.90	\$1.70-\$5.35
<b>4 zones</b>	Bay Fair to Montgomery \$3.85	\$146	\$3.65	\$2.85-\$4.65
<b>5 zones</b>	Pittsburg Bay Point to Montgomery \$5.30	\$176	\$4.40	\$3.60-\$5.70
<b>6 zones</b>	Dublin/Pleasanton to Millbrae \$5.95	\$205	\$5.15	\$4.45-\$6.30
<b>7 zones</b>	Pittsburg Bay Point to SFIA \$7.65	\$236	\$5.90	\$6.45-\$7.65



### Pros and Cons of the Linear Zone System

The following table shows LZS pros and cons for riders and BART:

	PROs	CONs
<b>Rider</b>	<ul style="list-style-type: none"> <li>• Reduces fares for some riders</li> <li>• For some riders, increases already high customer convenience provided by BART's existing multi-use ticket—rider buys only one pass each month</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces fares for only <u>some</u> riders, thus creating winners and losers, in contradiction to Fare Policy</li> <li>• Weakens value correlation between distance traveled and fare charged</li> <li>• Requires rider to upgrade to take trip not covered by pass</li> <li>• Adds zone system structure to current structure, increasing the complexity of an already complex fare structure, which contradicts Fare Policy goal to provide fare structure that customers find easy to understand</li> </ul>
<b>BART</b>	<ul style="list-style-type: none"> <li>• Could increase ridership: brand new riders and current riders taking more trips</li> <li>• Supports existing policies to reward frequent usage and increase customer convenience</li> <li>• Could reduce cash handling costs</li> <li>• Could reduce cost of ticket stock, since fewer tickets bought</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces fare revenue</li> <li>• Weakens connection between fare paid and cost of providing service in contradiction to existing policies</li> <li>• Requires 190 bpi ticket, with costs and implementation for: <ul style="list-style-type: none"> <li>○ Ticket encoding technology</li> <li>○ Fare gate and add fare machine reprogramming</li> </ul> </li> <li>• Increases back office costs, e.g., hot list &amp; refunds</li> <li>• Increases fare structure complexity by creating 2 fare structures, station-to-station for nonpass riders, zone for passes (if convert all fares to zone-based, bigger revenue loss)</li> <li>• Complicates accounting for trips made where revenue is shared with another agency (SamTrans &amp; Muni)</li> </ul>

### 4.3 Pass Program Implementation Costs

Pass program implementation costs include fare revenue impacts, the expense of software and equipment modifications or purchasing new equipment, and any additional operating costs incurred from ridership increases.

## Revenue Impacts

The LZS pass option is estimated to result in a 1% ridership gain and an annual net fare revenue loss of \$5.4 million, or about 2% of the District's annual net fare revenue. A ridership gain of 1% is assumed to require no additional service to meet it.

The estimated \$5.4 million LZS annual net fare revenue loss was calculated based on the following assumptions:

- Pass price equals 40 times the one-way zonal fare; 40 trips is the breakeven rate.
- Riders whose one-way zonal fare is less than the current distance-based fare (based on a 40-trip breakeven rate) are potential pass users.
  - 60% of this rider group pay for their trips with a pass; this percentage is based on Customer Satisfaction Survey data that indicates 60% of riders take BART 5+ times per week, which makes the pass cheaper for them than paying the distance-based fare.
    - 8.4% of this subgroup takes more than 40 trips per month (based on a recent telephone survey of BART riders); these riders used to pay BART the distance-based fare for each trip they took over 40 and, with the pass program, these trips become “free” and BART forgoes that revenue.
  - BART's ridership increases based on how much cheaper the zonal fare is than the distance-based fare (e.g., 15% cheaper), multiplied by an elasticity factor of  $-0.22$ .
- All other riders pay the current distance-based fare for their trips.
- Each trip in the trip table is then multiplied by either the zonal fare or the distance-based fare based on the assumptions above.
- Net revenue generated by this combination of trips with LZS fares and current distance-based fares is compared to the net revenue that the current distance-based only system generates.

## Technological Requirements

To implement the LZS described above requires either 190 bit per inch magnetic stripe tickets or smart card technology.

### 190 bit per inch Magnetic Stripe Tickets

The magnetic stripe on the BART ticket stores data, measured in bits per inch (bpi), and the fare gate reads that data to determine if the ticket is good for a specific trip. Staff is now working to make available a 190 bpi magnetic stripe ticket that can store 60% more data than the current 120 bpi ticket. Each 190 bpi ticket also has a unique serial number so that if the ticket is lost or stolen, it can be blocked to stop fraudulent use and its value refunded. Riders use a 190 bpi ticket in the fare gate in the same way they now use the 120 bpi ticket.

The 190 bpi ticket's extra data storage means it can accommodate more kinds of tickets, also known as “ticket types,” than the 120 bpi. Therefore, 190 bpi

technology can support the LZS, which would require seven ticket types for the seven different kinds of passes; an example of a pass ticket type is a pass good for travel through a maximum of three zones. The data fields that distinguish each ticket type are written onto the magnetic stripe by a ticket-encoding machine.

BART has two ticket-encoding machines, both of which would require upgrading to be capable of encoding 190 bpi tickets. Another option is to purchase new high-speed ticket encoders (HSTEs). The benefits of having new HSTEs rather than updating BART's current ticket encoders include the longer life expectancy and reliability of new equipment. With either upgraded ticket encoders or new ticket encoders, it would be necessary to reprogram BART's fare gates and add-fare machines. Fare gates would have to be reprogrammed to recognize the new 190 bpi ticket types. Add-fare machine functionality would need to be expanded so that a rider could pay for a trip that traverses more zones than his or her pass covers. For example, a rider buys a pass good for travel through three zones because he or she usually commutes between Pleasant Hill and 12<sup>th</sup> Street City Center; for the rider to use that pass to go from Pleasant Hill to Powell Street requires an upgrade to a five-zone pass, equal to paying an additional \$1.50 via the add-fare machine.

Estimated costs of equipment modifications or purchases are as follows:

	<b>Estimated Cost (\$millions)</b>
<b>Upgrade 2 existing ticket encoders</b>	\$1.0 or less
<b>Or Purchase 2 new high-speed ticket encoders</b>	\$4.2
<b>Reprogram fare gates and add-fare machines</b>	\$1.4
<b>Data reporting and systems testing</b>	\$0.3

Total cost estimates therefore range from \$2.7 million (upgrade current ticket encoders) to \$5.9 million (purchase two new encoders), with an estimated implementation timeframe of 36 months.

### **Smart Card Technology**

- **Stanford University Smart Card Demonstration Program**

At the end of July 2006, BART and Stanford University began a six-month demonstration program to encourage the use of public transportation. The program provides for eligible Stanford employees and graduate students to take certain trips on BART at no cost to them.

As part of the program, BART is providing Stanford with up to 200 smart cards loaded with a \$48 high value discount ticket. Stanford pays BART \$45 for each \$48 in value loaded on the cards (a 6.25% discount) through one credit card that Stanford makes available to BART. \$48 in value will be automatically reloaded onto the smart card when the card's value reaches \$10

Stanford has chosen the following parameters for smart card use by eligible employees and graduate students:

- Stanford pays for a BART trip taken by an employee or graduate student that begins or ends at the Millbrae, Fremont, or Union City station; Stanford can be reached by transferring to Caltrain at Millbrae, AC Transit at Fremont, and Dumbarton Express at Union City.
- Employees and graduate students reimburse Stanford for all BART trips they take with the smart card that do not begin or end at Millbrae, Fremont, or Union City station.

Stanford may choose to change its program parameters at any time.

These parameters are possible because of the extensive data smart cards provide about tripmaking by individual users. From BART's perspective, Stanford is paying the District for all trips taken by eligible employees and graduate students, less the high value discount of 6.25%.

Stanford has begun the program by distributing 50 smart cards to employees and graduate students who become eligible for the program when they turn in their parking permits. For the first few weeks of the program, BART has received about \$50 per day in fare revenue from smart card use. The smart card technology has been working smoothly, and with the start of the school year, program participation is expected to increase.

- **Additional Smart Card Applications**

The smart card technology BART is using for the Stanford demonstration program is potentially available for other applications. As a precursor to TransLink, this smart card technology could build a base of smart card users who would easily transfer over to TransLink upon its rollout. Smart card applications that BART could address in the near future include parking payment, fraud reduction, and other opportunities similar to the Stanford demonstration program.

Regarding parking, BART's current parking payment program uses add fare/parking validation machines to collect the daily parking fee. Currently, approximately 70-75% of daily parking fees are paid for with a BART ticket, with the rest paid for with cash. BART Board members have requested that staff examine new payment collection methodologies, with the goal of expanding the daily paid parking program to other stations (based on Board-adopted criteria), and eliminating the need for passengers to remember space numbers and stop to pay at the parking validation machine inside the fare gates. With a smart card-based parking application, the District may be able to achieve both goals.

Smart card technology can also meet the policy goals of a pass program by rewarding today's frequent riders and attracting new riders, while giving the District the ability to carefully monitor and quickly respond to any pass-related ridership and financial impacts. The Stanford demonstration program smart card is autoloading with the equivalent of a \$48 high value ticket. Examples of other smart

card applications that could reward frequent users and attract new riders include free rides after the patron has taken a certain number of trips, a percentage discount based on number of trips taken, and promotional programs that introduce the system to new riders.

As part of the BART Marketing and Research Department’s recently completed telephone survey, BART patrons who had participated in the 2004 Customer Satisfaction Study and continue to ride BART answered questions about their interest in three new options for paying their fares using smart cards. The survey results are as follows:

Payment Option	Participants Very Interested or Interested
<b>“Bonus” card:</b> Pay regular BART fare and get these bonus benefits: per month, a free ride after taking 20, 35, and 45 trips, for a maximum of 3 free trips; half-price fares to selected cultural/civic events; unlimited free rides on patron’s birthday.	<b>78%</b>
<b>Reusable plastic discount card:</b> Pay \$45 and get \$48 in loaded value, or a 6.25% discount.	<b>76%</b>
<b>Unlimited monthly pass:</b> Price based on 40 trip breakeven rate, good for unlimited rides between home station and a specific destination station as well as any trip of the same or lower fare from the home station.	<b>62%</b>

Staff is currently testing the smart card with a high value discount ticket loaded onto it. Once this testing is complete, staff can begin investigating the cost and time requirements for adding new functionality to the existing high value smart card.

#### 4.4 Regional Measure 2: Integrated Fare Program

Regional Measure 2 requires that the TransLink consortium develop a plan by July 1, 2007 for a regionwide Integrated Fare Program that covers all regional rapid transit trips and includes a zonal fare system to support a monthly zonal pass. The purpose of the Integrated Fare Program is to encourage greater use of the region’s transit network by making it easier and less costly for transit riders whose regular commute involves multizonal travel and may involve the transfer between two or more transit agencies.

As Assembly Bill 216 states, the program shall:

- Include a zonal fare system for the sole purpose of creating a monthly zonal pass, allowing for unlimited or discounted fares for transit riders making a minimum number of monthly transit trips between two or more zones.
- Not apply to fare structures that are not purchased on a monthly basis.

- Establish a monitoring program to evaluate the impact of the integrated fare program on the operating finances of the participating agencies.
- Be adjusted as necessary to ensure that the program does not jeopardize the viability of local or regional rapid transit routes impacted by the program
- Be adjusted to the extent possible to provide an equitable revenue-sharing arrangement among the participating agencies

BART will be participating in the Integrated Fare Program effort.

**SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT  
FARE POLICY  
Adopted by the BART Board of Directors November 17, 2005**

The purpose of BART's Fare Policy is to serve as a framework for decision-making that reflects the interconnected areas that fares can influence: customer satisfaction, ridership growth, financial health, seamless interagency travel, and optimal system usage. The Fare Policy is to be integrated with the District's Strategic Plan and complement the District's Financial Stability Policy. When making fare-related decisions, the Fare Policy goals should be considered as a whole, as they work together, with no one goal taking precedence to the exclusion of another.

**Goal A. Ensure and enhance customer satisfaction.**

Strategies:

- a. Provide BART customers with the safe, on-time, frequent, clean and reliable service they value and that is supported by setting fares to reflect the cost of providing such service, including an allocation to capital programs.
- b. Offer fare instrument options that are convenient and reward frequent usage.
- c. Provide a fare structure that customers find easy to understand so they can choose the option that best meets their needs.
- d. Consider the value to the customer of preserving fare structure continuity so that fare structure changes do not increase some customers' fares while decreasing the fares of other customers, creating clear winners and losers.

**Goal B. Increase ridership while meeting the goals of the District's Financial Stability Policy.**

Strategies:

- a. Attract new riders through innovative pilot programs.
- b. Encourage existing riders to take more trips by offering programs that reward frequent usage.

**Goal C. Maintain and improve the District's financial health, in accordance with BART's Strategic Plan and Financial Stability Policy.**

Strategies:

- a. Achieve an operating ratio (total operating revenue/total operating expense) of at least 62%.
- b. Consider ways to increase contributions from the components of total operating revenue in order to provide more options for fares while maintaining or increasing total operating revenue.
- c. Test fare structure changes on a small scale where possible, measuring customer response and revenue impact, to minimize risk to the District's financial health.

**Goal D. Promote seamless interagency travel.**

Strategies:

- a. Work with other agencies to provide fare instruments and pricing that encourage linked trips.

**Goal E. Optimize system usage and asset management.**

Strategies:

- a. Consider limited-duration promotional discounts to encourage off-peak and reverse commute ridership to fill excess capacity.
- b. Consider limited-duration promotional discounts to shift riders from a heavily used station to a nearby station that has greater available capacity.