CITY AND COUNTY OF SAN FRANCISCO
OFFICE OF THE CONTROLLER

Ed Harrington
Controller

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January 29, 2008

The Honorable Gavin Newsom
Mayor, City and County of San Francisco
Room 200, City Hall

The Honorable Members, Board of Supervisors
Room 244, City Hall

The Honorable Members, San Francisco Municipal Transportation Agency Board
1 South Van Ness Avenue, Floor 7

Dear Mayor Newsom, Ladies and Gentlemen:

I am transmitting with this letter a report analyzing the costs and benefits to San Francisco if fares were eliminated on the City's public transit system (Muni). The research was conducted by Sharon Greene & Associates with AECOM Consult, Inc., Transportation Management & Design, Inc., and Causeway Financial Consulting, Inc.

The study teams incorporated data, modeling and analyses provided by the San Francisco Municipal Transportation Agency and the City's Transit Effectiveness Project and by the San Francisco County Transportation Authority together with information from transit systems in the United States that have experience providing fare free service. These analyses were used to develop three different ridership increase scenarios (18%, 48% and 78%) and model a range of potential cost and impacts to the transit system that would result.

This research was undertaken at the request of Mayor Newsom and overseen by the San Francisco Municipal Transportation Agency and the Controller's Office. We hope that the study will inform City decision-making and efforts to improve transportation services. Muni is the eighth largest public transit operator in the United States and is a critical component of San Francisco's and the Bay Area's transportation system, economy and quality of life.

If you have questions on this report, please feel free to contact Peg Stevenson or Liz Garcia of my staff or me at 554-7500.

Sincerely,

Ed Harrington
Controller

EXECUTIVE SUMMARY

Fare Free Muni System Feasibility Analysis

Prepared for:

San Francisco Municipal Transportation Agency

Prepared by:

Sharon Greene + Associates

In Association with:

AECOM Consult, Inc.
Transportation Management & Design, Inc.
Causeway Financial Consulting, Inc.

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1.1 Purpose of Study

At the request of San Francisco Mayor Gavin Newsom, the San Francisco Municipal Transportation Agency (SFMTA) and City Controller commissioned this study to analyze the costs and benefits to the City of San Francisco if fares were eliminated on the City's public transit system (Muni). Muni is the eighth largest public transit operator in the United States[1] and is a critical component of the City's and region's transportation system, economy and quality of life.

The study team was charged with answering the following questions:

- If fares were eliminated, how would Muni ridership increase or decrease?
- What operational and capital items would be needed?
- What operational and capital items would no longer be needed?
- What policy issues would need to be addressed?
- What are the key risk areas?

The study teams incorporated data, plans, modeling and analyses provided by the SFMTA, the San Francisco County Transportation Authority (SFCTA), the Transit Effectiveness Project (TEP) and other US transit systems with experience providing fare free service. Recent SFMTA ridership data[2] and capital plans[3] and the TEP Operations and Maintenance (O&M) Cost Model were also used to develop the study's cost estimates of a fare free system. A literature review was conducted on US fare free systems and a survey of US transit systems with experience providing fare free service offered "lessons learned", including the type and magnitude of associated costs and projected ridership increases. Finally, the SFCTA Travel Demand Model provided an estimate of the impact that a fare reduction from $1.50 to $0 (all else about the system held constant) would have on ridership.

Using this preliminary data, three different scenarios were analyzed. Based on the experiences of other fare free transit systems, the first is a relatively small ridership increase of 18 percent across the system. The second, an increase of 48 percent, is consistent with ridership increases experienced in larger cities such as Austin, TX and Denver, CO. The final scenario involved a 78 percent ridership increase, one larger than any experienced by the transit systems surveyed. Three possible scenarios were examined, in order to develop a range of potential costs.

[1] Rank is based on ridership.

[2] Bus and rail ridership counts collected for the Transit Effectiveness Project (TEP) in early 2007 and SFMTA paratransit ridership counts for 2005-2006 were used. This data pre-dates the opening of the T-third line and does not include the cable car ridership counts.

1.2 Fare Free Systems in US Cities

Transit systems in the US have implemented fare free systems in various ways, including system-wide implementation on a pilot basis, implementation within a specific geographic area (e.g. a downtown), or only during specific events (e.g. poor air quality days). Six of the twelve US transit systems surveyed currently provide some form of fare free service. Though only one converted from a fare collecting system to a fare free system, all provide some degree of insight into how fare free service implementation could impact Muni costs and ridership.

Cost Impacts Experienced

The percentage of system costs related to fare collection varied by transit system. Savings were only realized when there was already excess capacity within the system. Specifically, reductions in costs associated with fare-setting[4], fare-collecting[5] and fare-enforcement[6] were realized. Costs increased when the system experienced increased demand for fare free service, resulting from limited excess capacity. In smaller systems, where agencies recover less than 10 percent of their operating costs from fares, elimination of fares did not result in any significant operating budget losses. Larger systems whose operating budgets rely more substantially on fare revenue found it more difficult to replace lost revenues with a stable and dedicated source of funding. Experiments conducted in Trenton, NJ, Denver, CO and Austin, TX demonstrated that a fare free system is cost prohibitive due to increased operational and maintenance costs driven by additional services, operators, security, facility maintenance, and customer service needs, coupled with the elimination of fare revenues.

Ridership Impacts Experienced

Cities that did eliminate fares experienced ridership increases between 13 and 75 percent. Experiments in the cities of Trenton, Denver, and Austin showed ridership increases of 50 percent. Little data exists to predict the type of rider that would drive the increase in ridership. The perception among transit professionals at 23 agencies was that the increase in ridership would be "choice riders" (those that would otherwise have driven their cars) and "dependent riders" (riders that would not have made their trip without transit). Under a fare free service scenario "choice riders" would initiate additional transit use and existing "dependent riders" would increase their use of transit.

1.3 Ridership Impact Analysis

The operational and capital impact of the three ridership increase scenarios (on bus and rail only) was calculated before developing cost estimates. Using bus and rail ridership data collected for the TEP in early 2007, as well as

[4] Fare-setting includes the administrative work related to fare policy research and planning.

[5] Fare-collecting includes staff assigned to pull fareboxes from buses, count fares, repair and maintain fare infrastructure.

[6] Fare-enforcing includes on-board fare agents.

Muni operating statistics, the following impacts were calculated for each ridership increase scenario across the system:

- The number of additional hours and miles of service needed.
- The number of additional vehicles needed during the "peak" or "rush" hours.
- The facilities needed to store or maintain the additional vehicles.
- The number of additional drivers needed.

Because paratransit service is contracted out, the impact analysis of a fare free system on paratransit service focused solely on the cost of paying for those increased trips.

Even a relatively small ridership increase of 18 percent across the system would require additional bus and rail trips and additional vehicles—specifically 41 buses, 11 streetcars and 37 light rail vehicles – based on an 85 percent load standard (meaning the vehicle is at capacity with passengers seated and standing).[7] Bus and rail routes had the least capacity available to absorb additional riders during daily rush hour or peak periods. The spillover effect of these additional trips includes the need for additional bus and rail operators, with approximately 59 additional operators needed in this scenario.

An increase in ridership of 48 percent across the system would require an additional 157 buses, 20 streetcars and 90 light rail vehicles – based on the same 85 percent load standard. Approximately 234 additional operators would be needed in this scenario.

An increase in ridership of 78 percent would require an additional 283 buses, 30 streetcars and 138 light rail vehicles and approximately 420 additional operators would be needed in this scenario.

A secondary impact of any scenario is the need for additional facilities to service and store the needed vehicles. Currently, the storage needs at SFMTA's facilities severely exceed capacity, as they already store and maintain more vehicles than they were designed to accommodate. Of five bus yards, only the Presidio bus yard has room for an additional 6 buses. Of two rail facilities, only one has room for an additional 13 vehicles. Similarly, subway capacity was analyzed and found to safely accommodate the trips needed to support a ridership increase of up to 48 percent.

Though no exact estimate of a potential ridership increase is available, the SFCTA Travel Demand Model forecasted that if fares were reduced, from $1.50 to $0, demand for Muni would increase by about 35 to 40 percent, a number close to the mid-growth scenario. This number is partly due to an increase in the rate of transfers, by those switching from non-transit modes of

[7] Passenger counts for each bus and rail route in San Francisco collected in early 2007 for the TEP and Muni operating statistics were used to determine the ability of the existing routes to absorb any additional passengers.

travel such as walking, biking or driving, and some opting to take Muni instead of the Bay Area Rapid Transit (BART) for trips within San Francisco.

Should Muni become a fare free system, the Americans with Disabilities Act (ADA) would require that SF Access, one of the City's three paratransit services, also be fare free service. The most recent count of paratransit passenger trip levels (2005-2006) estimated 234,000 annual SF Access passenger trips. Assuming the service would experience an increase in ridership similar to the larger system, the small, medium and large ridership increases were applied to the SF Access system to generate cost estimates. Annual ridership increases of 18, 48 or 78 percent would require SF Access to provide an additional 40,900, 111,000 or 181,000 trips, respectively.

1.4 Cost Impact Analysis

Using the TEP O&M Cost Model, cost estimates of transitioning to and operating as a fare free system were developed. The O&M Cost Model includes detailed cost and operating information[8] routinely collected by the SFMTA to determine cost increases and decreases associated with a certain level of service. For this study, costs associated with revenue collection, farebox and ticket vending machine repair and maintenance, fare policy research and proof of payment enforcement were removed from the model to simulate fare free service.

Projected Operations & Maintenance Costs

Fare-related costs totaled $8.4 million in O&M annual costs, a savings of approximately 1.5 percent of the total FY 2006 O&M budget and a reduction in total staff headcount of 91 full-time employees, which is approximately 2 percent of FY 2006 total staff. Excluding the additional cost associated with paratransit service, each of the three ridership increase scenarios would result in O&M costs, such as the cost of additional operators and security services, exceeding the $8.4 million in annual savings. Excluding paratransit service, if ridership increased by 18 percent, annual O&M costs would increase by nearly $23 million, (a 4 percent cost increase). If ridership increased by 48 percent, annual O&M costs would increase by nearly $69 million (a 12 percent cost increase). If ridership increased by 78 percent, annual O&M costs would increase by nearly $139 million (a 24 percent cost increase). In addition, with the implementation of a fare free system, SFMTA would lose about $111.9 million in annual fare revenue.

If ADA-mandated paratransit service experience similar ridership increases, annual O&M costs would increase by another $1 million, $2.8 million, or $4.6 million respectively. However, since SFMTA contracts out paratransit service, no capital costs associated with vehicle acquisition and maintenance facilities were considered.

[8] The O&M Cost Model includes actual operating and work order expenses, payroll, staffing levels and salaries, level of service and dispatch data. The model uses FY2006 cost information.

Projected Capital Costs

A review of SFMTA's Capital Improvement Program (CIP) identified the fare-related projects that would no longer be required with the implementation of a fare free system. Elimination of these projects from the plan would result in a savings of approximately $255 million over the period of 2007-2037. These projects include the purchase or upgrade of kiosks for media and advertising sales, administrative and training facilities, improvements related to fare collection, fareboxes, fare collection systems, and ticket vending machines.

The cost of procuring new bus and rail vehicles to accommodate additional demand would be $206 million, if ridership increased by 18 percent, $537 million if ridership increased by 48 percent, and $860 million, if the ridership increased by 78 percent.

This study also highlighted those planned capital projects critical to serving additional passengers, which would need to be completed prior to the implementation of fare free service. These projects include a new central control facility (estimated at $75 million), a new bus maintenance facility (estimated at $112 million), and restoration of a rail maintenance facility (estimated at $50 million).

A second set of capital projects, that SFMTA would need to make significant progress towards completing prior to the implementation of fare free service, includes equipment ($1.1 billion), facilities ($553 million), fleet ($5.4 billion), and infrastructure projects ($2.3 billion). This list of projects includes several data and security systems upgrades or replacements, rail and bus facility rehabilitation, purchase of buses, rail cars and maintenance vehicles, replacement of overhead wires and railway track, and improvements to bring the system into complete ADA-compliance.

These projects reflect the fact that SFMTA's current capital assets have not been replaced, upgraded or enhanced, as required, and already have significant impact on system reliability. The lack of investment in these capital projects, prior to the expected ridership increases resulting from a shift to a fare free system, could make such impacts even more severe.

In summary, the net financial impact of changes in annual O&M costs for the middle range scenario addressed in the study would be $184 million. This cost includes the elimination of the expected $111.9 million in annual fare revenue. This level of ridership increase is considered a reasonable estimate, based on the SFCTA's ridership projection and the experience in other fare free service initiatives. The procurement of additional vehicles, implementation of critical infrastructure projects (including the elimination of fare related capital projects) would result in additional capital costs of $519 million. These estimates do not include the cost of the projects that SFMTA should make significant progress towards completing prior to the fare free system implementation. Finally, these estimates do not address the replacement of operating revenues from other sources.

1.5 Policy Issues Analysis

Eliminating fares from the existing Muni system raises several political, implementation-related, regional and financial issues. These policy issues stem from the institutional and political context within which approval and implementation of a fare free system would occur. Legally, with the support of the SFMTA Board and the Board of Supervisors, the SFMTA could eliminate fares through the budget process. However, as this would be a long-term investment, it would be critical for local and regional policy bodies to affirmatively support fare free service to make the effort successful. Additionally, a vote of approval from the public may be warranted, given that a fare free system would require new sources of local revenue, possibly from taxes, fees and fines paid by residents, local businesses and visitors.

As a lead agency in the TransLink® regional fare program, SFMTA contributes the largest share of funding to the creation and implementation of that program. Conversion to a fare free system could adversely impact movement towards an integrated SMART-card based electronic fare collection system in the Bay Area. However, the SFMTA could choose to use the TransLink® card solely as a means to count riders.

The largest single issue, in terms of successful implementation, is SFMTA's ability to acquire vehicles, expand vehicle storage and maintenance facilities, and increase staffing levels in a timely manner, in order to address the security and operational needs necessitated by a fare free system.

At the current pace of procurement, it would take between five to ten years to acquire the additional vehicles and to provide sufficiently expanded maintenance capacity.

In the absence of sufficient funding, a fare free system could present SFMTA with a series of trade-offs to accommodate all aspects of transit service. The conversion to fare free service would likely widen the SFMTA's existing structural deficit[9] and create a potential trade-off between upgrading and expanding existing maintenance and other support facilities.

1.6 Risk Issues Analysis

Successful implementation of a fare free system depends largely upon the mitigation of all risks, including the known financial and political risks noted above. Other known challenges such as the limits of existing storage facilities, subway design, congested roadways and SFMTA's procurement process and timelines would need to be addressed prior to implementation. The SFMTA is pursuing trade-offs between transit and on-street parking needs, transit-only corridors, Charter Amendments providing for greater control over procurement, higher capacity vehicles and the ability to run three-car trains through the subway. Unknowns, such as the true level of increased ridership in response to a fare free system and the potential

[9] A structural deficit exists when a public entity's fiscal system is unable to generate sufficient revenue to support base-level public services from one year to the next, adjusting solely for annual inflationary costs.

increase in passenger incidents, as experienced by other transit systems that experimented with fare free service, would require the SFMTA to develop flexible strategies that can respond to needs as they emerge.

1.7 Conclusion

A fare free transit system in San Francisco, if enacted, would be the largest such experiment in the nation, to date. Those US transit systems with experience in providing fare free service did show that free transit could attract people to transit—but only when service standards were sufficiently maintained. In addition, they highlighted the importance of stable sources of dedicated funds to replace lost revenues.

Given the state of the City's public transit related structural deficit, as evidenced by the lack of adequate facilities, technology, capital assets and staffing, offering free rides presents a significant financial burden. In FY 2006, the operational and maintenance costs of fare collection totaled $8.4 million, including enforcement and farebox maintenance. The study team found that even a small ridership increase would result in O&M costs exceeding the $8.4 million in annual savings due to the already existing structural deficit. According to SFCTA travel demand models and other transit systems, a more reasonable increase in ridership (48 percent) would significantly increase annual O&M costs by $184 million, including the $111.9 million in annual farebox revenue forgone in a fare free system, and the capital needs are estimated to total $518 million. This does not include the cost of the projects SFMTA should make significant progress towards completing prior to implementation of a fare free system.

Conceptually, fare free service would appear consistent with San Francisco's "transit first" policy, which requires the City to promote alternatives to car travel. However, without significant improvements made to the system's infrastructure in order to increase reliability, fare elimination alone may actually make public transit a less viable alternative to other modes of travel.

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1. INTRODUCTION

1.1 Purpose of Study

At the request of San Francisco Mayor Gavin Newsom, this feasibility analysis was conducted to study the operational costs and benefits to the City of San Francisco if the San Francisco Municipal Transportation Agency (SFMTA) was to implement fare free service (elimination of fares) system-wide. Consideration of a fare free system is also driven by SFMTA's overall goal of increasing public transit ridership and mitigating traffic congestion on the City's busiest corridors in support of the City's Transit First policy.

Specifically, the objectives of the study are to address the following questions if the decision was made to implement a fare free system:

- If fares were eliminated, how would Muni ridership increase or decrease?
- What operational and capital items would be needed?
- What operational and capital items would no longer be needed?
- What policy issues would need to be addressed?
- What are the key risk areas?

1.2 Study Overview

To address the objectives above, the study focused on the following five areas:

1. **Lessons Learned from Other US Transit Systems:** Based on a review of available research and interviews, the study analyzed the relative successes and challenges experienced by US transit systems that have experimented with fare free service.
2. **Ridership Impact Analysis**: The study focused on the impact of increased ridership on bus, rail and paratransit service associated with fare free service. (Analysis of the impact on cable car ridership was not included in this study.) The purpose of the ridership analysis was to identify the increase in operational (hours and miles of service and staffing) and capital (buses, rail vehicles, and maintenance facilities) requirements to accommodate higher ridership levels associated with fare free service.
3. **Operation and Maintenance (O&M) and Capital Cost Impact Analysis:** Based on the results of the ridership impact analysis, cost estimates were developed to reflect the increased levels of service, and additional capital requirements associated with fare free service. Additionally, costs associated with critical capital infrastructure improvements that would need to be implemented prior to implementing fare free service were identified. Cost savings from the elimination of fare

related capital projects in the 30-year Capital Improvement Plan (CIP) were also identified.

4. **Policy Issues Analysis**: Key policy issues were identified associated with SFMTA converting to a fare free system. Key institutional, implementation, regional and funding issues were analyzed. These policy issues emerge from the particular institutional and political context within which approval and implementation of a fare free SFMTA system would occur.

5. **Risk Issues Analysis**: Eight primary risk categories were identified through the course of the study. For each of the following categories, specific risks were identified as were potential mitigations measures:

   - Ridership levels greater or less than anticipated in total and in certain routes and the geographic distribution of ridership different than anticipated
   - Passenger Incidents
   - Political
   - Funding
   - Storage and Subway Capacity
   - Procurement
   - Public Support
   - Roadway Capacity

2. FARE FREE SYSTEMS IN US CITIES

2.1 Background

This section provides an overview of the experiences of US transit systems that have eliminated fares. These fare free service experiences have included on-going full system operation, short and long term experiments, implementation in specific geographic areas, and use on poor air quality days only.

The most common operational, financial and policy reasons for considering fare free service include:

- Enhanced mobility by providing improved access for potential riders to local destinations
- Promoting the use of transit (increasing ridership) by eliminating financial and physiological barriers associated with fares to encourage potential riders to try transit
- Enhancing the mobility and accessibility of existing transit users, many of whom are lower income and minority residents
- Reducing congestion by getting people to use transit instead of cars
- Improving air quality by reducing the volume of vehicles and potentially improving the level of service for all vehicles along major corridors
- Maximizing available off-peak transit capacity
- Reducing operating costs associated with collecting and counting fare revenue, maintaining fare boxes, and fare collection agents; and reducing capital costs associated with replacing fareboxes
- Reducing the need for parking by encouraging greater use of transit

While some agencies may have considered elimination of fares, relatively few have actually done so on a continuing basis. Included among these are ten agencies that have implemented fare free service system-wide, and two agencies that have limited fare free service within the downtown area. In addition to the SFMTA, areas of the country that are evaluating the implementation of a fare free service policy include Charlottesville (Virginia) and New York City.

Some of the earliest fare free service experiments were sponsored by the Urban Mass Transportation Administration (UMTA), predecessor to the Federal Transit Administration (FTA), under its Service and Methods Demonstration Program. Two system-wide non-rush hour fare free service experiments were conducted in Trenton, New Jersey, and Denver, Colorado in the late 1970s. These projects were the first fare free service programs of such size and comprehensiveness and provided a number of conclusions. Based on a Transportation Research Board report in 1979, the major conclusions from these experiments are as follows:

- While fare free service induced large and sustainable ridership gains (19 percent in Trenton and 34 percent in Denver), the general behavior of the population in making their modal choices was not significantly different from what it would be with any other absolute change of an equal amount.

- The price elasticity of demand for transit implied by the Trenton results was -0.42, greater than the Simpson-Curtin standard for the transit industry, which states that an overall fare increase (decrease) of 10 percent will result in ridership loss (gain) of 3 percent.

- With fares free only in the off-peak, the demonstration served to reduce the peak-load capacity requirements in Trenton's transit system and caused a dramatic shift from the peak to the off-peak.

- Complaints of rowdiness, vandalism, and other incidents increased at both sites to such an extent that vehicle operators, passengers, and the general public called for the abandonment of the experiments.

Based on a review of available data, only four systems in the last 20 years that have implemented a system-wide fare free service continue to offer the service: Chapel Hill, North Carolina (2002), Clemson, South Carolina (1996), Logan, Utah (1992) and Island County, Washington (1987). Only one of these, the joint city-university transit operation in Chapel Hill, transitioned from a fare based system to a fare free system. A common characteristic of these systems is that they are located within small cities. In most cases, the collection of fares would generate little if any useable revenue for the system due to the day to day operating and maintenance (O&M) costs associated with the fare collection, accounting, and enforcement. This prior experience does not necessarily imply that transition to a fare free system for larger transit systems, such as the SFMTA, is not possible. However, it does serve to emphasize the need to determine if there is a net savings to the agency after accounting for avoided capital and operating costs, potential increases in the day to day O&M costs, long-term capital replacement costs, and the loss of fare revenue as a key funding source.

It is interesting to note that this is not the first time that a fare-less or low-fare transit has been considered for the San Francisco Bay Area. In 1973, the Metropolitan Transportation Commission (MTC) conducted a study entitled "No Fare and Low Fare Transit: An Evaluation of their Feasibility and Potential Impact in the San Francisco Bay Area." As referenced in an October 2002 Public Policy Institute of California Working Paper entitled "Transportation Affordability for Low Income Populations: A Review of the Research Literature, On-Going Research Projects, and San Francisco Bay Area Transportation Assistance Programs," author Lynn Scholl notes:

> *"The feasibility of no fare and low fare transit policies was examined in a report by the Metropolitan Transportation Commission in 1973. The report discusses several potential benefits associated with such policies such as increased ridership, reduced costs for groups with special needs such as the poor, disabled and the elderly, reduced congestion, lower pollution rates and energy conservation and the more efficient use of existing*

public transit. The report cites high costs and uncertainties regarding the degree of increase in ridership generated by such policies as problems. They examine several cities where no or reduced fares had been in place and concluded that while revenues were lost there was a general increase in social benefit among cities who had implemented such policies. The study suggests the evaluation and consideration of a number of complements to a no fare or low fare policy such as restrictions and disincentives on auto use, gasoline rationing, among others. Because of the difficulty in estimating increased demand due to no and low fare policies, the authors also recommend a series of demonstration projects focused on special needs groups to evaluate the benefits of such programs."

2.2 Methodology

The following methodology was applied to prepare this section:

- Conduct a literature review of available fare free service analysis reports
- Interview representatives or former employees of systems that implemented some version of fare free service
- Where data was available, compare the results and experiences of fare free systems, the most common operational, financial and policy reasons for implementing fare free service, and how systems addressed the potential negative impacts associated with the service such as increased vandalism, overcrowding, security incidents, and O&M costs
- Develop a general overview of key findings from the range of systems identified
- Develop more detailed project profile information for three fare free systems, the Bay Area's Spare the Air Campaign, and the proposed implementation of congestion pricing for auto traffic into New York City and the corresponding free transit service proposed to be funded by the congestion pricing
- Develop a summary of key conclusions specific to the potential implementation of fare free service in San Francisco

2.3 Literature Review

2.3.1 Overview

As summarized in Table 1, over the last 30 years twelve transit systems have implemented fare free services. Excluded from this number are systems with individual downtown routes such as Denver's Free Mall Ride and the downtown Orlando LYMMO service, small groups of routes such as Capital Metro's Downtown Austin 'Dillo Shuttle Service, resort area shuttle services in areas such as Mammoth, Aspen, Vail, Breckenridge, and Steamboat Springs, and fare free services offered only on bad air quality days. Transit systems today that offer fare free service are typically smaller communities or only provide free service within a specific geographic area such as downtown. The last major system to implement a long-term fare free service experiment was Austin's Capital Metro in 1989-1990. A detailed discussion of this 13-month experiment is provided in Section 3.5. Also, as shown on the table below, the primary objectives for implementing a fare free service policy all were contingent upon increasing transit ridership.

Based on the literature review, key findings of "Fare Free Policy: Costs, Impacts on Transit Service and Attainment of Transit System Goals" prepared for the Washington Department of Transportation, and "Fare, Free, Or Something In Between?" prepared by the Center for Urban Transportation Research/University of South Florida (CUTR report) include:

- Five of the six on-going fare free systems <u>began</u> operations as Fare Free systems. Only Chapel Hill <u>converted</u> to a Fare Free system (2002).

- The six permanent systems are small systems that provide service within their own community. Service is provided beyond the community limits for two systems (Chapel Hill and Vail) by regional transit providers which do charge fares.

- Of the major transit systems around the country, only Portland and Seattle provide fare free service on all routes and services within a geographic zone. Portland's "Fareless Square" provides free service all day while Seattle's "Ride Free Area" reduced it service to 6:00 am to 7:00 pm due to the reported number of intoxicated riders boarding the bus in the late evening.

- Of the three fare free experiments by larger transit systems (Austin, TX; Trenton, NJ; and Denver, CO), two of the three systems provided fare free service only during the non-rush hour periods.

One of the two offering fare free service during the non-rush hour service was Trenton, NJ in 1978. The primary objectives of the Trenton experiment were increased mobility and economic redevelopment of the downtown area. The results of the one-year Trenton experiment included:

- Ridership increased by 19 percent compared to prior to the implementation of Fare Free
- Weekly car vehicle miles traveled decreased by 0.5 to 1.0 percent
- A slight O&M cost savings related to fare collection labor costs
- Fare revenue reduction by approximately 25 percent, of which 4.3 percent occurred during the peak period
- Increased O&M costs due to additional service which had to be provided to meet high passenger demands during the fare-free hours
- Initial problems with crowding, rowdiness, schedule adherence and vandalism, which subsided as policy adjustments were made

Table 1: Fare Free Service Transit Systems

System	Years	Geographic Area	Time Period	Objectives	Achieved?
Amherst, MA	1976 - 2003	System-wide	All Day	Increasing Mobility and Reducing Congestion	Yes, until state funding was cut and increasing O&M cost required the need for fares.
Chapel Hill, NC	2002 - present	System-wide	All Day	Increasing Mobility, Air Quality, Parking and Congestion Relief	Yes. Ridership has increased 92% since introduced.
Clemson, SC	1996 - present	System-wide	All Day	Increasing Mobility	Yes.
Commerce, CA	1962 - present	System-wide	All Day	Increasing Mobility	Yes, with no significant issues.
Logan, UT	1992 - present	System-wide	All Day	Increasing Mobility	Yes. Ridership increased from approximately 750,000 in 1992 to 1.4 million in 2005.
Vail, CO	On-going	System-wide	All Day	Increasing Mobility	Yes. This city claims to be the largest free transit system in the country.
Trenton, NJ	1979	System-wide	Off-Peak Only	Increasing Mobility and Revitalization	Yes. Ridership increased by 19% and weekly auto vehicle miles traveled were reduced by 0.5 to 1%.
Denver, CO	1979	System-wide	Off-Peak Only	Increasing Promotion and Congestion, and Pollution, Relief.	Yes. Ridership increased by 34%; Reduced weekly auto vehicle miles traveled by 0.5 to 1%.
Austin, TX	1989-1990	System-wide	All Day	Increasing Promotion and Education	Yes, until increased passenger incidents led to the service's end.
Seattle, WA	1973 - present	Downtown only	6:00 am to 7:00 pm	Increasing Mobility	Yes.
Portland, OR	1975 - present	Downtown only	All Day	Increasing Mobility, Air Quality, and Congestion, Parking Relief	Yes, and over time, has evolved to address operation and fare issues.
Island County, WA	1987 - present	System-wide	All Day	Increasing Mobility and Promotion	Yes.

Sources: "Fare Free Policy: Costs, Impacts on Transit Service and Attainment of Transit System Goals", Hodge et al, March 2004; "Fare, Free, Or Something In Between?", Center for Urban Transportation Research; and Sharon Greene and Associates, June 2007.

The other city offering non-rush hour service, Denver, had the primary objectives of increasing ridership and reducing pollution through lower automobile use. Initially, Denver's experiment was a one month promotion that lasted a year. Similar to Trenton, Denver's experience included:

- A 34 percent ridership increase compared to prior to the implementation of fare free service
- Weekly car vehicle miles traveled decreased by 0.5 to 1.0 percent
- Initial problems with crowding, rowdiness, schedule adherence and vandalism, which subsided as policy adjustments were made

With respect to the role of free or reduced fares as a tool to increase ridership, findings from the 1998 National Personal Transportation Study (NTPS) indicated fares to be of relatively lower importance. As noted in "Public Transit in America: Findings from the 1995 Nationwide Personal Transportation Survey," by S. Polzin, J. Rey, and X. Chu (National Urban Transit Institute, University of South Florida, Report #NUT 14-USF-4, September 1998), concerns noted in order of significance were "crime on public transit, time spent on public transit, having access to a car when they need it, difficulty with crowding or getting a seat, cost of travel by public transit, time of day availability when they need to use it, transit stations and vehicles not being clean, and time and aggravation with transfers." Finally, in looking at what factors transit systems can control and how they affect ridership, a 2003 study by Brian Taylor of UCLA entitled "Reconsidering the Effects of Fare Reductions on Transit Ridership" determined that improvements in service supply – frequency, coverage, reliability - as well as on-time performance were more important than price (fares) in determining ridership. The Taylor study found that comparative measures of service and price elasticities show that responses to service changes are substantially more elastic than changes to fares. However, when fare programs are targeted to specific populations with relatively high price elasticities of demand, such as students and the transit dependent, they have been very effective in attracting ridership.

2.4 Potential Impacts of a Fare Free System

Implementation of a fare free service policy will have impacts throughout a transit system. The literature review identified potential impacts on costs, ridership, and quality of service.

2.4.1 Cost Impact

According to the "Fare Free Policy: Costs, Impacts on Transit Service and Attainment of Transit System Goals" (Free Fare Policy Report), the percentage of system costs related to fare collection varies by transit system. However, the authors of the Free Fare Policy Report documented studies conducted in the 1970's that indicated that activities related to fare collection were not a significant component of an agency's operating budget:

- A survey of six systems calculated fare collection operating costs to be roughly 1 to 3 percent of total operating costs or 0.75 to 1.93 cents per vehicle-mile, while fare collection capital costs (depreciation costs) ranged from 0.03 to 0.44 cents per vehicle-mile. Again, these costs vary by system size and sophistication of fare collection equipment.

- The elimination of fares considered in Boston would have reduced system costs by $3.5 million or 5 percent of the total O&M costs. It important to note that $2.0 million of these savings would have been from the elimination of subway station booth agents which have been reduced by most major rail systems today with the use of ticket vending machines. It should be noted that such costs are not necessarily eliminated. In the case of Chicago, for example, token agents became “customer assistants.”

The CUTR report also highlighted that the transition to fare free service would eliminate fare-related costs associated with fare-setting (administrative work related to fare policy research and planning), fare-collecting (staff assigned to pull fareboxes from buses and count fares) and fare-enforcing (on board fare agents). Additionally, the elimination of the administrative activities could provide staff additional time to focus on the issues and service changes related to the quality and effectiveness of transit service, which are keys to keeping and attracting ridership.

There are also costs associated with meeting the increased demand for fare free service. While most systems may have some excess capacity for additional riders, it was expected that frequency improvements and/or larger vehicles would be needed to accommodate higher passenger levels. In Austin, the initial 13-month experiment resulted in a reduction in the operating cost per passenger in large measure because no additional service was provided, due to the excess capacity that existed in the system. However, when the agency evaluated fare free service again four years later, staff identified an annual increase in O&M costs of approximately $1.0 million dollars and a capital cost impact of $2.7 million related to additional buses, fareboxes and radio communication equipment. This was in addition to an estimated loss of $6.7 million in fare revenue.

Another issue highlighted in the Free Fare Policy Report is that it is likely that communities that transition to a fare free service policy will receive requests for new and additional services not currently provided. While not quantified, there are administrative costs associated with evaluating and responding to these requests. If the additional service requests are adopted by agency’s board of directors, the agency will experience an increase in day to day O&M costs.

2.4.2 Service Impacts

The Free Fare Policy Report identified two impacts that could affect transit service: ridership (ridership levels and types of riders) and quality of service (on-board the vehicle and on-street performance).

2.4.2.1 Ridership Levels

When potential passengers compare taking transit to driving their car, there are typically four "costs" that could influence their decision making process:

- Fare value
- Use of the farebox as a barrier (i.e., have the right fare and the correct change)
- Personal safety and security costs
- Time and convenience costs

Introduction of fare free service eliminates the first two of these costs and results in a significant drop in the costs associated with the fare box by eliminating in the minds of potential passengers a source of confusion and possible embarrassment. As documented above, the elimination of fare value and barrier associated with the farebox through the introduction of fare free service results in increased ridership. Unfortunately, there is little experience in anticipating ridership increases. Most of the successful long-term/on-going fare free systems began fareless. Based on the examples described previously, the ridership levels increased between 13 percent and 75 percent:

- Trenton (one year; off-peak only): 19 percent
- Denver (one year; off-peak only): 36 percent
- Chapel Hill: (percent increase over previous year) Year 1: 20 percent (compared to last year of fares); Year 2: 36 percent; Year 3: 7 percent; Year 4: 10 percent
- Austin (13 months): 54 percent

The Free Fare Policy Report concluded that for most systems that transition to a fare free service policy, it would be realistic to anticipate a ridership increase of at least 25 percent but more likely the increase would be closer to 50 percent.

2.4.2.2 Types of Riders

In general, riders that typically use transit will reflect characteristics of one of the following:

- **"Choice Riders":** those who would have otherwise driven their cars are attracted to transit, decreasing auto use, and fulfilling environmental objectives
- **"Dependent Riders":** those who would not have made their trip without transit and are provided additional mobility
- **"Convenience Riders":** those who would have walked, carpooled, or rode bicycles are attracted to transit because of the convenience, thereby potentially burdening the system and not necessarily fulfilling the objectives of the program

- **"Joy riders":** riders who joy ride or vandalize and work against the objectives of the transit system by degrading the systems service and attractiveness to other potential users

While the first two groups of riders are the primary target for transit agencies, as noted in the Free Fare Policy Report, "unfortunately we do not have reliable data on either of these groups". Additionally, the authors of the Free Fare Policy Report conducted a survey of transit professionals at 23 transit agencies related to the potential impact of fare free service. The perception among the professional community was that ridership in targeted categories would increase significantly:

- 73 percent of respondents expected that existing dependent riders would increase their use of transit
- 70 percent of respondents expected that that choice riders would initiate use of transit
- 57 percent thought expected that convenience riders would transition to transit

The joy riding category is a separate concern for multiple reasons. In Austin, the introduction of fare free service led to a significant increase in incidents involving problem riders, primarily rowdy children and intoxicated passengers. The introduction of fare free service and its increased mobility opened up the region for school age children and also led to complaint from the school district regarding an increase in truancy. As mentioned earlier, Seattle curtailed the hours of operation of their downtown "Ride Free Area" due to the number of "intoxicated" passengers riding the bus in the late evening hours. Based on the survey conducted for the Free Fare Policy Report, 57 percent of the transit professionals responding to the survey expected the number of problem riders to increase.

However, it was also noted that the issue of problem riders does not appear to carry over to the smaller communities that have implemented a fare free service policy. The authors felt the two reasons for this were: 1) in general, smaller communities are less likely to be confronted by such problems 2) the majority of the small communities implemented an aggressive ridership policy from the start of fare free service that included educational programs (especially in local schools) and suspension of riding privileges for those who cause problems. According to the authors, in these communities, riding the bus is considered a privilege and threat of suspension is credible.

2.4.3 Quality of Service Impacts

Quality of service impacts of a fare free service policy may be of two distinct types. On a micro level, implementation of a fare free service policy could potentially impact the quality of service on-board the transit vehicles (driver-passenger interactions and passenger-passenger interactions) and on-street performance, such as schedule adherence. On a macro level, a fare free service policy could potentially result in reductions in the overall level and quality of transit service, particularly if additional funding sources are not available to replace revenues from fares.

As documented in the Free Fare Policy Report, on-board, both drivers and passengers could experience both positive and negative changes. Driver job satisfaction would improve due to the removal of the fare box and associated conflicts with passengers who equate fare payment with the driver's "ownership" of the vehicle. However, the increase of problem riders could result in increased incidents for drivers and increase the psychological costs (personal security) for riders. Additionally, if ridership grows significantly exceeding existing capacity and the level of service is not increased, crowded and uncomfortable conditions may also raise riders' psychological costs. Based on their experience, 92 percent of the drivers in Trenton found their jobs to be less favorable as a result of the program. In Austin, 75 percent of drivers signed a petition requesting the elimination of the fare free service experiment in 1990.

While acknowledging the potential for more negative impacts with fare free service than positive, the authors of the Free Fare Policy Report suggest that these results of fare free service have been over-emphasized by critics due to a lack of understanding of the experiments. Based on their review:

- Problem riders were always an issue, even without fare free service
- Policy adjustments (asking a problem rider to leave the bus after a complete round trip) and educational programs directed at school age children may effectively resolve these problems
- The severity of these problems may vary between systems that start as a Fare Free and those that transition to fare free service
- Management's attitudes towards the policy, and the communication of the attitudes to other agency personnel, can impact the strategies developed to deal with the predictable negative aspects of fare free service

In terms of operational efficiency, one of the key factors relates to the dwell times at stops. The Free Fare Policy Report referenced a study 1974 study by James Scheiner and Grover Starling that estimated boarding times may decrease as much as 18 percent when the farebox is removed because multiple doors can be used for boarding and disembarking. This time savings could improve the overall on-time performance of routes, especially those traveling along congested corridors. However, the authors of the Free Fare Policy also point out that fare free service may negatively impact on-time performance due to: 1) overcrowding conditions with higher ridership levels which increases the time to get on and off the bus; 2) an increased number of short transit trips, where previously travelers would have walked; and 3) the possibility that the bus will have to make more local stops along a route than previously due to the fare free service.

2.4.4 Key Conclusions from Literature Review

Based on their research, CUTR identified several questions that they felt must be addressed In order to assess if a fare free service policy would benefit a transit system:

- ***What is the net cost of a fare free service policy*?** In smaller systems where the net farebox recovery (useable revenue) is generally less than ten percent, the cost of collection might cancel out any net proceeds of fare collection. Additionally, for the systems that currently have a fare free service policy, they have some form of dedicating funding source to off-set the loss of fare revenue.

  In larger systems, the net farebox recovery is typically much greater and the revenue is a substantial portion of the operating budget. According to the CUTR report, in Austin, which had a 15 percent farebox recovery prior to their experiment, increased costs of operations due to maintenance, labor, and security costs threatened the financial well being of the system and the cost of the deterioration of the internal bus environment, security, employee satisfaction, and public image were not worth the benefits that could be gained by fare free service.

- ***What will be the impact of a fare-free policy on ridership and quality of service?*** Fare-free policy will yield substantial gains in ridership. What is important is the type of ridership that is being gained: Will the types of people attracted to the system be positive or negative for the system? Will the implementation of fare-free service overwhelm the system with overcrowding and problem riders, driving away existing users?

- ***How will a fare-free policy impact the attainment of the community's goals?*** Will fare-free service increase mobility for transit-dependent riders in the community? Will fare-free service advance environmental and traffic congestion goals? Will fare-free service cause a positive perception of the transit system in the long term? Will fare-free service cause an increase or decrease in customer service and satisfaction?

Finally, available research shows that smaller transit systems have a more positive experience offering fare free service than larger systems and that the most successful fare free systems started operations that way. However, as pointed out in the Free Fare Policy Report, this does not mean that fare free service can not be successful in larger systems. It may require larger agencies to develop strong policies in anticipation of potential negative impacts and implement an aggressive educational campaign prior to the transition. At a minimum the following guidelines should be followed:

- Clearly identify the objectives addressed by the fare free service policy
- Recognize the importance of total organizational commitment to the policy
- Clearly communicate system objectives and policy to the community

- Deal firmly with problem riders (based on adopted policies), but use education to reduce problems
- Be prepared for substantially more riders and requests for more service changes

2.5 Project Profiles

This section provides profiles of four different fare free service experiences:

- A long term experiment (13 months): Austin, Texas
- A designated downtown fare free service zone: Portland, Oregon
- A small transit system that transitioned to fare free service: Chapel Hill, North Carolina
- A short term episodic regional air quality improvement program: San Francisco

In addition, it describes a congestion pricing/fare free service proposal under consideration in New York, New York.

2.5.1 Austin, Texas Fare Free Service Program (1989 – 1990)

2.5.1.1 Background

Initially, the Austin experiment was a three-month demonstration project which waived fares on all services except: 1) public event shuttles; 2) the University of Texas Shuttle (UT Shuttle), i.e. student fees for the shuttle were not eliminated during the experiment; and 3) vanpools originating outside the agency's service area. The primary objective of the experiment was to induce trial ridership and attract new long-term ridership to the transit system. Additionally, the agency was facing political pressure over its financial situation. At the time of the experiment, the agency's fare box recovery was in the 10 to 15 percent range and the agency had a large excess of capital reserve funds due to a combination of a successful 1 percent sales tax referendum in 1985 and the lack of a major capital improvement program that was ready for implementation. As a result there was pressure growing in the community to take back a portion of the sales tax revenue since it appeared the money was only being set aside in the reserve fund.

2.5.1.2 Results

In order to track the results of the fare free service experience, Capital Metro staff published a series of quarterly reports that assessed the operations through a series of performance measures. The measures included: average weekday ridership, cost per passenger trip, complaints per 1,000 boardings, and security incidents.

- **Average weekday ridership:** In the month preceding the fare free service experiment (September 1998), average weekday ridership was

50,765 (less UT Shuttle ridership). The first month of fare free service average weekday ridership increased to 72,396 – a 42 percent increase. At the end of the 13-month experiment, average weekday ridership had leveled off to approximately 78,000, which was a 54 percent increase compared to the last month prior to the experiment.

Following the reintroduction of fares in January 1991, average weekday ridership fell to 55,235 but had grown to approximately 60,000 by August 1993. Based on a recent interview with Tony Kouneski, General Manger during the fare free service period, the ridership growth during the fare free service experiment was concentrated around schools, as the free transit service provided students with something to do after school. He also indicated that this market increase caused a decrease in core riders who did not want to ride with the school kids and their rowdy behavior.

- **Cost per passenger trip:** In September 1998, the agency's cost per passenger trip was $2.21. With the introduction of fare free service, the cost per passenger fluctuated between $1.62 and $1.33 (a 27 to 40 percent reduction). This reduction was the result of excess capacity on a large portion of the agency's existing services which allowed the increased ridership to be provided more cost effectively. In 1992, the second year after the reintroduction of fares, the cost per passenger had increased to $2.24.

- **Complaints:** During the initial three months of the experiment the agency received 0.259 complaints per 1,000 riders. As the program continued, the complaint rate increased and reach a peak in the next to last quarter of the experiment with 0.415 complaints per 1,000 riders; a 60 percent increase. By the end of the first year of fares being reinstated, complaints had decreased to 0.195 complaints per 1,000 riders, a 53 percent decrease.

  The top three categories of complaints received during the fare free service period pertained to driver behavior, late buses, and hazardous operations. While these categories remained the top three categories after fare were reinstated, the ratios dropped significantly. Additionally, special categories of complaints were created during the experiment:

- **Deteriorating environment for traditional riders**: An increase in the number of complaints received regarding intoxicated passengers and "other undesirable passengers" riding the buses

- **Truancy and Safety Issues for Schools**: School district officials complained of various problems associated with the fare free service experiment including: increased rates of truancy since students could ride anywhere at anytime during the school day for free; safety concerns when children chose to ride unsupervised transit buses, rather than supervised school buses, and the issue of children crossing the street from a transit bus when cars behind the transit buses do not have to stop.

- **Vandalism**: Reports of vandalism increased, particularly near bus stops. Local business owners complained about the increased levels of bus riders loitering in front of their properties. Additionally, according to Mr. Kouneski, over time the buses became a “shelter” for the homeless population and the agency received complaints from local law enforcement for general increases in crime since they felt free bus service was providing easier access for criminals.

- **UT Student concerns**: The agency received complaints and requests from UT students who felt they were entitled to a refund of the student fee payments during the period of fare free service.

- **Security Incidents:** During the quarter immediately preceding fare free service, the agency reported 44 system-wide security incidents. Additionally, going into the fare free service program the agency employed a small number of security staff. During the first three months of the program, security incidents increased nearly three-times to 120. By the second quarter of the experiment, system-wide security incidents had increased to 193. Of these, 69 pertained to intoxicated passengers (up from 21 complaints in the first three months of the program), and 31 to incidents of drivers being verbally abused (up from 15 during the first quarter of the program).

  In the spring of 1990, the increased volume of incidents resulted in: 1) a petition signed by 215 of the agency’s drivers (approximately 75 percent of all drivers) asked that the program be eliminated; 2) a series of media reports highlighted the issues; and 3) a public hearing was held to try to address the problems of the program. In response, staff increased security measures system-wide and the number of security incidents dropped to 110, which was lower but still significantly higher than before fare free service was implemented. By comparison, the final quarter of the first year after reintroducing fares resulted in 68 security incidents.

A public opinion survey and on-board survey were conducted by the agency in April 1990. The results of the survey included:

- The general public and transit riders felt favorably toward the fare free service program
- More than a third (37 percent) of the sample population had ridden the bus following the introduction of fare free service
- Most ridership gains from the experiment were from increased use of the system by passengers who used the system prior to fare free service
- The fare free service had limited success in attracting new riders with only 6 percent of riders and that these riders were more likely to stop using the bus if fares were reintroduced
- In ranking the factors most important in choosing to ride the bus; cost (fares) ranked eighth out of nine factors. The survey determined the top five most important factors in deciding to ride the bus to be: 1) on-board safety (psychological cost); 2) on-time performance (time cost); 3) convenience of routes (time cost); 4) cleanliness inside the bus (psychological cost); and 5) frequency of service (time cost).

2.5.1.3 Fare Free Service Revisited

In 1993, the agency considered a re-introduction of fare free service. In response to the request, staff developed impact estimates for ridership, operating costs and performance measures based on their previous fare free service experiment. Based on the system's 1993 ridership and capacity levels, staff estimated the following impacts with the re-introduction of fare free service:

- Additional revenue vehicles (14 peak vehicles), hours (15,170) and miles (234,700)
- Increased staff: drivers (8 full time and 5 part time) ; mechanics (3 full time); facilities maintenance (2 full time) and customer service (5 full time telephone operators)
- Additional benefits due to increased staffing
- Increased fuel, parts, tires and other materials and supplies
- Increased security levels
- Increased promotional/educational activities
- Elimination of the student fee revenue from 40,000 plus students

Based on the above assumptions, staff estimated for FY 1994, O&M costs would increase by $1.0 million dollars; capital costs would increase by $2.7 million; and revenue loss (including the loss of the UT student fee) would be $6.7 million.

Based on the previous fare free service experiment, staff projected FY 1994 ridership levels to be 31.5 million with fare free service and 27.5 million with fares (a 15 percent increase during the first year). Based on the O&M costs impacts and ridership estimates, staff projected the cost per passenger to be $1.78 under fare free service and $1.86 with fares.

Based on a review of the 1989-1990 experiment and the FY 1994 staff projections, the agency decided not to reintroduce fare free service in 1994.

2.5.2 Portland Fareless Square (1975 – Current)

Fareless Square is a fare free service area within downtown Portland. This area is served by the TriMet Bus, MAX Light Rail and Portland Street Car systems and offers free service throughout the day. As shown in Figure 1, the Fareless Square geographical area is comprised of downtown between the Willamette River and the I-405, south of Northwest Hoyt Street and south to the intersection of the I-405 and the river at Marquam Bridge.

2.5.2.1 Background

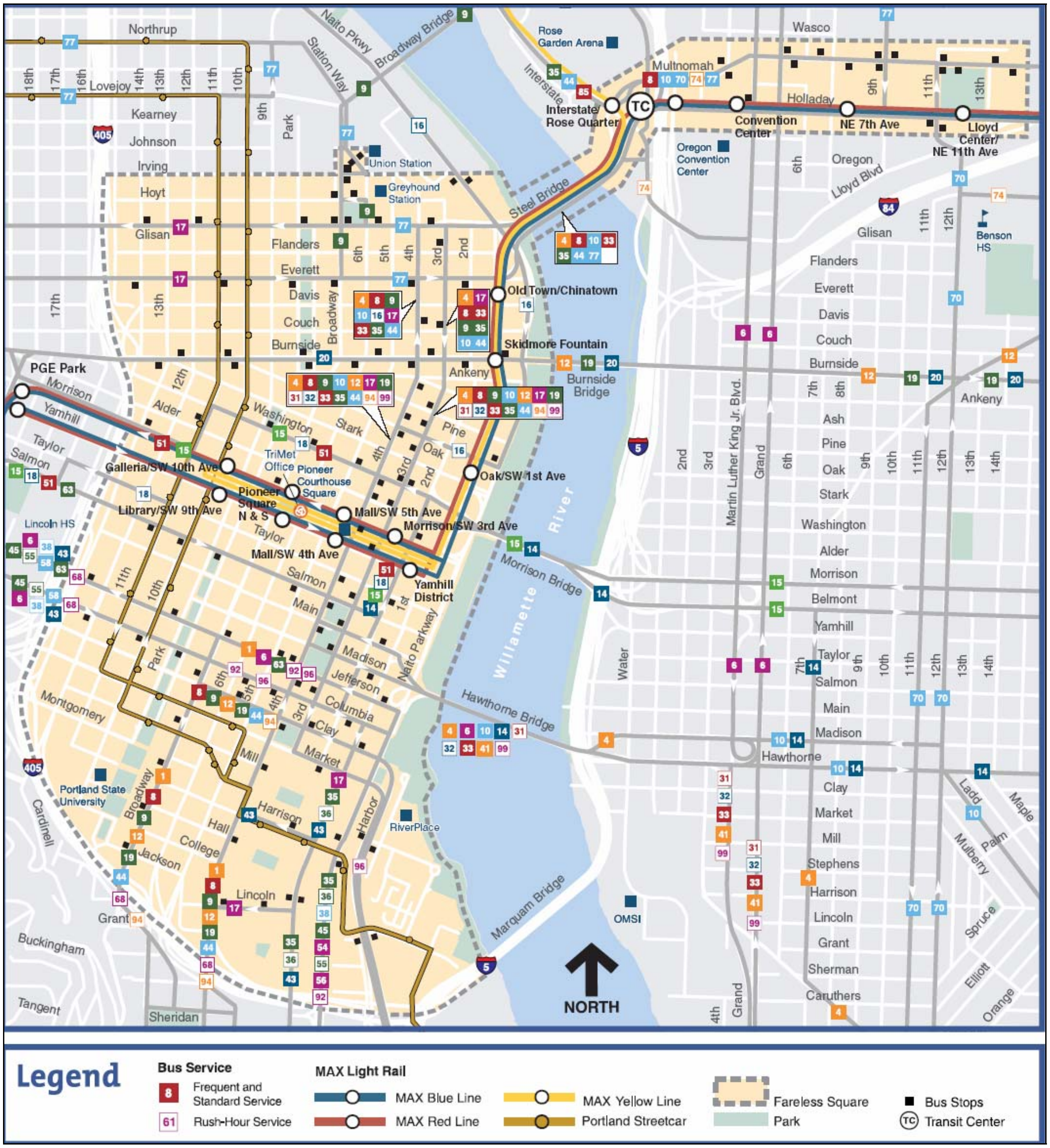
Fare free service was introduced in Portland in 1975 in conjunction with efforts to revitalize the downtown area, which in the mid-1970's was not a thriving economy. Based on a 1974 staff report, the initial objectives of what has become known as the Fareless Square included:

- Promoting transit by providing people who do not currently use transit a free opportunity to try it
- Reducing auto generated air pollution by eliminating short auto trips within the fare free zone
- Providing higher mobility and coordination for travel between governmental centers and offices in the downtown
- Providing more opportunities for travel within downtown to retail, financial, hotel and entertainment areas

In addition to these initial objectives, over the last 30 years, the following benefits have also been attributed to Fareless Square:

- **Fareless Square Encourages Commuters To Use Transit**: Fareless Square encourages commuters to leave their cars at home by providing alternative transportation during the day. According to a 1991 report, at that time approximately 23,000 people took TriMet to work in downtown Portland on a daily basis and approximately 3,000 to 4,000 trips were made within the Fareless Square. A survey of riders who rode services within Fareless Square once a month identified that 50 percent of this population was daily transit riders and 42 percent drove alone or carpooled to work on a daily basis. A key conclusion from this study is that downtown worker may be more inclined to drive to work rather than use transit without the benefit of Fareless Square.
- **Fareless Square Provides an Attractive Downtown Environment for Businesses to Locate**: Because of the lack of free parking, expanded TriMet transit service has been important to making downtown Portland an attractive place for retail businesses and other employers to locate. Based on a the variety of changes to Fareless Square described in more detail below, merchants and business groups in downtown Portland felt that the elimination of Fareless Square could have a negative effect on their businesses since transit service would not be as attractive and parking is restricted in the downtown area.

Figure 1: Portland's Fareless Square



Source: http://www.trimet.org/pdfs/farelesssquaremap.pdf

2.5.2.2 Evolution of Fareless Square

Portland's Fareless Square has evolved since it was implemented in 1975, not in terms of the geographic boundaries but in terms of addressing the issue of fare evasion for passengers getting on the bus in downtown and getting off the bus outside of the Fareless Square boundary. For trips heading to downtown, passengers paid fares using the traditional method of pay as you enter (PAYE). For trips starting within the Fareless Square, a pay-as-you-leave (PAYL) system was implemented where passengers would pay upon exiting the bus. However, PAYL resulted in the following issues:

- On crowded buses, passengers struggled to get past standing passengers so they could pay their fare as they disembarked which resulted in travel time increases due to delays in passengers exiting the buses. As a consequence to this delay, additional buses were added during the evening peak hours to maintain on-time performance.
- Fare evasion was not eliminated. Determined evaders learned they could simply exit the bus without paying a fare.

In 1979 Portland attempted to address the majority of the fare evasion issues by eliminating fare free service during the afternoon peak period (3:00 pm to 6:00 pm) by requiring passenger to pay their fare upon entering the bus. This on again/off again process created confusion for passengers and lead to a second revision in 1982. Under this revision, the PAYL was replaced with PAYE for transit service in all directions during all hours. This revision was tied in with TriMet's implementation of proof of payment fare in anticipation of the start-up of the MAX light rail service. This shifted the burden of fare monitoring from the drivers to the agency's 30 fare inspectors. Fare evasion increased significantly during this time period for the following reasons: 1) the limited number of fare inspectors compared to the level of service being provided downtown; 2) the implementation of articulated buses with three double-wide doors and the ability of passengers to board and alight through any door.

TriMet eliminated proof of payment fares in April 1984 and returned the responsibility of monitoring fares to the drivers. Additionally, the agency reduced the number of fare inspectors to five. However, this revision did not take full advantage of driver monitoring since passengers could still enter through the rear doors in downtown without paying their fare. As a result fare evasion remained a problem.

In 1986, in an attempt to address the lost revenue associated with fare evasion and the costs associated with fare inspections, a proposal was taken to the public to eliminate Fareless Square. Due to public support for Fareless Square in providing intra-downtown mobility and meeting regional air quality goals, the proposal was dropped from consideration.

In 1988, fare policy in Fareless Square was reviewed again to address the amount of real revenue lost, approximately $250,000 to $300,000 annually, and perceived fare evasion that occurred. According to testimony at public hearings, paying riders indicated that felt "cheated" by fare evasion associated with Fareless Square. Several options were considered to address the fare evasion issue:

- **Eliminate Fareless Square:** This was rejected because it did not address the regional needs for air quality improvements and intra-downtown mobility for transit patrons and auto commuters.
- **Operate Fareless Square only during selected hours or select days (e.g. 10 a.m. to 3 p.m. weekdays and all day Saturday and Sunday):** This was rejected since time based fares would be inconsistent with the goal of a simple fare system that encourages ridership.
- **Allow Fareless Square trips only at select bus stops:** This was rejected because: 1) Passenger confusion and it would defeat the goal of encouraging ridership through simplicity; and 2) It would not provide a high enough level of service to meet the goal for intra-downtown mobility.
- **Charging a special fare for Fareless Square trips:** This was rejected because it assumed that the special fare would not increase passenger revenue (most would opt to take their car, walk, or not make the trip rather than pay the fare). Also it would not solve the problem of fare evasion since passengers could still ride past the boundaries of Fareless Square without proper fare payment.
- **Replacing Fareless Square with a downtown shopper shuttle:** This was rejected because it was not cost effective. Further, past experience has shown that people have been observed to take their car thereby reducing the benefits of Fareless Square, walk to their destination, or do not make the trip rather than wait five or ten minutes for a specific shuttle.
- **Retaining Fareless Square and increasing fare inspection:** This was rejected as not cost effective. Driver monitoring of fares was seen as a more cost effective alternative to adding fare inspectors.

In the end, TriMet opted to retain Fareless Square with minor modifications which increased the ability of operators to monitor fares, decreased the potential for fare evasion, and simplified the system. Specifically:

- TriMet retained PAYE and returned to front door boarding for the entire system, including within Fareless Square. All passengers are required to enter through the front doors and either show proof of fare payment or indicate to the operator that they are only traveling within Fareless Square.

- No fare inspectors are permanently dedicated to Fareless Square. However, periodic spot checks of problem routes appear to provide adequate coverage of the bus system. Additionally, driver job satisfaction improved by allowing more control over fare evasion through front door monitoring and PAYE.

According to TriMet, these changes appear to be the most cost effective for reducing fare evasions costs. Short of a 100 percent positive check of all passengers, the fare evasion rate for buses was assumed to be nearing its potential lower limit. A March 1990 Fare Evasion Review estimated the agency was losing between $310,000 to $325,000 system-wide due to fare evasion in Fareless Square since approximately 1.87 percent of all riders on buses leaving downtown evade the fare.

Even with the loss of fare revenue, according to the 1991 TriMet report, the agency supports the public policy decisions which created and maintain the existing Fareless Square. Through the iterative process described above, there is a balance in terms of public policy needs and operational concerns.

2.5.3 Chapel Hill, NC (1974 – 2002: Fare, 2002 – Current: Fare Free)

2.5.3.1 Background

Established in 1974, Chapel Hill Transit provides service to the towns of Chapel Hill and Carrboro, and the University of North Carolina campus. With a goal of encouraging ridership and reducing congestion, in July of 2002, the transit system converted to a fare free system. The University of North Carolina was the major proponent in the conversion to a fare free system. In addition to the overall goals of the transition, the University also wanted address on campus transportation problems, primarily limited parking, provide enhanced service to lower income students and employees, and create a campus that was more conducive to pedestrian traffic. To help implement fare free service, the University contributed approximately $4 million and underwrote a $300,000 local match for new buses.

Annual funding for the Chapel Hill Transit system is through a partnership between the University of North Carolina and the Town of Carrboro. On-going O&M and capital costs are allocated between the partners based on a formula that is agreed upon annually. The University's funding is generated through student fees ($77 per student) while the Town of Carrboro uses a $.10/$100 valuation ad valorem tax.

Chapel Hill Transit operates 22 fixed routes within its 25 square mile service area. Fixed route service is provided seven days a week. Chapel Hill's EZ Rider paratransit service and the demand-responsive Shared Ride service are also free to its patrons.

2.5.3.2 Results

To date, the available data indicates that Chapel Hill Transit is meeting its objectives for implementing fare free service.

- **Ridership:** Ridership on Chapel Hill Transit increased over 20 percent annually in the first two years of fare free service, and continued to increase over 10 percent per year in subsequent years. Specifically, ridership increased 22 percent in 2002, 30 percent in 2003, 14 percent in 2004, and 12 percent in 2005.

- **Level of Service:** Fixed route transit service hours have increased by over 41 percent (with a fixed route ridership of 5.8 million) and operating hours increased by 36 percent from 2001 to 2003. The additional hours were implemented with the implementation of fare free service in anticipation of the increased ridership that was expected with the transitioning to a fare free system.

- **Reduced Congestion:** As a by-product of reduced congestion due to the increase in transit ridership, the Chapel Hill area has experienced improved air quality. Between 2003 and 2004 the region's volatile organic compound (VOC) emissions were reduced by 21 metric tunes from over 10,000 kilograms to 6,000 kilograms. Although emissions were slightly higher in 2005 they are still less than the emissions in 2002 when the fare free service began. Similarly, Nitrogen oxide (NOx) emissions have been reduced by 38 metric tons and carbon dioxide (CO_2) emissions have been reduced by 9,098 metric tons.

2.5.4 Spare the Air/Fare Free Campaign: San Francisco Bay Area

2.5.4.1 Background

The Spare the Air/Free Transit Campaign is an episodic air quality program that is implemented on days when air quality is forecasted to be unhealthy for the Bay Area. The Free Transit aspect of the program began in 2004, with fare free service provided in the morning on two transit systems – Bay Area Rapid Transit (BART) and Livermore Amador Valley Transit Authority (LAVTA) – on two air quality episodic days. In 2005, the program was expanded to 29 Bay Area transit systems, with fare free service provided all day on one air quality episodic day. In 2006, funding was provided by MTC and the Bay Area Air Quality Management District (Air District) to expand the program to offer fare free service all day on 26 bus, rail, and ferry systems initially for three days, with an additional three days added subsequently, for a total of six days of fare free service. In 2007, the Spare the Air/Free Transit Campaign is budgeted to provide four air quality episodic days. Transit service will be fare free service all day for bus and light rail services, and free up to 1 pm for heavy rail (BART, Caltrain, and ACE) and ferry services (Vallejo, Golden Gate, and Alameda). In addition, to avoid potential safety and security issues, fares will remain in effect in the event that the July 9-10, 2007 dates for the Major League Baseball All-Star Activities are declared air quality episodes.

While there is an extensive marketing, education, and evaluation program associated with the Spare the Air/Fare Free Transit Campaign, there is less than a 24-hour notice as to when the specific days will occur. Essentially, the Air District makes the determination by 1:15 pm on the day preceding, based on anticipated air quality episodes – usually on hot days with no wind.

2.5.4.2 2006 Spare the Air/Free Transit Campaign Evaluation

The 2006 Spare the Air/Free Transit Campaign extended over the June 1 – October 16, 2006 summer ozone period. In total, the Air District declared eleven Spare the Air advisories, of which only the first six Spare the Air weekdays featured the free transit rides. The goals adopted for the 2006 Campaign were to:

- Increase public awareness about "sparing the air" by emphasizing the linkages between travel mode choices and air quality
- Encourage Bay Area residents to drive less and use public transit more by providing a monetary incentive to use transit for an initial transit experience and to convert new transit users to become regular riders
- Reduce emissions to avert exceeding the national 8-hour ozone standard

Participating Transit Operators

Including the SFMTA (MUNI), 26 Bay Area transit operators participated in the 2006 campaign:

- AC Transit
- Alameda-Harbor Bay Ferry
- Alameda-Oakland Ferry
- Altamont Commuter Express (ACE)
- BART
- Benicia Breeze
- Caltrain
- County Connection (CCCTA)
- Cloverdale Transit
- Dumbarton Express
- Fairfield/Suisun Transit
- Golden Gate Ferry and Bus (GGBHTD)
- Livermore Amador Valley Transit Authority (LAVTA/Wheels)
- MUNI
- Petaluma Transit
- Port of Oakland (AirBART)
- Rio Vista Breeze
- SamTrans
- Santa Rosa CityBus
- Sonoma County Transit
- Tri Delta Transit (ECCTA)
- Union City Transit
- Vacaville City Coach
- VINE
- WestCat
- Santa Clara VTA

2.5.4.3 Program Evaluation

For the 2006 Spare the Air/Free Transit Campaign, an extensive evaluation was conducted to:

- Determine the number of additional riders carried on the six Spare the Air/Free Transit days in comparison to baseline conditions
- Understand the travel behavior of people who responded to the campaign
- Assess the overall public awareness and recall of Spare the Air messaging

- Estimate the amount of emissions reduced for the two ozone precursors (reactive organic compounds and nitrogen oxides)

The data collection and analysis comprising the evaluation included ridership counts, comparisons to baseline conditions, onboard passenger surveys, telephone surveys of Bay Area drivers, online surveys, and emission reduction estimation.

The key findings of the evaluation were presented in the 2006 Spare the Air/Free Transit Campaign Evaluation Report, prepared by the Metropolitan Transportation Commission and the Bay Area Air Quality District in October 2006. The results reported below are drawn directly from the evaluation document.

2.5.4.4 Key Results

Transit Ridership

- Region-wide, transit ridership increased by approximately 15 percent over the six Spare the Air days. This represents an average of an additional 225,000 riders per Spare the Air day and a total of 1.35 million additional riders.

- Over the six Spare the Air days, SFMTA experienced the highest absolute ridership gain, with close to 500,000 additional riders (up 12 percent) compared to the baseline. The agencies with the next largest increases were AC Transit, (360,000 additional riders - up 28 percent), BART (152,000 additional riders - up 8 percent), and VTA bus (81,000 additional riders - up 15 percent).

- Light-rail and passenger rail services also experienced increases compared to the baseline with the VTA light-rail carrying an additional 46,300 riders (up 25 percent), Caltrain had 4,000 additional riders (up 25 percent) and ACE carried 1,800 additional riders from the Central Valley into the Bay Area (up 11 percent).

- The most dramatic percentage increases in ridership levels occurred on the ferry systems: the Golden Gate Sausalito Ferry experienced a 326 percent going from an average of 1,800 ferry riders per day to 7,600; ridership on the Golden Gate Larkspur Ferry increased 93 percent from an average of 5,200 ferry riders per day to 10,000 riders per day; and the Alameda-Oakland and Alameda Harbor Bay Ferries experienced a 226 percent ridership gain, going from an average of 1,800 ferry riders per day to 5,900 ferry riders per day.

Transit Travel Behavior

- Trip Origin and Destination: The majority of trip origins were either at home (56 percent) or at work (27 percent) and similarly, the majority of trip destinations were work (43 percent) and home (28 percent).

- Mode of Arrival to Transit: The primary mode to transit was walking (43 percent); followed by driving (21 percent), transfer from another form of transit (19 percent); dropped off (9 percent) and carpooled (3 percent).

- Typical Mode of Transportation: On non-Spare the Air days, sixty-two percent of respondents typically use public transit followed by car (23 percent), walk (6 percent) carpool (3 percent) and bike (2 percent).

- Spare the Air Awareness: 68 percent of respondents were aware that it was a Spare the Air day. Twenty-three percent reported that they rode public transit specifically because it was a Spare the Air/Free Transit day, while the remaining 77 percent normally use transit. This represented a 7 percent increase of the 2005 Spare the Air/Free Morning Commute Campaign survey results.

- Impact of Spare the Air: In order to calculate the Spare the Air impact, an “impacted” respondent was defined as someone who noted being aware it was a Spare the Air day, typically used a car as their primary transportation mode but made a conscious decision to change their travel behavior by taking transit rather than driving their car because it was a Spare the Air day. The result of this impact calculation showed that 9.4 percent of the respondents were “impacted.” This was 5.8 percent increase over the 2005 Spare the Air/Free Morning Commute Campaign survey results.

Transit Operations

- Operators that lost farebox revenue were completely reimbursed by MTC and the Air District.

- The only issues experienced by operators were crowding and security issues noted below.

- Transit operators were able to expose their transit services to a new customer base, potentially attracting new riders to use transit on a regular basis.

- Transit operators’ execution of the free transit offer provided test of the true capacity of their systems. This information will be useful in planning for emergency response to potential disasters such as an earthquake.

- The Golden Gate Transit and Alameda/Oakland Ferry operators experienced unique issues related to crowd control, ensuring transit security, maintaining on-time performance levels, and responding to frustrated regular riders. Additionally, on-time performance was negatively impacted due to the record-high number of ferry riders. Additional ferryboats were added on the last two Spare the Air days to address this issue.

- Transit security and passenger safety were issues for all the transit operators given the increased number of passengers on any single transit vehicle. For example, for July 21, BART police reported that calls for service were double what they would normally expect. The majority of calls occurred during the afternoon and evening hours.

- Caltrain reported passengers issues related to older adults taking refuge on the trains to escape from the heat and the high number of first-time and/or non-regular riders unfamiliar with the Caltrain system. These issues resulted in crowding, service delays and an overall unpleasant transit atmosphere and experience for its riders.

Customer Complaints

- Complaints from regular ferry riders included overcrowding and service delays due to the increased number of new riders during the mid-day and evening peak periods. Regular riders perceived the new riders were taking advantage of the free ride and viewed it as a theme park ride. Some regular passengers suggested that free ferry rides should not be offered all-day, and indicated that they would rather drive on Spare the Air days than deal with the overcrowding.

- Complaints from regular BART riders expressed security concerns due to groups of unruly teenagers fighting or intimidating and harassing other BART riders.

- A handful of Caltrain, ACE, AC Transit, and VINE monthly pass holders complained that they would not be reimbursed for the unused day of their monthly pass. In response, “oops” passes were provided by VINE to their few unhappy monthly pass holders, and the Air District gave “thank you” coupons to transit operators to distribute to their monthly pass holders. The thank you coupons included a two-for-one admission coupon to Disney on Ice; a two-for-one admission coupon to the Ringling Bros and Barnum & Bailey Circus; and vouchers for 50 percent off a new subscription to the San Francisco Chronicle.

- Complaints were received that bus drivers and train operators were not customer friendly, while bus drivers and train operators complained that passengers were inundating them with too many questions.

Customer Positive Feedback

- Positive feedback from riders included:
    - Feeling compelled to get out of their cars because of the Spare the Air messaging
    - Spare the Air/free transit offer saved riders money and the environment
    - Even though it is not free for monthly pass holders and the buses, trains, and ferries were standing room only, it was very good to get people to drive less and ride more
    - Money saved from the transit fare was redirected to spontaneous shopping and dining activities, which gave the regional economy a

nice boost (see San Francisco Chronicle editorial published July 21, 2006)

Emission Reductions

- By persuading an estimated 465,444 drivers to reduce an estimated 1.14 trips each, an estimated 2.221 tons of nitrogen oxides (NOx), 2.179 tons of reactive organic gases (ROG), and 0.852 tons of particulate matter (PM-10) per Spare the Air day were reduced. Additionally, collectively drivers reduced an estimated 528,279 vehicle trips and more than 3.5 million miles of travel per Spare the Air day.
- Estimated emissions reductions due to fewer trips on the six Spare the Air days were 13.33 tons of NOx, 13.07 tons of ROG, and 5.11 tons of PM-10.
- The cost of the 2006 campaign was $13.2 million which resulted in emission reductions of 32.2 tons for ROG, NOx and PM-10 combined for the six days. This equates into a cost-effectiveness estimate of $410,800 per ton of emissions reduced. Although it produced the largest emissions reductions, the 2006 Campaign was less cost-effective compared to other transportation-air quality strategies.

2.5.4.5 Components of the 2007 Program

- MTC and the Air District considered the following ideas suggested by transit operators and members of the public as they defined the parameters for the 2007 Spare the Air/Free Transit Campaign.
- With the exception the transit operators noted below, all other operators suggested the continuation of the free, all-day transit offer. Specifically, bus operators felt strongly that the free, all-day transit offer was very effective and was by far easier to implement than prior years' morning commute offer.
- Golden Gate Transit suggested offering a "2 for 1" program where passengers would buy one ferry ticket and board for free on the Spare the Air day, but save the purchased ticket for use on another day.
- To address safety and security concerns, BART suggested going back to just the free morning commute offer as was done in 2004 and 2005.
- Caltrain felt that the passenger taking advantage of the all-day fare free service was not reflective of a typical commute on Caltrain, due in large part to disruptive first-time or non-regular riders, which, in effect, may dissuade riders (new and regular) from taking transit altogether. Instead the agency suggested going back to the free morning commute offer, or possibly a morning/evening commute offer. For Caltrain, commute hours offer the optimal transit experience because the problem crowds are not likely to be out and about. A positive transit experience may compel riders to continue to take transit in the future.
- Soliciting funding assistance from private sponsors was also suggested.

2.5.4.6 Spare the Air/Free Transit Campaign Conclusions

Based on the results of the extensive evaluation process, the 2006 Spare the Air/Free Transit campaign successfully achieved its main goals of: 1) raising public awareness about the link between travel choice and air quality and 2) encouraging the public to drive less and take transit more. The most direct impacts were the substantial increases in transit ridership and the associated emission reductions. The 2006 Campaign established new benchmarks for both awareness and positive attitudes about air quality improvement efforts and what actions individuals can take to help improve air quality.

2.5.5 New York City Proposed Congestion Pricing Program (Spring 2007)

2.5.5.1 Background

As one of 127 strategies in the 2030 Plan NYC sustainability vision announced by Mayor Michael Bloomberg on April 22, 2007 (Earth Day), the City of New York would enact a congestion pricing program. The objectives of the program would focus on reducing congestion, improving air quality, and reducing greenhouse gas emissions. Under the congestion pricing (or cordon road pricing) program, all vehicles crossing into Manhattan from 86th Street to the Battery on weekdays between 6 am and 6 pm would be charged a fee of $8 for cars and $21 for trucks. The fees would be assessed electronically and could be paid with a toll pass (EZPass), over the phone, or on-line.

As initially proposed by the Mayor and in a “NYC Sustainability Bill” introduced by the Republican majority leadership in the State Senate, funds generated through the program would have been deposited into a newly-created Sustainable Mobility and Regional Transportation (SMART) fund and used for public transportation purposes. Under the initial proposal, the fund would have been administered by a newly-established Sustainable Mobility and Regional Transportation Financing Authority. This initial proposal was subsequently modified to allow the State legislative leadership to participate in how the funds would be used, whereby the fund would be administered by a four-member review panel – similar to the panel that currently deals with the New York Metropolitan Transportation Authority capital program. Prior to the close of the State Legislative session on June 21, 2007, various failed legislative attempts were made to resolve issues related to the respective roles of the City and the State legislative bodies and elected officials in control over the funds, as well as other issues including the level of future City and State financial participation in funding public transit in the City. These issues were not resolved before the Legislature adjourned. However, the Governor of New York has committed to convene a special session if resolution of these issues appears imminent. Also at issue is meeting the conditions of a pending U.S. DOT Congestion Pricing Demonstration Grant, requiring the City to have legislation in place by mid-August 2007 for creation of the Congestion Pricing Program.

Annual gross revenue generated through the levels and daily duration of fees proposed in the Congestion Pricing Program is estimated at $620 million. Of this total, $240 million would be used for system operation and program administration, leaving a net of $380 million annually in revenue. Such revenue would initially have been allocated to the SMART fund. Over the course of development of the Mayor's Sustainability Program and discussion of the role of congestion pricing, a private non-profit foundation became interested in the prospect of using congestion fees to replace all or a portion of the approximately $3 billion in annual revenue presently raised by bus and subway fares. The foundation, Nurturing New York's Nature (NNYN), is headed by Theodore Kheel, a well-respected transportation labor mediator with a long-standing interest in using toll revenues from public transportation authorities in New York to fund public transit deficits. The NNYN Foundation approached the Institute for Rational Urban Mobility Inc (IRUM) to submit a proposal for a research study to estimate the benefits and costs of combining cordon congestion pricing with free or reduced fare public transit. NNYN then made a grant of $100,000 to IRUM to conduct the study.

The "Price Matters: Free Transit with Road Pricing for the Manhattan Central Business District" study was initiated in February 2007 and is expected to be completed by September 2007. The study will consider three scenarios of fare free service in comparison to a no-action scenario: no additional fare for use of a commuter rail system for local travel within a Central Zone, cutting fares in half in the Central Zone, and dropping fares to zero. The following overview statement of work has been provided by George Haikalis, President of IRUM and project manager for the study:

> *In addition to a "no-action" scenario, the study will develop a future base scenario that incorporates the key features of the Regional Rail System plan proposed by IRUM. This plan calls for recasting the region's commuter rail lines into a single Regional Rail System, with frequent service, integrated fares, and thru-running. The fare integration element of this plan assumes that travelers could use the commuter rail system for local travel within a Central Zone, consisting of New York City, Hudson County and Newark, without payment of additional fares. Likewise, commuter rail users from the suburbs could ride local buses and subways to complete their trips within the Central Zone without the payment of extra fares.*
>
> *The second future scenario will address the effects of cutting fares in half in the Central Zone. The third future scenario will study the effects of dropping these fares to zero. For each scenario, cordon road pricing will be set at levels sufficient to offset diminished transit revenues. Also, several fare options for the suburbs beyond the Central Zone will be considered in the study.*
>
> *A very preliminary analysis of revenue and operating cost consequences of implementing the Regional Rail System plan compared to a "no-action" scenario will be undertaken as part of this study. This will require a specialized examination using ridership counts and related information that will be obtained from the commuter railroads.*
>
> *The analysis will assess the ability of the existing transit system, plus the enhanced service provided by the Regional Rail System, to accommodate the shift of core-bound car users to transit and the extra*

load of new transit riders generated by free or reduced fares will be assessed. The cost of increased service, if needed, will be estimated.

For each future scenario the cost of meeting long term transit rehabilitation and expansion needs will be assumed to come from other sources. A high quality transit system provides substantial benefits to residents and businesses in the region. Identifying these benefits will be the subject of a subsequent research project.

2.6 Lessons Learned from Fare Free Systems in US Cities

Key conclusions that can be drawn from the research conducted for this analysis include:

- Over the last 30 years no city with a population greater than 100,000 residents has implemented a system-wide fare free service policy
- Small cities where net farebox revenue (farebox revenue minus the cost to collect, administer, and enforce) is not a significant funding source for the system have successfully implemented fare free systems and in most cases have a dedicated transit funding source
- Of the small city systems, most began operation as a fare free system and only one, Chapel Hill, transitioned to a fare free system
- The three large systems (Trenton, Denver, and Austin) that had year-long experiments with fare free service achieved their objectives of increasing ridership
- The three large systems also identified a need for additional security associated with fare free service due to the significant increases in on-bus incidents. Additionally, although fare free service may eliminate driver-passenger confrontations related to fares, as shown by the Trenton and Austin experiments, based on the increased number of incidents drivers requested the fare free service programs be eliminated.
- Smaller cities have experienced significantly lower levels of on-bus incidents due in part to developing strict policies regarding inappropriate activities and strong educational outreach activities.
- Introduction of fare free service resulted in increased ridership levels on the order of 50 percent or more. Based on the other systems' experiences, additional O&M costs were required related to additional levels of service when existing capacity is surpassed; increased security staff and activities; increase facilities maintenance staff and potentially increased levels of telephone support staff. Additionally; capital expenditure increased due to the number of additional buses associated with levels of service increases
- Based on the research of fare free systems, the boarding process would be facilitated due to the ability to board using multiple doors with the elimination of fares. However, the research also indicated that there is also the potential for on-time performance to decrease due to overcrowding on buses which delays a passenger's ability to get on and

off the bus as well as the potential that there would be more consistent regular activity at a larger number of bus stops than under a fare based system

- Based on a survey conducted during the Austin experiment, it was determined that of nine factors affecting a person's decision to rider the bus, fare charged was ranked eighth. More important to potential and existing passengers was safety, on-time performance, cleanliness and frequency of service
- Based on the Portland profile, if a specific zone is designated as fare free an agency must weigh the benefits of their policy decisions (improved mobility; reduced need for downtown parking; improved air quality) against the likely loss of fare revenue due to passengers evading fare for trips that start in the free zone and end outside the zone.

Given these findings, there are a number of analyses SFMTA will need to conduct prior to making a decision on a fare free service policy. Some of these are technical and were conducted as part of this study while others are policy-based and will require the coordination of local stakeholders. The analyses include:

- **Identify a realistic range of costs associated with the anticipated ridership increases:** As part of this analysis, SFMTA staff requested a model run of the regional travel demand model to provide an estimate of the level of ridership that could be expected. SFMTA was analyzed on a route level basis to determine the amount of additional service that would be needed to meet SFMTA capacity standard and the costs associated with the additional service. These costs would include: capital costs for new buses and expanded maintenance facilities and operating & maintenance costs for additional staff (drivers, mechanics, facilities maintenance, customer service, and security).
- **Identify supplemental revenue sources:** The results of this study will identify the range of additional costs the SFMTA would likely encounter plus an estimate on the level of revenue that will be lost from fares. This gap will provide staff and policy makers a realistic level of supplemental funding that would be needed and will provide a starting point for regional leaders on the potential sources that could fill this gap.
- **Evaluate existing policies:** As stated in the literature review and in the project profiles above, a passenger's perception of security and safety on a transit vehicle is a key decision making factor in whether to use transit. Some of the security incidents that occurred in other systems, such as the rowdy school children in Austin, may not be an issue in San Francisco due to the maturity of the system and the level of access students currently have within the City. However, there likely will be an increase in the number of incidents on the bus and at the bus stop because the removal of fares does open the bus up to the public. As stated before, additional security staff will be needed. As it will not likely be financially feasible to have security staff on all buses, policymakers/the agency may decide to develop strict passenger conduct policies and an early and on-going educational campaign that promotes no tolerance for inappropriate activity on transit vehicles.

3. Ridership Impact Analysis

The study focused on the impact of increased ridership on bus, light rail and paratransit service associated with fare free service. Analysis of the impact on cable car ridership was not included in this study. The purpose of this section is to summarize the results of the impacts on the existing bus, light rail and paratransit systems associated with three potential ridership growth scenarios considered for the implementation of a fare free system. For bus and light rail, the impacts analyzed include: increased vehicle hours and miles; increased peak vehicle requirements (vehicles needed during the highest ridership periods), related vehicle maintenance and storage issues; and increased staffing (primarily operators and mechanics) requirements. Due to the demand response nature of the service, the paratransit analysis focused on increased passenger trips and operating costs.

The results of the ridership impact analyses were used to develop O&M and capital cost impact estimates for the bus, rail and paratransit system. The cost impact analysis is provided in the Section 5.

3.1 Key Assumptions and Data Sources

This section summarizes the operational and capital impacts of three potential ridership growth scenarios associated with the implementation of a fare free system. The three scenarios reflect the following:

- Ridership Growth Scenario 1: 17.5 percent increase in all-day weekday ridership (mid-way between a low-end 15-20 percent increase)
- Ridership Growth Scenario 2: 47.5 percent increase in all-day weekday ridership (mid-way between a 45-50 percent increase)
- Ridership Growth Scenario 3: 77.5 percent increase in all-day weekday ridership (mid-way between a 75-80 percent increase)

The ridership impact analysis, and the O&M and capital cost impact analysis in Section 5, compare the results of the three scenarios to existing conditions (FY 2007). The study did not quantify any current operating or capital infrastructure deficits but it is assumed that all of these needs would need to be addressed prior to implementing fare free service.

The primary sources of data for this analysis were:

- Bus and rail ridership and operating statistics: the Transit Effectiveness Project (TEP)
- Paratransit ridership and operating statistics: SFMTA FY 2005-2006 Year End Statistics

Finally, during this study, SFMTA requested and received a travel demand model run from the San Francisco County Transportation Authority (SFCTA) in which all fares on the SFMTA system were changed to $0 with no other changes to the other transit providers. The level of ridership increase on SFMTA bus and rail lines was approximately 35 to 40 percent. While this level of increase is most similar to ridership growth scenario 2, the model results were completed after the ridership and cost impacts for all three scenarios were nearly complete.

3.2 Bus and Rail Methodology and Results

This section provides an overview of the methodology used to identify the level of service and capital infrastructure increases for the bus and rail system based on the impacts of three potential ridership growth scenarios (17.5, 47.5, and 77.5 percent all-day weekday increases) associated with the implementation of a fare free system.

3.2.1 Hourly Capacity Analysis: Base System

Using the steps described below, an hourly capacity analysis was conducted of each bus route's and rail line's existing weekday service (FY 2007 schedules) for the three ridership growth scenarios. An example of this analysis is provided in Table 2.

1. The total existing trips that start within an hour period were summarized based on data from the TEP. (Column B)
2. Based on data from the TEP[1], the average maximum passenger loads for all trips that start within each hourly time period were multiplied by the ridership growth rate scenario. (Column C)
3. The number of trips for each hour (Column E) was estimated by dividing the average maximum passenger loads per hour (Column C) by the 85 percent load standard for each route based on the type of vehicle currently assigned to the route (Column D).
4. The number of additional trips needed for the growth scenario was determined by subtracting Column E from Column B. In the example below, the hours that would require additional trips are highlighted in yellow.

[1] Note: rail data does not include ridership information for the T Line as data collection efforts pre-date the implementation of this line. Also, no night trips on rail lines K, L, and M were surveyed due to due to subway closure after 9.30 p.m. during the data collection period.

Table 2: Example of Additional Capacity Analysis – Existing Weekday Services

Hourly Time Period	Number of Existing Trips	Average Maximum Passenger Load (Existing Passenger Load * Growth Scenario)	85% Load Standard	Number of Trips Required To Meet Growth Scenario	Number of Additional Trips for Growth Scenario
(A)	(B)	(C)	(D)	(E)	(F)
6:00-7:00 AM	0	0	0	N/A	N/A -
7:00-8:00 AM	2	115	80	2	-
8:00-9:00 AM	8	551	80	7	-
9:00-10:00 AM	9	490	80	7	-
10:00-11:00 AM	8	419	80	6	-
11:00-12:00 PM	9	532	80	7	-
12:00-1:00 PM	9	569	80	8	-
1:00-2:00 PM	8	568	80	8	-
2:00-3:00 PM	9	623	80	8	-
3:00-4:00 PM	8	713	80	9	1
4:00-5:00 PM	9	831	80	11	2
5:00-6:00 PM	8	794	80	10	2
6:00-7:00 PM	7	609	80	8	1
7:00-8:00 PM	0	0	0	N/A	N/A
8:00-9:00 PM	0	0	0	N/A	N/A
9:00-10:00 PM	0	0	0	N/A	N/A
10:00-11:00 PM	0	0	0	N/A	N/A
11:00-12:00 AM	0	0	0	N/A	N/A
12:00-1:00 AM	0	0	0	N/A	N/A
1:00-2:00 AM	0	0	0	N/A	N/A
2:00-3:00 AM	0	0	0	N/A	N/A
3:00-4:00 AM	0	0	0	N/A	N/A
4:00-5:00 AM	0	0	0	N/A	N/A
5:00-6:00 AM	0	0	0	N/A	N/A

The results of the hourly capacity analysis indicated that the existing bus routes and rail lines have varying levels of excess capacity. This excess capacity would accommodate some of the increased ridership levels, however, under each ridership growth scenario it was determined that additional trips would be required to meet the higher levels of demand. Figures 2, 3 and 4 provide a summary of the total number of bus trips, by hour that would be needed under each scenario, while Figures 5, 6, and 7 provide similar information for the rail lines. The hourly capacity analysis assumes that before the growth requirements are met, any existing capacity gaps are filled first and the growth is added once the gap is met.

Figure 2: Additional Bus Trips Needed By Time of Day: Ridership Growth Scenario 1 (17.5% Increase)

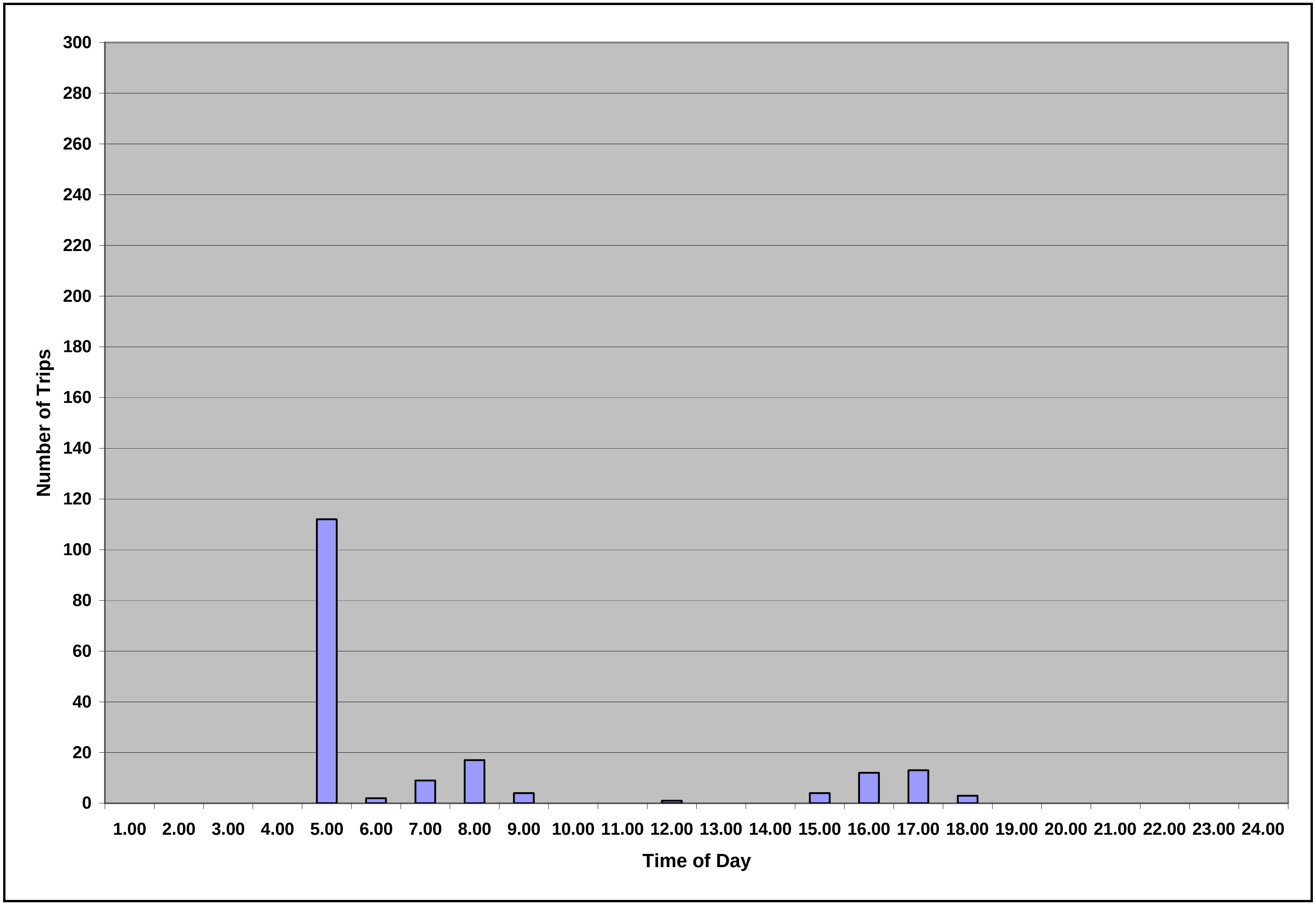


Figure 3: Additional Bus Trips Needed By Time of Day: Ridership Growth Scenario 2 (47.5% Increase)

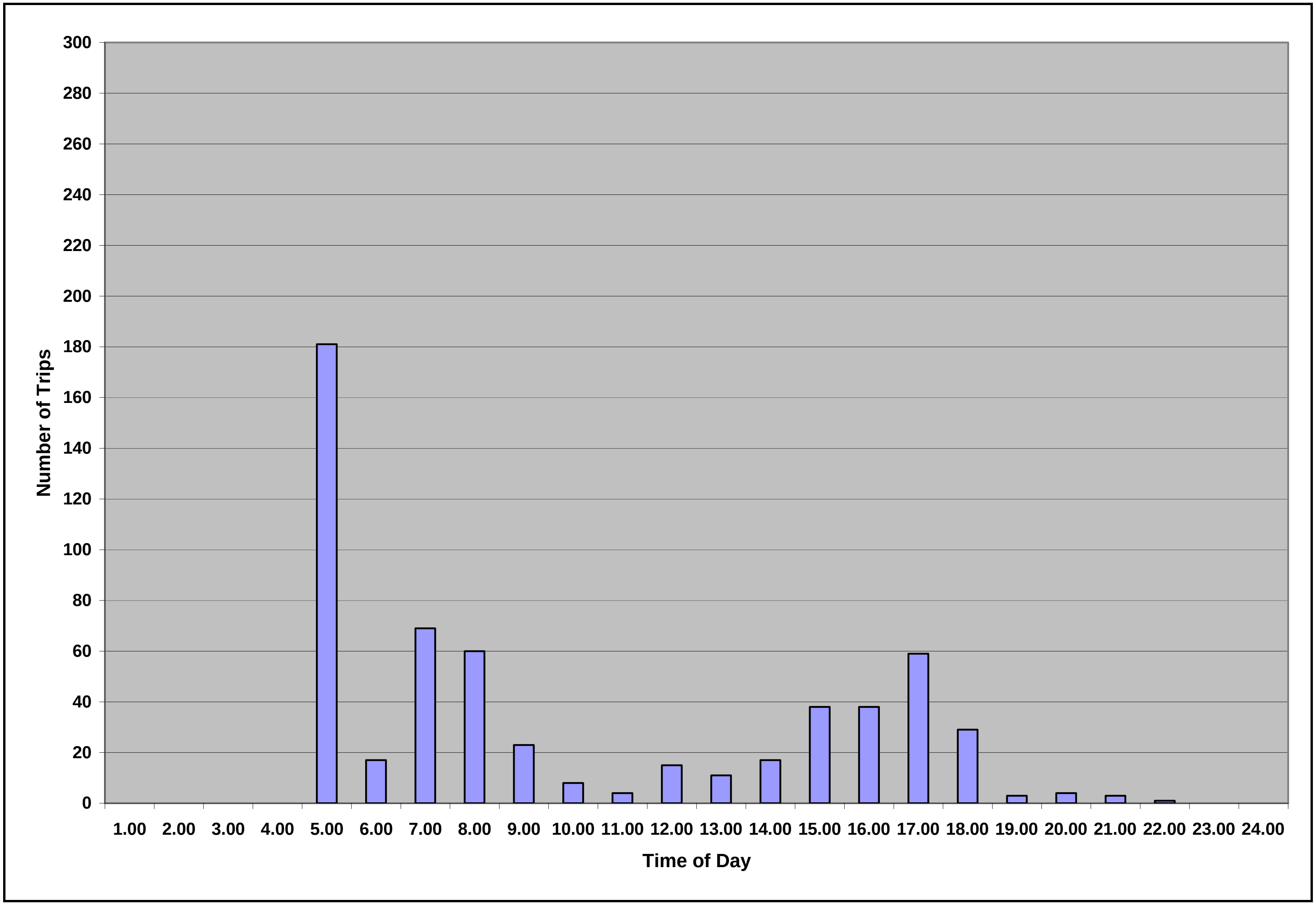


Figure 4: Additional Bus Trips Needed By Time of Day: Ridership Growth Scenario 3 (77.5% Increase)

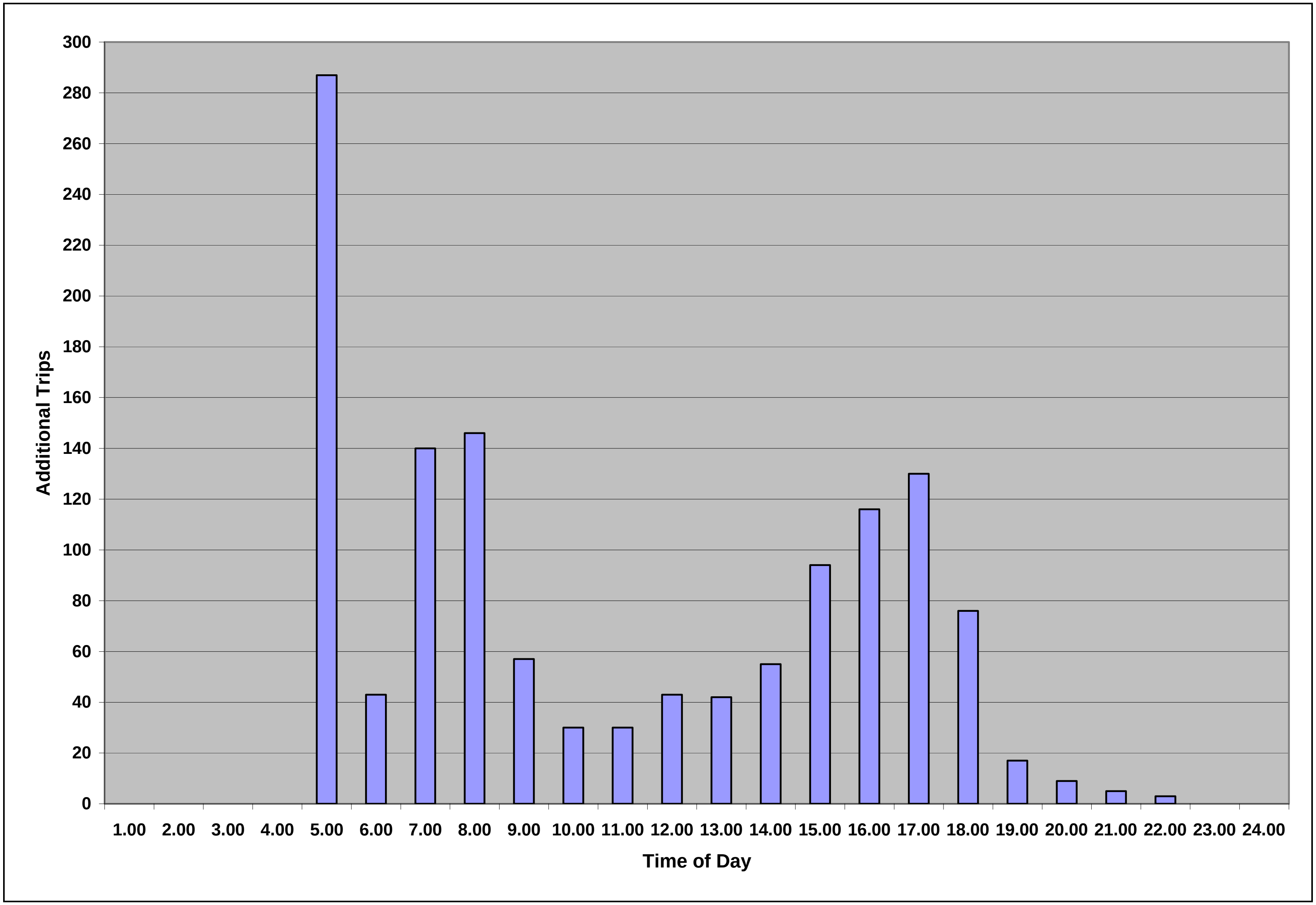


Figure 5: Additional Rail Trips Needed By Time of Day: Ridership Growth Scenario 1 (17.5% Increase)

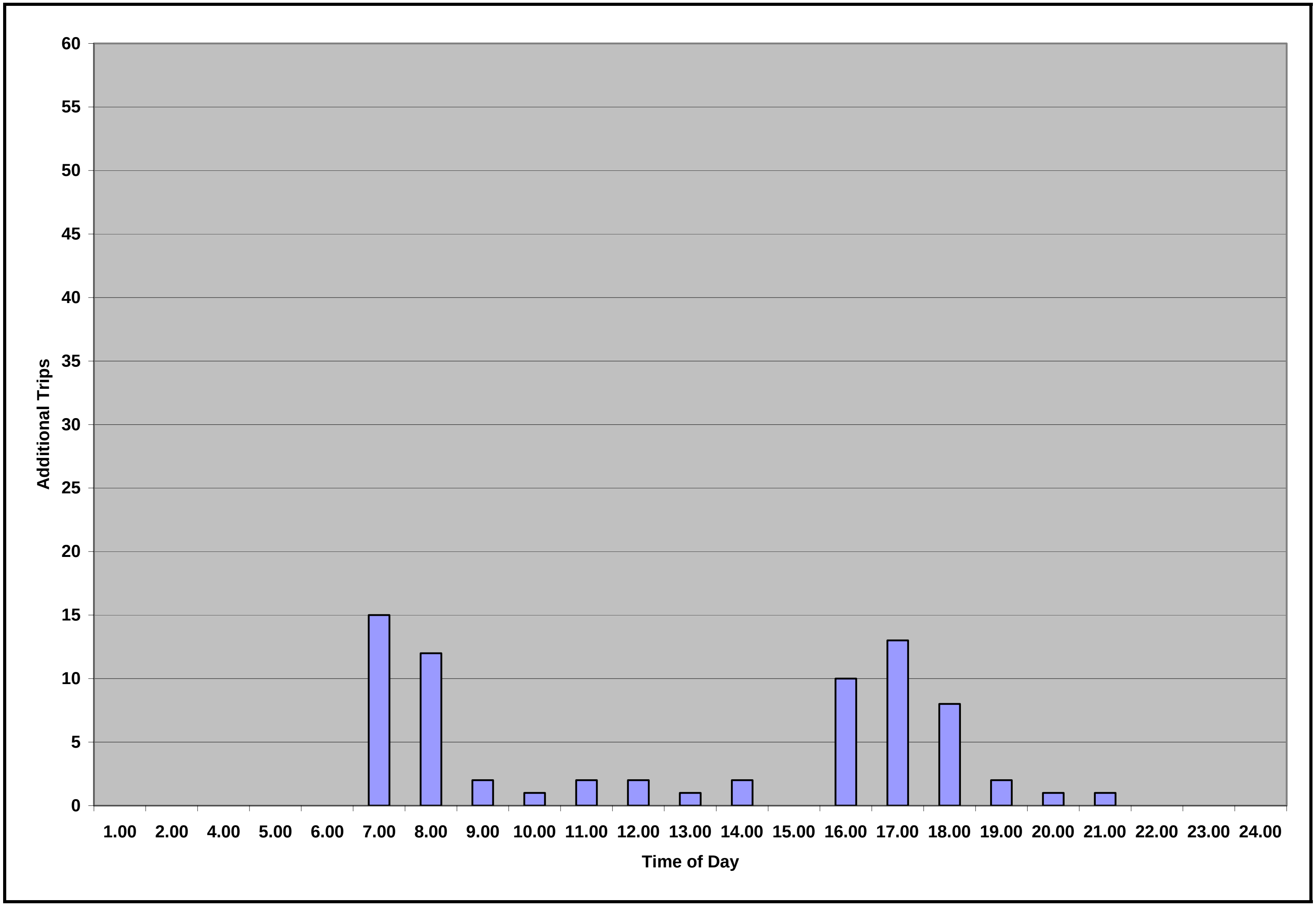


Figure 6: Additional Rail Trips Needed By Time of Day: Ridership Growth Scenario 2 (47.5% Increase)

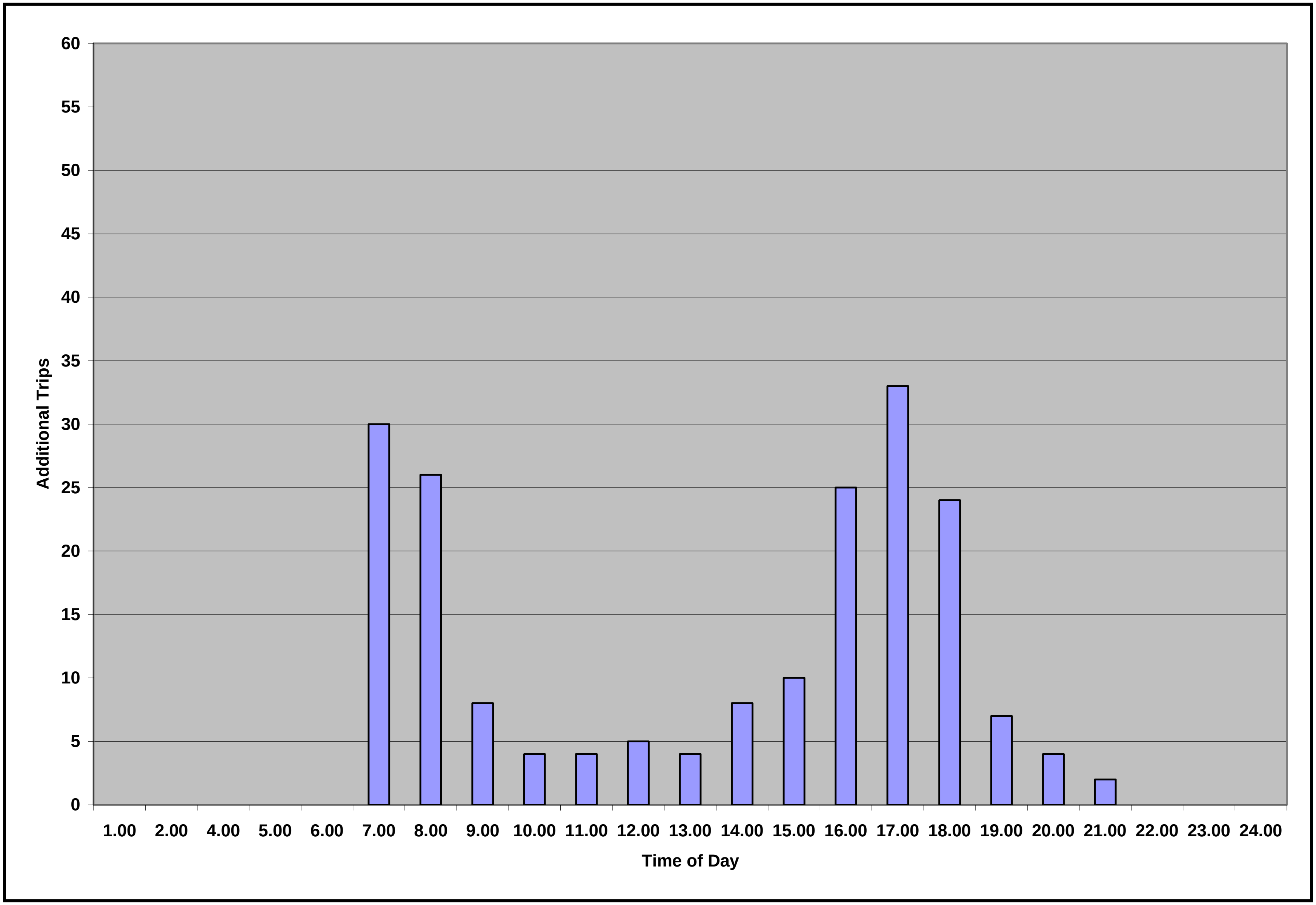
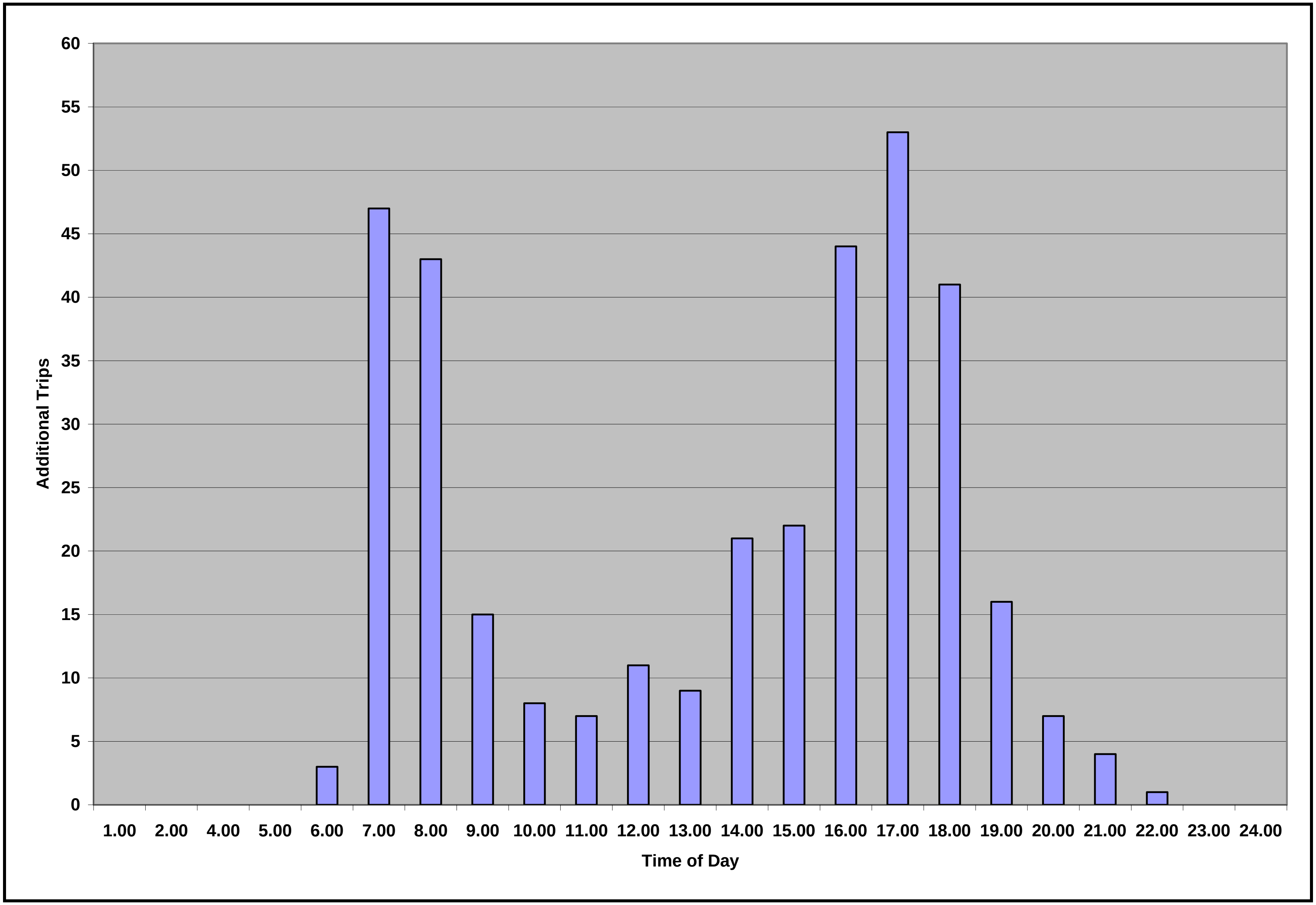


Figure 7: Additional Rail Trips Needed By Time of Day: Ridership Growth Scenario 3 (77.5% Increase)



3.2.2 Increased Level of Service Analysis: Bus

Based on the results of the hourly capacity analysis above, an analysis was conducted to determine the additional hours, miles, vehicles and bus operators that would be required to provide the additional trips under each growth scenario. A detailed scheduling analysis was not conducted to determine these increases. Instead, the following steps were used to identify the impacts under each ridership growth scenario. A similar analysis was conducted for the rail system.

3.2.2.1 Additional Hours and Miles Calculations

1. The analysis calculated the existing average number of revenue hours (the time when a vehicle is available to the general public and there is an expectation of carrying passengers) and miles per trip (Table 3 Columns E and F) based on the existing number of total weekday revenue hours, miles and trips (Columns B, C and D).
2. Based on the hourly capacity analysis described above, the analysis calculated the total number of additional weekday trips that each bus route would need under the three ridership growth scenarios (Column G).
3. Additional miles and hours for each growth scenario (Columns H and I) were calculated for each route by multiplying Columns E and F by Column G. These results were increased by 50 percent for Growth Scenario 1 and 75 percent for the other two scenarios to account for deadheading (traveling to and from the garage) and to account for the return movement if no trip in the opposite direction was then required.

Table 3: Example of Additional Hours and Miles Calculation

Route	Existing Weekday Revenue Hours	Existing Weekday Revenue Miles	Existing Weekday Trips	Existing Revenue Hours/Trip	Existing Revenue Miles/Trip	Additional Trips Needed for Growth Scenario	Additional Weekday Hours for Growth Scenario	Additional Weekday Miles for Growth Scenario
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
1	329.43	2200.25	454	0.73	4.85	2	**2.54**	**16.96**
1AX	11.48	114.7	20	0.57	5.74	1	**1.00**	**10.04**
1BX	16.73	142.79	33	0.51	4.33	3	**2.66**	**22.72**
2	130.7	847.95	127	1.03	6.68	7	**12.61**	**81.79**
3	84.6	503.52	151	0.56	3.33	0	**0.00**	**0.00**
4	41.91	269.55	84	0.50	3.21	4	**3.49**	**22.46**
5	249.47	2036.27	443	0.56	4.60	6	**5.91**	**48.26**
6	160.35	1147.44	198	0.81	5.80	2	**2.83**	**20.28**
7	35.34	217.78	68	0.52	3.20	0	**0.00**	**0.00**
9	217.8	1806.1	209	1.04	8.64	3	**5.47**	**45.37**
9AX	27.63	303.16	32	0.86	9.47	3	**4.53**	**49.74**
9BX	21.55	232.35	29	0.74	8.01	0	**0.00**	**0.00**
9X	92.03	1011.07	119	0.77	8.50	2	**2.71**	**29.74**

Table 3 (Cont)

Route	Existing Weekday Revenue Hours	Existing Weekday Revenue Miles	Existing Weekday Trips	Existing Revenue Hours/Trip	Existing Revenue Miles/Trip	Additional Trips Needed for Growth Scenario	Additional Weekday Hours for Growth Scenario	Additional Weekday Miles for Growth Scenario
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
10	84.2	569.68	113	0.75	5.04	1	**1.30**	**8.82**
12	150.37	1022.17	183	0.82	5.59	2	**2.88**	**19.55**
14	340.42	2639.96	381	0.89	6.93	5	**7.82**	**60.63**
14L	46.02	366.45	47	0.98	7.80	4	**6.85**	**54.58**
14X	23.57	247.47	28	0.84	8.84	0	**0.00**	**0.00**

The additional hours and miles was used to estimate the O&M cost impact of each scenario. The results of this analysis are provided in the Section 5.

3.2.2.2 Additional Buses Calculation

The following process was used to determine the number of additional buses that would be required for each growth scenario. A similar analysis was conducted for the rail system.

1. Summarize the existing number of AM and PM peak trips for each route (Table 4 Columns B and C).

2. Summarize the additional trips that would be required by time period under each growth scenario (Columns D through H).

3. For each route, focus on the additional trips needed during AM and PM peak periods to determine the additional number of buses (Column I) that would be needed to for these trips. This assumes the additional trips are spread over each hour and accounts for the time required for a round trip. Examples of how additional vehicles were calculated include:

    a. Route 1BX (purple shaded cells): Three additional trips would be needed during the AM peak. The AM peak has the highest vehicle requirement during the day so three additional vehicles would be needed for the additional trips.

    b. Route 5 (orange shaded cells): One additional trip is needed during the AM peak. However, as the PM peak is dominant for vehicle demand, an additional bus is not needed.

    c. Route 9AX (green shaded cells): One additional trip is needed during the end of school period. Since the end of the school period requires fewer buses than the peak period, due to less frequent service, adding a bus for this trip would not require a new bus purchase. It would only require starting an existing bus earlier, which would result in an increase in O&M costs but not capital costs.

d. 28L (yellow shaded cells): Five additional PM peak trips would be needed for this route. However, only four additional buses would be needed to accommodate these trips. This is because the AM peak requires one more bus than the PM peak (23 compared to 22) which means that one existing bus would be available for the PM peak.

Table 4: Example of Additional Bus Calculation

Routes	Existing AM Peak Vehicles	Existing PM Peak Vehicles	Additional Trips By Time Period					
			AM Peak	Midday	School	PM Peak	Evening	Additional Buses Needed for Growth Scenario
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
1	28	34	1	0	0	0	0	1
1AX	38	31	1	0	0	0	0	1
1BX	38	31	3	0	0	0	0	3
2	11	11	0	0	0	2	0	2
3	15	15	0	0	0	0	0	0
4	15	15	0	0	0	0	0	0
5	20	20	1	0	0	0	0	0
6	15	15	0	0	0	0	0	0
7	15	15	0	0	0	0	0	0
9	14	17	0	0	0	2	0	2
9AX	17	17	0	0	1	0	0	0
9BX	17	17	0	0	0	0	0	0
9X	17	17	0	0	0	0	0	0
10	6	7	0	0	0	0	0	0
12	12	12	1	0	0	0	0	1
14	21	23	0	0	0	0	0	0
14L	9	9	0	0	0	0	0	0
14X	9	9	1	0	0	0	0	1
15	29	26	0	0	0	0	0	0
16AX	15	12	0	0	0	0	0	0
16BX	15	12	0	0	0	0	0	0
17	3	3	0	0	0	0	0	0
18	6	6	0	0	0	0	0	0
19	13	13	0	0	0	0	0	0
21	13	14	0	0	0	0	0	0
22	22	19	0	0	0	0	0	0
23	7	7	0	0	0	0	0	0
24	15	12	0	0	0	0	0	0
26	5	5	0	0	0	0	0	0
27	9	9	0	0	0	0	0	0
28	23	22	0	0	0	4	0	3
28L	23	22	0	0	0	5	0	4
29	16	20	2	1	1	2	0	2

Finally, as shown previously in Figures 5 through 7, under each ridership growth scenario the hour with the largest number of trips added is 5:00 – 6:00 am. This hour and these trips are not included in the analysis shown in Table 4. The analysis determined that the trips needed during this time period could be accommodated without acquiring new vehicles. Instead, the vehicles used during the AM peak could begin service earlier to address the need for additional trips. This would result in additional operating costs but not capital costs.

Tables 5 and 6 summarize the vehicles required by SFMTA Yard and by vehicle type. As shown in Table 5, for each scenario the analysis determined the number of additional vehicles that would be required by SFMTA Yard, while Table 6 summarizes the number of additional vehicles by vehicle type. The additional vehicles identified for each Yard were then multiplied by 20 percent to account for the agency's standard spare ratio for its bus fleet. The result of this analysis indicates SFMTA would need to purchase 41 buses under ridership growth scenario 1; 156 buses under ridership growth scenario 2; and 283 buses under ridership growth scenario 3. While diesel buses currently operate out of the Kirkland, Woods and Flynn bus yards, all future SFMTA bus purchases were assumed to be either hybrid or zero emission vehicles.

Table 5: Additional Buses by Growth Scenario by Yard

Yard and Current Bus Type	Growth Scenario 1: 17.5% Increase	Growth Scenario 2: 47.5% Increase	Growth Scenario 3: 77.5% Increase
Kirkland - 40 ft diesel motor coach - 60 ft diesel motor coach (articulated)	40 ft hybrid motor coach: 22 buses	40 ft hybrid motor coach: 53 buses	40 ft hybrid motor coach: 85 buses
Woods - 40 ft diesel motor coach - 60 ft diesel motor coach (articulated)	40 ft hybrid motor coach: 10 buses	30 ft zero emission motor coach: 3; 40 ft hybrid motor coach: 31 buses	30 ft zero emission motor coaches: 3; 40 ft hybrid motor coach: 57 buses
Flynn - 40 ft diesel motor coach - 60 ft diesel motor coach (articulated)	60 ft hybrid motor coach: 7 buses	60 ft hybrid motor coach: 40 buses	60 ft hybrid motor coach: 66 buses
Presidio - 40 ft electric trolley coach - 60 ft electric trolley coach (articulated)	40 ft electric trolley coach: 1 bus	40 ft electric trolley coach: 24 buses	40 ft electric trolley coach: 44 buses
Potrero - 40 ft electric trolley coach - 60 ft electric trolley coach (articulated)	60 ft electric trolley motor coach: 1 bus	60 ft electric trolley coach: 3 buses; 40 ft electric trolley coach: 3 buses	60 ft electric trolley coach: 13 buses; 40 ft electric trolley coach: 15 buses
Total with Spares	**41**	**157**	**283**

Table 6: Summary of Buses Required, By Vehicle Type and By Ridership Growth Scenario

Vehicle Type	Growth Scenario 1: 17.5% Increase	Growth Scenario 2: 47.5% Increase	Growth Scenario 3: 77.5% Increase
30 ft zero emission motor coach	0	3	3
40 ft hybrid motor coach	32	84	142
40 ft electric trolley coach	1	27	59
60 ft hybrid motor coach (articulated)	7	40	66
60 ft electric motor coach (articulated)	1	3	13
Total with Spares	**41**	**157**	**283**

3.2.2.3 Bus Facilities

A secondary impact of the need for additional buses is space at existing facilities for maintenance and storage. Table 7 summarizes the current capacity, current utilization, and level of capacity available by Yard. Four of the five facilities (Flynn, Kirkland, Woods and Potrero) are currently over capacity (68 buses total), while Presidio has a small amount of excess capacity (6 buses total). However, this excess capacity would not accommodate the number of additional buses that would be required under the three ridership growth scenarios. As a result, expansion of existing facilities and/or the construction of a new facility would be needed to accommodate the additional buses needed under each scenario.

Table 7: SFMTA Maintenance Facilities Existing Capacity

Yard	Facility Capacity	Actual Number of Vehicles	Vehicles Over/(Under) Capacity
Flynn	115	135	20
Kirkland	134	138	4
Woods	233	260	27
Potrero	165	182	17
Presidio	171	165	-6

The results of the additional bus analysis will have an impact on both O&M and capital costs which will be documented in Section 5. The O&M costs would relate to the additional mechanics and bus servicing staff that would be required to maintain the new vehicles in addition to increased supplies, services and cost of goods related to a larger fleet size. The capital costs would include the additional buses and the required maintenance and overhaul of the vehicles. In addition, the costs of increased capacity at the existing maintenance facilities, the continued maintenance of these facilities or development of new maintenance facilities and their related upkeep, such as the planned Islais Creek Facility which has been designed to accommodate 165 vehicles.

3.2.2.4 Additional Bus Operators

For the additional operators required under each scenario, it is assumed that SFMTA only operates with full time operators. The segments of the day were examined for AM peak, Midday, PM peak and Evening service periods to determine how many extra operators would be needed. It is assumed that one operator in each period is the equivalent of an extra half shift. The total of these extra operator half shifts across the day divided by two gives the new operator count.

Based on these steps, the number of additional full time bus operators that would be required for each SFMTA Yard were estimated. These totals were increased by 27.5 percent to provide coverage for operator absences, vacations, training, etc. ("extra board operators" as per the existing Memorandum of Understanding between SFMTA and the bus operators union) to determine the required additional operators.

As shown in Table 8, the results of this analysis determined that 31 full time employees would be needed under ridership growth scenario 1, and 170 and 360 full time employees under scenarios 2 and 3 respectively. Additions to other variables and costs, such as supervisors and other support staff required to manage the increased number of operators, will also be included in the overhead calculation in the Section 6 O&M cost impact analysis.

Table 8: Additional Full Time Employees by Growth Scenario by Bus Yard

Yard	Growth Scenario 1: 17.5% Increase	Growth Scenario 2: 47.5% Increase	Growth Scenario 3: 77.5% Increase
Kirkland	16	50	91
Woods	8	41	61
Flynn	6	42	80
Presidio	1	30	59
Potrero	1	7	25
Total w/ Extra Board Operators	**31**	**170**	**316**

3.2.3 Increased Level of Service Analysis: Rail

Based on the hourly capacity analysis methodology described above, an analysis was conducted to determine the additional train hours, vehicle miles, vehicles, and train operators that would be required to provide the additional trips under each growth scenario. Similar to the bus analysis, a detailed scheduling analysis was not conducted to determine these increases. Instead, the following steps were used to identify the impacts under each ridership growth scenario.

3.2.3.1 Additional Train Hours and Vehicle Miles Calculations

The analysis examined the additional trips needed by hour to determine the impact of adding rail cars to existing train sets to try to accommodate the additional ridership. Currently the rail lines operate with the following train set configurations:

- **F line:** operates as one car train and must add a new one car train to increase capacity since this line uses historic streetcars
- **J, K, and S lines:** operate as one car trains and can be expanded to two-car trains to increase capacity
- **L, M, and N lines:** currently operate as two-car trains and can be expanded to four-car trains to increase capacity

The impact of adding cars to trains results in an increase in vehicle miles (because more cars are in operation) but there is no increase in revenue hours because no additional train operators are needed to increase the train's carrying capacity.

An example of this analysis is shown in the Table 9. As shown in the table (Column B), the results of the additional trips analysis indicated that:

- **F Line:** This line cannot increase capacity by adding rail cars to the existing train set, all 29 required additional trips would be needed (Column C)
- **J and K Lines:** Require 6 and 10 additional trips to accommodate increased ridership levels respectively. However, the addition of a second rail car to the existing one car train set provided enough capacity to meet the increased ridership levels and no additional trips would be needed (Column C)
- **L Line:** The addition of two rail cars to the existing train sets would still not provide enough additional capacity to accommodate the increased passenger levels (column C). As a result, this line would require additional trips which were assumed to be provided with two-car trains.

Table 9: Example of Impact of Larger Trains on the Need for Additional Trips

Line	Results of Additional Trips Analysis	Additional Trips Needed After Adding Cars to Existing Trains
(A)	(B)	(C)
F	29	29
J	6	0
K	10	0
L	10	10
M	1	1
N	16	16
S	0	0

As shown in Table 10, additional train hours and vehicle miles for each growth scenario (Columns F and G) were then calculated for each line by multiplying Column C by Columns D and E. These results were increased by 75 percent under each ridership growth scenario to account for deadheading (traveling to and from the garage) and to account for the return movement if no trip in the opposite direction was then required.

Table 10: Example of Increased Hours and Miles Calculation

Line:	Results of Additional Trips Analysis	Additional Trips Needed After Adding Cars to Existing Trains	Existing Hours Per Trip	Existing Miles Per Trip	Additional Weekday Hours For Growth Scenario	Additional Weekday Miles For Growth Scenario
(A)	(B)	(C)	(D)	(E)	(F)	(G)
F	29	29	0.97	5.58	28.13	161.82
J	6	0	0.82	7.34	0	44.04
K	10	0	0.72	7.46	0	74.6
L	10	10	0.72	7.46	7.2	149.2
M	1	1	0.72	7.46	0.72	14.92
N	16	16	0.82	7.34	13.12	234.88
S	0	0	0.33	3	0	0

As shown in Table 11, for each scenario the analysis determined the number of additional rail vehicles by vehicle type. Further, the additional vehicles identified for each scenario were then multiplied by 20 percent to account for the agency's standard spare ratio for its rail fleet. The result of this analysis indicates SFMTA would need to purchase 48 rail vehicles under ridership growth scenario 1; 110 rail vehicles under ridership growth scenario 2; and 168 rail vehicles under ridership growth scenario 3.

Table 11: Summary of Rail Vehicles Required, By Type and By Ridership Growth Scenario

	Growth Scenario 1: 17.5% Increase	Growth Scenario 2: 47.5% Increase	Growth Scenario 3: 77.5% Increase
Streetcar Vehicles	11	20	30
Light Rail Vehicles	37	90	138
Total with Spares	48	110	168

3.2.3.2 Rail Facilities

Similar to the bus analysis, a secondary impact of the need for additional rail vehicles is space at existing facilities for maintenance and storage. Table 12 summarizes the current capacity, current utilization, and level of capacity available by Rail Yard. As shown in the table, the Green facility is currently over capacity (71 vehicles), the Geneva facility has capacity for 12 more vehicles and the cable car facility is at capacity. The relatively small amount of excess capacity would not accommodate the number of additional rail vehicles that would be required under the three ridership growth scenarios. As a result, expansion of existing facilities and/or the construction of a new facility would be needed to accommodate the additional rail vehicles required under each scenario.

Table 12: SFMTA Maintenance Facilities Existing Capacity

Yard	Facility Capacity	Actual Number of Vehicles	Vehicles Over/(Under) Capacity
Green	80	151	71
Geneva	50	27	(13)
Cable Car	40	40	-

3.2.3.3 Subway Capacity

Another potential impact analyzed was subway capacity. The subway is designed to accommodate 60 trips per hour (one train every 60 seconds). As shown in Table 13, under ridership growth scenarios 1 and 2, the number of trips in the AM and PM peak hour would be less than or equal to the design capacity for the Van Ness / Embarcadero Portal. Under ridership growth scenario 3, the number of trips in the AM and PM peak hour would exceed the design capacity. As a result, under scenario 3 and with the current subway configuration, passengers would experience significant delays in the AM and PM peak hours due to the lack of capacity and the “bunching” of trains entering the subway.

Table 13: Peak Hour Subway Capacity

Scenario	Design Capacity: Van Ness / Embarcadero – 60 Trips	Design Capacity: Van Ness / West Portal – 60 Trips
AM Inbound Trips		
Existing	44	28
Scenario 1: 17.5% Increase	52	32
Scenario 2: 47.5% Increase	**60**	37
Scenario 3: 77.5% Increase	**71**	44
PM Outbound Trips		
Existing	46	29
Scenario 1: 17.5% Increase	53	32
Scenario 2: 47.5% Increase	**60**	39
Scenario 3: 77.5% Increase	**71**	52

3.2.3.4 Additional Rail Operators

The assumptions and methodology used to estimate the number of additional bus operators was used to calculate the number of additional train operators that would be needed under each scenario.

As shown in Table 14, the results of this analysis determined that 28 full time employees would be needed under ridership growth scenario 1, and 64 and 104 full time employees under scenarios 2 and 3 respectively. Additions to other variables and costs, such as supervisors and other support staff required to manage the increased number of operators, will be included in the overhead calculation in the Section 6 O&M cost impact analysis.

Table 14: Additional Full Time Employees by Growth Scenario by Rail Yard

Yard	Growth Scenario 1: 17.5% Increase	Growth Scenario 2: 47.5% Increase	Growth Scenario 3: 77.5% Increase
Streetcar	13	27	37
Light Rail	15	37	67
Total w/ Extra Board Operators	**28**	**64**	**104**

3.2.3.5 Conclusion: Bus and Rail Ridership Impacts

Based on the results of the existing hourly bus and rail capacity analyses, Table 15 summarizes the increased levels of hour, miles, peak vehicles and full time operators that would be required under the three ridership growth scenarios compared to existing levels.

Table 15: Summary of Bus and Rail Ridership Impacts

	Total Trips	Total Revenue Hours	Total Revenue Miles	Total Peak Vehicles	Total Operators
BUS					
Existing	9,214	7,295	57,919	968	1,926
Scenario 1	9,391	7,552	60,141	1,002	1,957
% Change	*1.9%*	*3.5%*	*3.8%*	*3.5%*	*1.6%*
Scenario 2	9,794	8,127	64,890	1,098	2,096
% Change	*6.3%*	*11.4%*	*12.0%*	*13.4%*	*8.8%*
Scenario 3	10,550	9,283	74,459	1,204	2,176
% Change	*14.5%*	*27.3%*	*28.6%*	*24.4%*	*13.0%*
RAIL					
Existing	1,596	1,261	11,115	112	261
Scenario 1	1,652	1,347	12,304	152	284
% Change	*3.5%*	*6.8%*	*10.7%*	*35.7%*	*8.8%*
Scenario 2	1,750	1,496	14,234	204	314
% Change	*9.6%*	*18.6%*	*28.1%*	*82.1%*	*20.3%*
Scenario 3	1,885	1,698	16,818	252	348
% Change	*18.1%*	*34.6%*	*51.3%*	*125.0%*	*33.3%*

3.2.4 Paratransit Analysis

Due to the nature of the service, the analysis to determine the impact of a fare free system on paratransit service was different than the methodology used for bus and rail. As opposed to determining capacity analysis impacts associated with the three ridership growth scenarios, the paratransit analysis projected the number of additional trips and their associated costs based on existing (FY 2005 – 2006) passenger trip levels and cost per trip estimates. Finally, since SFMTA contracts out paratransit service, there would be no increased capital costs associated with vehicle acquisition and maintenance facilities. The impact on O&M costs are provided in Section 4.

SFMTA currently contracts out three types of paratransit service:

- **Paratransit Taxi:** Provides curb-to-curb service for individual trips and is open to the general public. Although this is not an Americans with Disabilities Act (ADA) service, many paratransit-eligible riders have found that it better meets their transportation needs. Passengers purchase taxi voucher booklets for $4 and can use the vouchers at their discretion with no advanced reservation required. Due to budget constraints, paratransit taxi service is not available to most new customers, however some exceptions are made for wheelchair users, persons needing kidney dialysis, and people over 80 years of age.
- **Group Van:** A pre-scheduled van service providing door-to-door transportation to groups of ADA-eligible riders attending agency programs such as Adult Day Health Care, senior centers, or work sites.
- **SF Access:** Includes ADA Access (for ambulatory persons) and Lift-Van (for persons who use wheelchairs) that provide door-to-door service for individuals using ADA-compliant vans. ADA Access and Lift-Van are both shared-ride services and passengers must make reservations from one to seven days in advance of their trip. Service is provided within one hour (before or after) the requested pick-up time. Of the three services, only the SF Access program falls under the requirements of the ADA legislation. As a result, for this analysis it was assumed that implementation of a fare free system would only be applicable on the SF Access program.

Finally, in addition to the three services described above, SFMTA does provide a relatively small number of Out of Area trips. These are paratransit trips that begin or end outside of SFMTA's service area. Since these trips are not required by the ADA legislation they were not included in the impact of fare free service analysis.

Table 16 provides a summary of the number of trips on each of these services for FY 2005-2006. As shown on the table, SF Access trips accounted for approximately 19 percent of all paratransit trips in FY 2005 - 2006. Although there would likely be some shifting of passengers between taxi, group van and SF Access with the implementation of a fare free system it is difficult to quantify the level of this shift. One of the major unknowns is whether paratransit taxi passengers would still prefer paying $4 for a taxi voucher book to have the convenience to travel at their discretion compared to using the proposed free ADA service which would require an advanced reservation and service within a block of time. For the purposes of this analysis, it was assumed that any shifts between services would be accounted for within the three ridership growth scenarios.

Table 16: FY05-06 Paratransit Trips

Paratransit Services	FY 05-06 Trips	Percent of Total Trips
Taxi (non-ADA)	650,539	53.4%
SF Access (ADA)	233,530	19.2%
ADA Access	*147,997*	
Lift Van	*85,533*	
Group Van (non-ADA)	280,447	23.0%
Out of Area (non-ADA)	53,796	4.4%
Total	**1,218,312**	

Note: ADA access includes East Bay paratransit passenger trips (10,766)

As stated earlier, within the SF Access category there are two types of trips: ADA Access and Lift-Van. As shown in Table 17, ADA Access accounts for 64 percent of the trips (147,997 trips) while Lift Van accounts for 36 percent (85,533 trips).

Table 17 summarizes the increased passenger trips that would result with the three growth scenarios for the SF Access service. This analysis assumes the current ratio of ADA Access and Lift Van trip would remain at the FY 2005 – 06 levels. As shown in the table, growth scenario 1 would result in an increase to approximately 274,398 trips, while scenarios 2 and 3 would result in an increase to 344,457 trips and 414,516 trips.

Table 17: Fare Free Service Impact on Paratransit Trips

Scenario	Estimated Annual Passenger Trips
Existing Conditions	**233,530**
ADA Access	*147,997*
Lift Van	*85,533*
Growth Scenario 1: 17.5% Increase	**274,398**
ADA Access	*173,896*
Lift Van	*100,501*
Growth Scenario 2: 47.5% Increase	**344,457**
ADA Access	*218,296*
Lift Van	*126,161*
Growth Scenario 3: 77.5% Increase	**414,516**
ADA Access	*262,695*
Lift Van	*151,821*

4. COST IMPACT ANALYSIS

This section develops projections of the O&M and capital cost impacts of the proposed fare free System. The O&M cost model developed for the Transit Effectiveness Project (TEP) was adapted for this study and unit costs from this model were applied to the level of service (LOS) estimated in Task 4 to estimate the bus and rail O&M costs for the three potential ridership growth scenarios analyzed in this study.

On the capital side, the capital cost savings resulting from the elimination of fare-related capital projects have been identified. Also presented are the capital projects which SFMTA must have completed prior to the implementation of the fare free system. The cost estimates for these projects are based on the Capital Improvement Program (CIP) developed by SFMTA. The capital cost of additional buses to be procured for each growth scenario is also computed.

4.1 O&M Cost Model

The O&M cost model developed for the TEP and the Central Subway New Starts application required for Federal funding is used for this study. The O&M cost model is based on a disaggregate and resource build-up structure in accordance with the Federal Transit Administration’s preferred method to project O&M costs. Line item costs are determined according to the quantity of service supplied and other system characteristics. Expenses are classified as “fixed” and/or “variable” and a “driving variable” is identified to project the variable costs. **Fixed costs** are those that do not change as service changes while variable costs fluctuate as service changes based on a specific variable (e.g. track miles, passenger miles, etc.) Costs are broken out at an object class level (e.g. salaries, fringes, fuel, materials, supplies, etc.) so that appropriate inflation rates can be applied to each object to project future costs for labor, fringes, and energy costs.

4.1.1 Model Approach

Resource build-up models, also referred to as “causal factors models,” compute costs by estimating the actual quantities of labor, materials, supplies, and services required to provide a given level of service, and then multiplying these costs by productivity factors and appropriate wage rates and unit costs, in other words the “causes” underlying the costs incurred.

In its most detailed form, a resource build-up model represents costs in a series of equations of the form:

$$\textbf{OM Cost}_{it} = \textbf{Unit of Service}_t \textbf{ X (Productivity Factor)}_i \textbf{ X (Unit Cost per resource)}_i$$

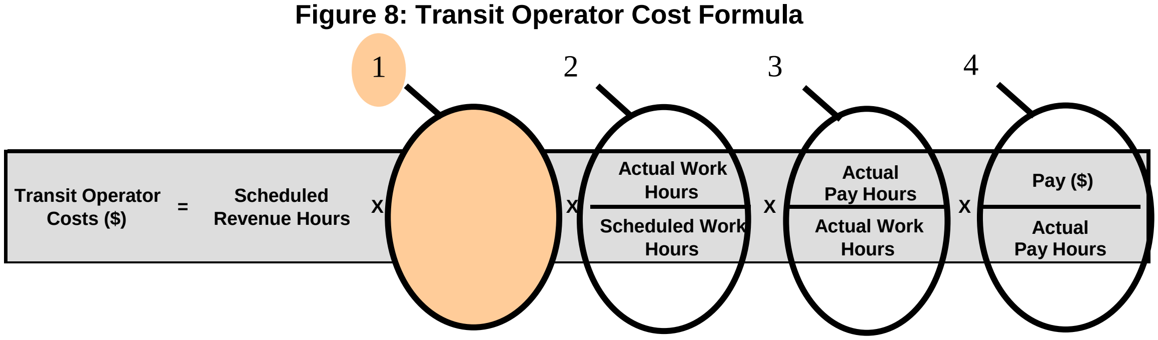
Where OM Cost_{it} is the O&M cost for cost category i in year t. The unit of service in the above equation is usually the level of service variables including: vehicle revenue miles, vehicle (or train) revenue hours, peak vehicles, yards, stations, garages, track-miles, passengers etc. The productivity factor is the resource required per unit of service, for example, in such terms as “mechanics per vehicle mile” for vehicle-mechanic labor and “gallons of diesel fuel per vehicle-mile” for fuel costs. The unit cost per resource is a wage rate or annual salary for that resource. The unit costs are derived based on levels of service actually provided in FY 2006, or July 1, 2005 through June 30, 2006, compared to the actual costs incurred in FY 2006 as calculated by the O&M cost model.

The O&M cost model assumes that the expenses are fixed and/or variable, and a driving variable is assumed to drive the variable costs. The separation of the fixed and variable costs, and the identification of the “driving variables”, which propel the variable costs, are based on the experience within the transit agency. The driving variables are usually the service units shown in the above equation.

4.1.1.1 Transit Operator Costs

Realizing that transit operator costs represent the single largest line item expenditure in any transit agency’s operating budget, a detailed, mode- and garage-specific resource build-up formulation was developed for estimating transit operator costs, which is shown in Figure 8.

Figure 8: Transit Operator Cost Formula



In this formulation,

1. The ratio of scheduled work hours to scheduled revenue hour measures the effectiveness of the schedule (revenue vs. non-revenue time). **Revenue time** is defined as the time when the transit vehicle is available to the general public with the expectation that it would carry passengers. **Non-revenue** time is the time when the transit vehicle is not available for service but is most likely the time spent traveling from/to the garage to start/end revenue service (also known as deadheading);
2. The ratio of actual work hours to scheduled work hour addresses impact on the dispatching function of open work. **Open work** results from operators not being able to perform their scheduled assignments due to benefit time, training, working as supervisor, and other activities. Some of the open work is planned operator absence scheduled in advance (like vacation) while some arise at the last minute (like sick leave);

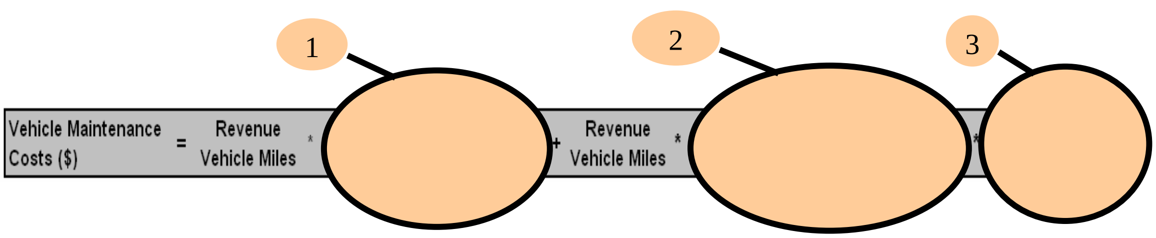
3. The ratio of actual pay hours to actual work hour measures the effect of overtime and schedule guarantees; also addresses the higher demand of service operating out of certain garages; and
4. ratio of operator pay ($) to actual pay hour validates the operator salaries paid out by mode as recorded in the General Ledger system

The scheduled revenue hours in this formulation is defined as the revenue time and recovery time, which is consistent with SFMTA's current definition. The analysis has been structured to compute these intermediate factors at the garage level and was aggregated to compute unit costs by mode.

4.1.1.2 Vehicle Maintenance Costs

Realizing that vehicle maintenance costs represent the second largest line item expenditure in any transit agency's operating budget, the data from the SFMTA maintenance work order system was used to develop the unit costs for some revenue vehicle maintenance functions. The data used in this section was the actual costs incurred in FY 2006.

Figure 9: Vehicle Maintenance Cost Formula



As shown in Figure 9, in this formulation,

1. The ratio of inventory consumption per revenue vehicle mile represents the transfer of parts from inventory to mechanics performing corrective and preventative maintenance as captured in the Spear 2000 purchasing system (SHOPS);

2. The ratio of maintenance labor headcount per revenue vehicle mile represents the labor required to perform corrective and preventative maintenance as captured in SHOPS; and

3. The annual salary per maintenance labor represents average annual wage per maintenance labor.

4.1.2 Sources of Data

The O&M cost model took advantage of the detailed financial and operating data that is routinely maintained by the SFMTA. In some cases, raw data was generated to support the analysis. The following are the list of data sources used to develop the cost model.

- **Actual Operating Expenses:** The 2006 actual O&M expenses were obtained in a raw data format from the City's General Ledger accounting system. It listed the annual expenses for all the **divisions** such as Maintenance, Transit Operations, Finance and Administration etc. The expenses were broken down by wages, materials, services, utilities (diesel and propulsion-related electricity), fringe benefits (healthcare, retirement, unemployment insurance,, etc.), and other miscellaneous expenses.
- **Actual Staffing Levels and Salaries:** The actual staffing levels during FY 2006 were also provided in a raw data format from the City's accounting system. Within each division and section (e.g. Vehicle Maintenance division, Potrero Trolleybus Maintenance section or Flynn Motorcoach maintenance section or Track Maintenance section) headcounts for every staff position and average salary were provided
- **Level of Service** – The level of service was derived from a variety of sources listed below.
    - **National Transit Database Report:** The National Transit Database (NTD) report submitted in 2006 by SFMTA was the source for actual revenue vehicle/train hours, actual revenue vehicle/car miles, ridership, and data on physical facilities.
    - **Reports Maintained by SFMTA Schedules Department:** The reports maintained by the Schedules department include Block Stat reports, Line Stat reports, and Range reports. These sources, to a varying degree of detail, provide scheduled revenue time, recovery time, non-recovery time, and total time by line/route or line groups for a Weekday, Saturday, and Sunday. SFMTA had four different schedules during FY2006. Reports for all four schedules were provided and processed in this analysis.
    - **Equipment Demand Report:** The peak vehicle requirements were estimated based on the Vehicles in Scheduled Operation reports. This report provided vehicle requirement by line or line group by garage by hour during the day. This data was available for four different schedule periods by Weekday, Saturday, and Sunday.
- **Data from Dispatching Software:** During FY 2006, SFMTA was using dispatching software called AutoDispatch. Data was extracted from the software in a raw format to summarize the actual work hours performed by day by garage by run by multiple pieces of work performed within a run.
- **Payroll Data:** The transit operator payroll data, maintained by San Francisco Public Utilities Commission, recorded the actual pay hours by day by garage by operator by different pay codes (straight pay hours versus premium hours). This data was obtained in a raw format and was then processed to obtain a summary of actual pay hours by garage.
- **Maintenance Work Order System:** SFMTA is currently using the maintenance work order system called SHOPS. This software system captures all labor hours and quantity of inventory consumed for all

maintenance activities accomplished through work orders in the garages. This data was available by vehicle number so that a distinction can be made on different fleet types operated by SFMTA.

4.1.3 O&M Model Calibration

The main steps involved in developing a model using data from the accounting system include:

- **Assemble operating expenses and staffing data in a line-item format:** The 2006 operating expenses data obtained from the accounting system listed the expenses for all the divisions and sections. The expenses were categorized by wages, services, materials and supplies, fringe benefits, diesel fuel, propulsion-related utilities, and other miscellaneous expenses. The staffing data obtained from the accounting system listed every unique staff title and provided headcount and salaries associated with each position by division and section. These two data sources were merged in a line-item format suitable for computing productivity factors and implementing cost equations.

- **Identify fixed costs and assign cost drivers:** In the O&M cost model each line item expense in the model spreadsheet is either a fixed or semi-fixed or variable cost. The fixed costs do not vary as a function of level of service and remain constant with service changes. For example, even if the service is increased by 10 percent, the administrative expenses associated with SFMTA's CEO will not increase by the same percent. The semi-fixed costs are partly fixed and party variable. In such cases, a percentage of the cost is treated as fixed and the remaining expenses are treated as variable. The variable costs are completely variable with the level of service. Mostly the expenses associated with vehicle operations and maintenance are treated as variable costs. The identification of the fixed costs, semi-fixed costs, variable costs and cost drivers are based on experiences within the transit agency and the industry in general. Some of this information was obtained based on interviews with SFMTA personnel during the course of the development of the model.

- **Compute productivity factors:** Once the data was assembled and cost drivers were assigned, productivity factors were computed for each line item expense. Productivity factors are factors that describe the resources allocated per unit of service, in other words, how labor and materials vary with the level of service and tied to the driving variables for the line item expense. Fixed cost line items do not have a productivity factor. For example, the wages for the Transit Supervisors in the cost model are driven as a function of revenue bus/train hours. So the productivity factor is expressed as Transit Supervisors per revenue bus/train hour.

$$\textbf{Productivity Factor for Transit Supervisors} = \frac{\textbf{(Number of Transit Supervisors)}}{\textbf{(Revenue Bus/Train Hours)}}$$

- **Formulate cost equations:** Costs are calculated by multiplying the number of resources required to support the level of service and unit cost of resource used. The number of resources required to support the level of service is computed by applying the productivity factor above to the unit of service. For example, taking the same example of Transit Supervisors, the number of resources required is calculated using the following formula:

Number of Transit Supervisors	**=**	**(Productivity Factor for Transit Supervisors) X (Revenue Bus/Train Hours)**

The cost equation, using the same example, can be formulated as:

Estimated Annual O&M Cost	**=**	**(Number of Transit Supervisors) X (Salary for a Transit Supervisor)**

- **Estimate O&M costs associated with each cost driver:** The model is run with the with FY 2006 values as the base year for all driving variables. The sum of expenses by division and section and by object class should match the total base year actual operating and maintenance expenses, which ever was used to develop the model. After this step is computed, the model was run without any driving variables to isolate the fixed costs for the agency. Then the model was run one driving variable at a time to estimate the O&M cost associated with each cost driver to understand the full impact each cost driver on the costs.

- **Compute unit costs for each cost driver:** The incremental unit costs were computed using this formula.

$$\textbf{Unit Cost } DV_i = \frac{(\text{Total Cost } DV_i) - (\text{Fixed Cost})}{DV_i}$$

where**,**

DV_i =	the value of the input cost driver or driving variable
Unit Cost DV_i =	unit cost for the input cost driver or driving variable
Total Cost DV_i =	total cost (including fixed cost) associated with the input cost driver
Fixed Cost =	fixed cost obtained by running the master pivot table without any input cost drivers

Applying this cost model required removing the cost associated with the functions eliminated with a fare free system. Everything else in the cost model remained the same.

The following section provides details on the cost centers eliminated and shows the calibrations results described above and the resulting unit costs.

4.2 Adapting SFMTA O&M Model for Fare Free System Study

Several adjustments were made to the O&M cost model developed for the TEP for application in the Free Fare System study. This included accounting for functions that that would be eliminated and functions that would be added or expanded with the implementation of free fares.

4.2.1 Functions Eliminated with Fare Free Service

The specific functions that would be eliminated in a fare free system are:

- **Revenue collection:** This function includes revenue collecting from and servicing of revenue vehicles; faregates; staffed booths and automatic vending machines installed at stations and other locations; and revenue processing which includes sorting, counting, and accountability of the collected fare. This also includes the production, sales and distribution of fare media.

- **Farebox and Ticket Vending Machine Maintenance:** This function includes maintenance of automatic registering fareboxes on the revenue fleet, ticket vending machines, subway fare gate collection equipment, TransLink® car-borne equipment, the fare collection equipment at the divisions and the counting room equipment.

- **Proof-of-Payment (POP):** SFMTA's POP initiative was designed to decrease the rate of fare evasion by providing additional staff to ensure that passengers have a valid fare instrument while riding the system. The POP concept was developed to allow for back door boarding in attempts to speed up this system which has steadily declined and is currently at 8.1 mph. POP inspectors patrol and survey approximately 25 percent of the daily runs on light rail vehicles.

As shown in Table 18, for FY 2006 the elimination of these fare related functions would have resulted in $8.4 million in O&M savings (approximately 1.5 percent of the total FY 2006 O&M budget) and a reduction in total headcount of 91.

Table 18: FY06 Actual O&M Expense and Headcount after Removing Cost Centers Eliminated Due to Fare Free System

Functions to be Eliminated	FY06 Actual	
	O&M Expense	O&M Headcount
Revenue Collection, Servicing, and Administration	$6,009,725	65
Proof-of-Payment	$1,450,784	17
Farebox Shop	$984,197	9
Estimated Savings from Eliminated Functions	**$8,444,706**	**91**
System-wide Total	**$577,014,363**	**4,138**
System-wide Total Net of Eliminated Functions	**$568,569,657**	**4,047**

4.2.2 Expanded Functions with Fare Free Service

An analysis of preventative maintenance (PM) and corrective maintenance (CM) staffing requirements was performed as part of the TEP study. SFMTA's light rail maintenance staff provided an estimate of labor hours required for each PM inspection cycle. Based on a ratio of PM labor hours per car mile and the headcount of front-line maintenance staff, and the number of PM and CM labor positions required in FY 2006 were estimated. Based on discussions with SFMTA light rail vehicle maintenance staff, the cost associated with the corrective maintenance labor was assumed to grow proportional to ridership and a separate corrective maintenance labor cost per rider was estimated for the light rail mode.

4.2.3 Summary of Unit Costs and Cost Drivers

Table 19 provides the unit cost results by cost driver in 2006 dollars. Table 20 shows the O&M cost driven by cost driver and by object class in 2006 dollars.

Table 19: Unit Cost Results by Cost Driver in 2006 Dollars

Cost Driver or Driving Variable	Salaries and Wages	Health Benefits	Other Benefits	Fuel and Lubes	Parts and Supplies	Electricity Prop	Other	Total Unit Cost
Peak Bus/Rail Car Day								
Motorbus	$52.4586	$7.4597	$10.7371	$0.0000	-$3.8339	$0.0000	$5.7634	$72.5849
Trolleybus	$51.9732	$7.4565	$10.6553	$0.0000	-$3.9449	$0.0000	$5.7188	$71.8589
Light Rail	$51.9732	$7.4565	$10.6553	$0.0000	-$3.9449	$0.0000	$5.7188	$71.8589
Historic Streetcars	$51.9732	$7.4565	$10.6553	$0.0000	-$3.9449	$0.0000	$5.7188	$71.8589
Cable Car	$51.9732	$7.4565	$10.6553	$0.0000	-$3.9449	$0.0000	$5.7188	$71.8589
Peak Weekday Revenue Bus/Train Hour								
Weekday								
Light Rail + Historic Streetcars	$3.6815	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$3.6815
Cable Cars	$13.2568	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$13.2568
Trolleybus	$3.9497	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$3.9497
Motorbus	$2.8822	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$2.8822
Revenue Bus/Train Hour								
Paratransit Service	$1.3653	$0.1735	$0.2739	$0.0000	$0.0533	$0.0000	$42.1912	$44.0572
Weekday								
Light Rail + Historic Streetcars	$58.7202	$7.7001	$11.8386	$0.0000	$0.3184	$0.0000	$6.2064	$84.7836
Cable Cars	$97.1176	$13.3085	$19.5880	$0.0000	$0.3117	$0.0000	$12.8634	$143.1892
Trolleybus	$51.4606	$7.8756	$10.5922	$0.0000	$0.3016	$0.0000	$9.4949	$79.7248
Motorbus	$51.0630	$7.8699	$10.5036	$0.0000	$0.2916	$0.0000	$9.4553	$79.1834
Saturday								
Light Rail + Historic Streetcars	$53.5517	$7.7001	$11.8386	$0.0000	$0.3184	$0.0000	$6.2064	$79.6151
Cable Cars	$85.1872	$13.3085	$19.5880	$0.0000	$0.3117	$0.0000	$12.8634	$131.2587
Trolleybus	$43.8582	$7.8756	$10.5922	$0.0000	$0.3016	$0.0000	$9.4949	$72.1224
Motorbus	$42.9238	$7.8699	$10.5036	$0.0000	$0.2916	$0.0000	$9.4553	$71.0443
Sunday								
Light Rail + Historic Streetcars	$55.7262	$7.7001	$11.8386	$0.0000	$0.3184	$0.0000	$6.2064	$81.7896
Cable Cars	$89.7747	$13.3085	$19.5880	$0.0000	$0.3117	$0.0000	$12.8634	$135.8462
Trolleybus	$46.9475	$7.8756	$10.5922	$0.0000	$0.3016	$0.0000	$9.4949	$75.2117
Motorbus	$46.5261	$7.8699	$10.5036	$0.0000	$0.2916	$0.0000	$9.4553	$74.6465

Table 19 (Continued)

Cost Driver or Driving Variable	Salaries and Wages	Health Benefits	Other Benefits	Fuel and Lubes	Parts and Supplies	Electricity Prop	Other	Total Unit Cost
Revenue Bus/Car Mile								
Motorbus	$1.3327	$0.2288	$0.3165	$1.0199	$0.3587	$0.0000	$0.4166	$3.6732
Articulated Motorbus	$0.2273	$0.0000	$0.0000	$0.0000	$0.5031	$0.0000	$0.0000	$0.7304
Standard Motorbus	$0.1891	$0.0000	$0.0000	$0.0000	$0.3743	$0.0000	$0.0000	$0.5634
Trolleybus	$1.0920	$0.2235	$0.3217	$0.0000	$0.1231	$0.1349	$0.4349	$2.3301
Articulated Trolleybus	$0.5542	$0.0000	$0.0000	$0.0000	$0.4745	$0.0000	$0.0000	$1.0287
Standard Trolleybus	$0.4586	$0.0000	$0.0000	$0.0000	$0.5301	$0.0000	$0.0000	$0.9888
Light Rail	$2.7769	$0.3880	$0.5665	$0.0000	$1.2303	$0.4860	$1.3512	$6.7990
Historic Streetcars	$4.3752	$0.3857	$0.8323	$0.0000	$1.9205	$0.4860	$0.5189	$8.5186
Cable Cars	$6.2076	$0.8453	$1.2606	$0.0000	$1.7817	$0.3275	$0.9992	$11.4219
Other								
Unlinked Passenger Trips (Directly Operated)	$0.0016	$0.0001	$0.0003	$0.0000	$0.0000	$0.0000	$0.0854	$0.0875
Unlinked Passenger Trips - Light Rail	$0	$0	$0	$0	$0	$0	$0	$0
MUNI Maintenance Garages	$471,770	$88,057	$102,167	$0	$48,824	$0	$298,031	$1,008,850
Manned Stations	$514,243	$67,785	$103,826	$0	$2,626	$0	$42,507	$730,987
Manned Stations and Wayside Platforms	$25,134	$4,137	$5,295	$0	$2,880	$0	$16,897	$54,342
Total Track Miles (Light Rail + Historics)	$81,927	$7,863	$15,756	$0	-$3,960	$0	-$18,335	$83,251
Total Track Miles -- Cable Cars	$323,362	$45,509	$66,058	$0	$15,627	$0	$32,428	$482,984
Miles of Overhead Trolleywire Lines	$5,406	$494	$1,033	$0	-$137	$0	-$921	$5,875
Parking Meters	$82	$13	$17	$0	$31	$0	$724	$867
Lane Miles	$8,819	$1,281	$1,812	$0	$5,533	$0	$5,092	$22,538
Number of Citations	$7	$2	$2	$0	$0	$0	$8	$19
Number of Hearings	$8	$2	$2	$0	$0	$0	$3	$16
Residential Parking Permits	$11	$1	$2	$0	$0	$0	-$8	$6
Number of Substations	$56,658	$5,978	$11,041	$0	$2,071	$0	$5,084	$80,832
FIXED COSTS	$24,690,500	$2,469,779	$4,775,176	$0	-$322,321	$0	$4,357,622	$35,970,756
Corrective Maintenance Cost per Light Rail Pass.	$0.1522	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$0.0000	$0.1522

Table 20: O&M Cost Driven by Cost Driver by Object Class in 2006 Dollars

Cost Driver or Driving Variable	Salaries and Wages	Health Benefits	Fuel and Lubes	Parts and Supplies	Electricity Prop	Benefits + Miscellaneous	Total
Peak Bus/Rail Car Day							
Motorbus	$6,481,528	$921,683	$0	-$473,703	$0	$2,038,717	$8,968,224
Trolleybus	$4,034,679	$578,849	$0	-$306,245	$0	$1,271,123	$5,578,406
Light Rail	$1,794,219	$257,414	$0	-$136,187	$0	$565,267	$2,480,713
Historic Streetcars	$356,536	$51,152	$0	-$27,062	$0	$112,326	$492,952
Cable Car	$481,792	$69,122	$0	-$36,569	$0	$151,788	$666,132
Peak Weekday Revenue Bus/Train Hour							
Weekday							
Light Rail + Historic Streetcars	$360,529	$0	$0	$0	$0	$0	$360,529
Cable Cars	$240,554	$0	$0	$0	$0	$0	$240,554
Trolleybus	$824,195	$0	$0	$0	$0	$0	$824,195
Motorbus	$1,161,696	$0	$0	$0	$0	$0	$1,161,696
Revenue Bus/Train Hour	$579,468	$73,621	$0	$22,621	$0	$18,023,651	$18,699,361
Paratransit Service							
Weekday	$20,062,247	$2,630,794	$0	$108,785	$0	$6,165,204	$28,967,030
Light Rail + Historic Streetcars	$10,404,314	$1,425,753	$0	$33,388	$0	$3,476,551	$15,340,006
Cable Cars	$37,853,837	$5,793,216	$0	$221,868	$0	$14,775,784	$58,644,705
Trolleybus	$58,133,668	$8,959,613	$0	$332,024	$0	$22,722,673	$90,147,977
Motorbus							
Saturday	$2,601,544	$374,070	$0	$15,468	$0	$876,624	$3,867,706
Light Rail + Historic Streetcars	$1,666,712	$260,385	$0	$6,098	$0	$634,921	$2,568,116
Cable Cars	$5,007,215	$899,146	$0	$34,435	$0	$2,293,301	$8,234,098
Trolleybus	$7,334,061	$1,344,664	$0	$49,830	$0	$3,410,231	$12,138,786
Motorbus							
Sunday	$2,339,900	$323,320	$0	$13,369	$0	$757,693	$3,434,282
Light Rail + Historic Streetcars	$1,756,468	$260,385	$0	$6,098	$0	$634,921	$2,657,872
Cable Cars	$4,889,867	$820,294	$0	$31,416	$0	$2,092,186	$7,833,763
Trolleybus	$7,677,793	$1,298,696	$0	$48,127	$0	$3,293,653	$12,318,269
Motorbus	$6,481,528	$921,683	$0	-$473,703	$0	$2,038,717	$8,968,224

Table 20 (Continued)

Cost Driver or Driving Variable	Salaries and Wages	Health Benefits	Fuel and Lubes	Parts and Supplies	Electricity Prop	Benefits + Miscellaneous	Total
Revenue Bus/Car Mile							
Motorbus	$16,466,633	$2,827,220	$12,601,397	$4,432,724	$0	$9,058,272	$45,386,246
Articulated Motorbus	$741,250	$0	$0	$1,640,543	$0	$0	$2,381,794
Standard Motorbus	$1,720,065	$0	$0	$3,404,111	$0	$0	$5,124,176
Trolleybus	$7,239,755	$1,481,536	$0	$815,939	$894,333	$5,016,369	$15,447,932
Articulated Trolleybus	$821,464	$0	$0	$703,372	$0	$0	$1,524,837
Standard Trolleybus	$2,360,853	$0	$0	$2,728,794	$0	$0	$5,089,647
Light Rail	$13,088,861	$1,828,878	$0	$5,799,039	$2,290,803	$9,039,301	$32,046,882
Historic Streetcars	$2,843,394	$250,683	$0	$1,248,093	$315,853	$878,149	$5,536,172
Cable Cars	$2,704,469	$368,289	$0	$776,242	$142,689	$984,502	$4,976,190
Other							
Unlinked Passenger Trips (Directly Operated)	$344,184	$27,987	$0	$7,742	$0	$17,892,847	$18,272,760
Unlinked Passenger Trips - Light Rail	$0	$0	$0	$0	$0	$0	$0
MUNI Maintenance Garages	$4,245,934	$792,513	$0	$439,418	$0	$3,601,781	$9,079,646
Manned Stations	$4,628,183	$610,067	$0	$23,633	$0	$1,316,996	$6,578,879
Manned Stations and Wayside Platforms	$1,005,346	$165,462	$0	$115,184	$0	$887,684	$2,173,676
Total Track Miles (Light Rail + Historic Streetcars)	$5,974,089	$573,403	$0	-$288,761	$0	-$188,077	$6,070,654
Total Track Miles -- Cable Cars	$2,845,583	$400,477	$0	$137,521	$0	$866,677	$4,250,259
Miles of Overhead Trolleywire Lines	$2,703,109	$247,053	$0	-$68,534	$0	$55,957	$2,937,585
Parking Meters	$1,898,627	$291,788	$0	$709,141	$0	$17,068,861	$19,968,417
Lane Miles	$7,761,000	$1,127,361	$0	$4,869,447	$0	$6,075,500	$19,833,307
Number of Citations	$14,291,335	$3,251,110	$0	$167,811	$0	$19,116,505	$36,826,762
Number of Hearings	$778,921	$184,559	$0	$5,097	$0	$508,950	$1,477,526
Residential Parking Permits	$257,444	$21,131	$0	$30	$0	-$127,355	$151,250
Number of Substations	$1,288,977	$136,003	$0	$47,118	$0	$366,836	$1,838,934
FIXED COSTS	**$24,690,500**	**$2,469,779**	**$0**	**-$322,321**	**$0**	**$9,132,798**	**$35,970,756**
GRAND TOTAL	**$296,742,795**	**$43,397,477**	**$12,601,397**	**$27,335,143**	**$3,643,679**	**$184,849,166**	**$568,569,657**

4.3 Level of Service

Level of service estimates are applied to the unit costs described above to estimate the annual cost impacts of the Free Fare System. The additional average weekday hours, miles, vehicles, and ridership estimated from the ridership impact analysis (Section 4) were converted to annual values using annualization factors from the NTD data for the agency fiscal year 2006. Table 21 shows the annualization factor used to expand the average weekday values to annual totals.

Table 21: Annualization Factors to Expand Average Weekday Level of Service to Annual Values

Service Operated	Weekdays	Saturdays	Sundays	Total	Annualization Factor
Days Schedule Operated	**253**	**54**	**58**	**365**	
Motorbus					
Scheduled Vehicle Revenue Miles	38,834	29,978	28,789	13,113,555	338
Actual Vehicle Revenue Hours	4,184	3,084	2,940	1,393,740	334
Trolleybus					
Scheduled Vehicle Revenue Miles	20,964	16,030	15,304	7,057,248	337
Actual Vehicle Revenue Hours	2,862	2,055	1,880	944,107	330
Bus (Motorbus + Trolleybus)					
Unlinked Passenger Trips (MB+TB)	509,929	305,710	242,767	159,601,056	313
Light Rail					
Scheduled Vehicle Revenue Miles	18,264	10,509	8,664	5,690,834	312
Actual Vehicle Revenue Hours	1,778	1,064	877	558,178	314
Unlinked Passenger Trips	132,637	75,359	70,373	41,708,086	314

Source: SFMTA FY2006 National Transit Database Report

Table 22 shows the average additional weekday level of service (LOS) for the three ridership growth scenarios.

Table 22: Average Additional Weekday Level of Service for Three Ridership Growth Scenarios

Average Additional Weekday Level of Service	Growth Scenario 1: 17.5% Ridership Increase	Growth Scenario 2: 47.5% Ridership Increase	Growth Scenario 3: 77.5% Ridership Increase
Motorbus and Trolleybus			
Revenue Vehicle Miles	1,904	6,971	16,540
Artic Motorbus	*277*	*1,608*	*4,264*
Small Motorbus	*63*	*93*	*237*
Standard Motorbus	*1,130*	*3,805*	*8,475*
Articulated Trolleybus	*126*	*296*	*783*
Standard Trolleybus	*308*	*1,170*	*2,781*
Revenue Vehicle Hours	220	832	1,988
Motorbus	*155*	*610*	*1,452*
Trolleybus	*65*	*221*	*536*

Table 22 (Continued)

Average Additional Weekday Level of Service	Growth Scenario 1: 17.5% Ridership Increase	Growth Scenario 2: 47.5% Ridership Increase	Growth Scenario 3: 77.5% Ridership Increase
Peak Buses	34	130	236
Motorbus	*32*	*105*	*176*
Trolleybus	*2*	*25*	*60*
Unlinked Passenger Trips (Motorbus + Trolleybus)	86,142	233,814	381,485
Historic Street Cars			
Revenue Vehicle Miles	283	762	1,318
Revenue Vehicle Hours	49	132	229
Peak Vehicles	9	17	25
Unlinked Passenger Trips	4,103	11,136	18,170
Light Rail Vehicles			
Revenue Vehicle Miles	906	2,357	4,384
Revenue Train Hours	37	102	207
Peak Vehicles	31	75	115
Unlinked Passenger Trips	26,332	71,471	116,611

Table 23 shows the annualized LOS values for the three ridership growth scenarios computed using the application of annualization factors.

Table 23: Annual Additional Level of Service for Three Ridership Growth Scenarios

Annual Additional Level of Service	Growth Scenario 1	Growth Scenario 2	Growth Scenario 3
Motorbus and Trolleybus			
Revenue Vehicle Miles	642,548	2,352,523	5,581,579
Artic Motorbus	*93,696*	*542,876*	*1,439,732*
Small Motorbus	*21,286*	*31,478*	*80,123*
Standard Motorbus	*381,599*	*1,284,863*	*2,861,756*
Articulated Trolleybus	*42,334*	*99,588*	*263,710*
Standard Trolleybus	*103,633*	*393,719*	*936,258*
Revenue Vehicle Hours	73,190	276,594	661,172
Motorbus	*51,820*	*203,635*	*484,216*
Trolleybus	21,370	*72,959*	*176,956*
Peak Vehicle Days	10,650	40,688	73,884
Motorbus	*9,920*	*32,443*	*54,294*
Trolleybus	*730*	*8,245*	*19,590*
Unlinked Passenger Trips (Motorbus + Trolleybus)	26,961,223	73,180,463	119,399,703
Historic Street Cars			
Revenue Vehicle Miles	88,236	237,325	410,755
Revenue Vehicle Hours	15,454	41,565	71,939
Peak Vehicle Days	3,175	5,875	8,575
Unlinked Passenger Trips	1,290,164	3,501,873	5,713,582

Table 23 (Cont)

Annual Additional Level of Service	Growth Scenario 1	Growth Scenario 2	Growth Scenario 3
Light Rail Vehicles			
Revenue Vehicle Miles	282,256	734,484	1,366,086
Revenue Train Hours	11,559	32,149	65,089
Peak Vehicle Days	9,601	23,171	35,507
Unlinked Passenger Trips	8,280,050	22,474,423	36,668,795

The additional ridership was estimated based on the actual ridership counts on each bus and rail route collected as part of the TEP study.

The O&M cost model required that the total revenue hours by mode be disaggregated by weekday, Saturday, and Sunday revenue hours. In order daily peak vehicle requirements to be applied in the O&M cost model, the weekday peak vehicles estimated from the ridership growth analysis was converted to weekly peak vehicle days by computing peak vehicle requirements on Saturday and Sunday. To accomplish this, using FY 2006 hourly equipment demand data, the ratio of Saturday peak vehicles to weekday peak vehicles was used to compute peak vehicle requirements on Saturday. Similarly, by computing a ratio of Sunday peak vehicles to weekday peak vehicles, the Sunday peak vehicle requirements were estimated.

For each mode, using FY 2006 data, weekday revenue hours as a percent of total revenue hours, Saturday revenue hours as percent of total revenue hours, and Sunday revenue hours as percent of total revenue hours were computed. These percentages were applied to the additional annual hours for each fare free system ridership growth scenario to estimate the weekday, Saturday, and Sunday revenue hours. Similarly, weekday peak revenue hours by mode was computed by applying the peak weekday revenue hours as a percent of total weekday revenue hours from FY 2006 data.

Finally, realizing that most of SFMTA's bus garages were already at or beyond capacity and the free fare system would significantly increase the size of the motor bus and trolley bus fleets, it was assumed that the implementation of fare free system would require one additional bus maintenance garage beyond the currently availability. It was also assumed that the Metro East facility would be restored to its original scope to ensure a fully functional rail maintenance facility.

4.4 O&M Cost Impact

4.4.1 O&M Cost Impact of Additional Level of Service (Excluding Paratransit Service)

The unit cost results were applied to additional hours, miles, vehicles, and ridership for the three fare free system growth scenarios to compute the associated bus and rail O&M costs, which is summarized in Table 24. The O&M cost impact of Paratransit service is discussed separately under Section 5.5. The O&M cost estimates in FY 2006 dollars were inflated to FY2007 dollars using the following San Francisco-specific annual inflation factors by object class:

- **Salaries and Wages:** San Francisco Consumer Price Index - All Urban Consumers (CPI-U) + 0.5 percent, based on historical growth in salaries and wages
- **Health Benefits:** Historical growth in healthcare expenses of 10 percent
- **Other Benefits:** San Francisco CPI-U - All Items
- **Fuel and Lubes:** Crude Oil Price: West Texas Intermediate - Sweet Wellhead
- **Materials & Supplies:** San Francisco CPI-U - All Items
- **Propulsion Electricity:** San Francisco CPI-U - Electricity
- **Other:** San Francisco CPI-U - All Items

Table 24: Additional Annual O&M Cost by Object Class in 2007 Dollars

Additional Annual O&M Cost by Ridership Growth Scenario	Salaries and Wages	Health Benefits	Fuel and Lubes	Materials and Supplies	Electricity Propulsion	Other Benefits and Miscellaneous Expenses	Additional Annual O&M Cost
Growth Scenario 1: 17.5 percent	$11,241,422	$1,572,597	$523,245	$1,047,447	$204,962	$7,574,188	$22,163,860
Growth Scenario 2: 47.5 percent	$34,116,484	$4,803,089	$1,959,043	$3,114,396	$552,906	$21,252,843	$65,798,761
Growth Scenario 3: 77.5 percent	$70,552,842	$10,225,909	$4,616,872	$6,670,182	$1,052,174	$40,511,283	$133,629,263

For the 17.5 percent ridership growth scenario, the increased level of service would result in additional annual O&M expenses of around $ 22.16 million. On a system-wide basis, excluding the additional cost associated with paratransit service, this growth translates to a 3.90 percent increase from FY 2006 agency wide operating expenses. From the ridership impact analysis described in Section 3, it was observed that the 54 out of the 71 bus routes had at least one hour when the 85 percent passenger load was exceeded. This represents a total of 90 hours or only 9 percent of total hourly periods in operation during the day when the 85 percent passenger load is exceeded.

For the 47.5 percent ridership growth scenario, the increased level of service would result in additional annual O&M expenses of around $65.80 million. On a system-wide basis, excluding the additional cost associated with paratransit service, this represents an 11.57 percent increase from FY 2006 agency wide operating expenses. Based on the ridership impact analysis, it was observed that the 61 out of the 71 bus routes had at least one hour when the 85 percent passenger load was exceeded. This represents a total of 260 hours or 25 percent of total hourly periods in operation during the day when the 85 percent passenger load is exceeded.

For the 77.5 percent ridership growth scenario, the increased level of service would result in additional annual O&M expenses of around $133.63 million. On a system-wide basis, excluding the additional cost associated with paratransit service, this represents a 23.50 percent increase from FY 2006 agency wide operating expenses. The ridership impact analysis identified 64 out of the 71 bus routes had at least one hour when the 85 percent passenger load is exceeded. This represented a total of 411 hours or 39 percent of total hourly periods in operation during the day when the 85 percent passenger load is exceeded.

Tables 25, 26, and 27 show the estimated O&M costs by cost driver for the three fare free system ridership growth scenarios. In each table, the additional LOS and additional O&M costs by cost driver for that scenario are shown.

Table 25: Additional Annual O&M Cost by Cost Driver by Object Class for Ridership Growth Scenario 1 (17.5 percent)

Cost Driver or Driving Variable	Additional LOS for 17.5% Ridership Growth	ADDITIONAL ANNUAL O&M COST BY COST DRIVER BY OBJECT CLASS (in FY 2007 Dollars)						
		Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials & Supplies	Electricity Propulsion	Benefits + Miscellaneous Expenses	Total Annual O&M Cost
Peak Bus/Rail Car Day								
Motorbus	9,920	$535,159	$81,400	$0	-$38,918	$0	$167,493	$745,135
Trolleybus	730	$39,017	$5,988	$0	-$2,947	$0	$12,231	$54,289
Light Rail	9,601	$513,157	$78,749	$0	-$38,756	$0	$160,865	$714,015
Historic Streetcars	3,175	$169,698	$26,042	$0	-$12,817	$0	$53,197	$236,121
Cable Car	0	$0	$0	$0	$0	$0	$0	$0
Peak Weekday Revenue Bus/Train Hour								
Light Rail + Historic Streetcars	6,120	$23,171	$0	$0	$0	$0	$0	$23,171
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	4,675	$18,988	$0	$0	$0	$0	$0	$18,988
Motorbus	14,167	$41,990	$0	$0	$0	$0	$0	$41,990
Revenue Bus/Train Hour								
Paratransit Service	0	$0	$0	$0	$0	$0	$0	$0
Weekday								
Light Rail + Historic Streetcars	21,352	$1,289,388	$180,854	$0	$6,957	$0	$394,263	$1,871,462
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	16,479	$872,095	$142,762	$0	$5,086	$0	$338,718	$1,358,662
Motorbus	40,015	$2,101,262	$346,402	$0	$11,941	$0	$817,233	$3,276,839
Saturday								
Light Rail + Historic Streetcars	3,036	$167,200	$25,716	$0	$989	$0	$56,060	$249,964
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	2,558	$115,359	$22,158	$0	$789	$0	$52,571	$190,877
Motorbus	6,005	$265,092	$51,988	$0	$1,792	$0	$122,651	$441,523
Sunday								
Light Rail + Historic Streetcars	2,624	$150,384	$22,227	$0	$855	$0	$48,454	$221,920
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	2,333	$112,655	$20,214	$0	$720	$0	$47,961	$181,551
Motorbus	5,800	$277,517	$50,211	$0	$1,731	$0	$118,458	$447,916

Table 25 (Continued)

Cost Driver or Driving Variable	Additional LOS for 17.5% Ridership Growth	ADDITIONAL ANNUAL O&M COST BY COST DRIVER BY OBJECT CLASS (in FY 2007 Dollars)						
		Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials & Supplies	Electricity Propulsion	Benefits + Miscellaneous Expenses	Total Annual O&M Cost
Revenue Bus/Car Mile								
Motorbus	496,582	$680,563	$124,986	$523,245	$182,292	$0	$372,514	$1,883,600
Articulated Motorbus	93,696	$21,904	$0	$0	$48,237	$0	$0	$70,141
Standard Motorbus	402,885	$78,354	$0	$0	$154,296	$0	$0	$232,649
Trolleybus	145,966	$163,920	$35,880	$0	$18,382	$20,204	$113,014	$351,400
Articulated Trolleybus	42,334	$24,127	$0	$0	$20,556	$0	$0	$44,682
Standard Trolleybus	103,633	$48,879	$0	$0	$56,216	$0	$0	$105,095
Light Rail	282,256	$806,040	$120,470	$0	$355,340	$140,756	$553,890	$1,976,496
Historic Streetcars	88,236	$397,007	$37,439	$0	$173,397	$44,002	$122,001	$773,847
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Other								
Unlinked Passenger Trips (Directly Operated)	36,531,437	$61,932	$5,387	$0	$1,386	$0	$3,203,595	$3,272,300
Unlinked Passenger Trips - Light Rail	8,280,050	$0	$0	$0	$0	$0	$0	$0
MUNI Maintenance Garages	2	$970,320	$193,725	$0	$99,920	$0	$819,018	$2,082,984
Manned Stations	0	$0	$0	$0	$0	$0	$0	$0
Manned Stations and Wayside Platforms	0	$0	$0	$0	$0	$0	$0	$0
Total Track Miles (Light Rail + Historic Streetcars)	0	$0	$0	$0	$0	$0	$0	$0
Total Track Miles -- Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Miles of Overhead Trolleywire Lines	0	$0	$0	$0	$0	$0	$0	$0
Parking Meters	0	$0	$0	$0	$0	$0	$0	$0
Lane Miles	0	$0	$0	$0	$0	$0	$0	$0
Number of Citations	0	$0	$0	$0	$0	$0	$0	$0
Number of Hearings	0	$0	$0	$0	$0	$0	$0	$0
Residential Parking Permits	0	$0	$0	$0	$0	$0	$0	$0
Number of Substations	0	$0	$0	$0	$0	$0	$0	$0
FIXED COSTS								
Corrective Maintenance Cost per Light Rail Passenger.	8,280,050	$1,296,243	$0	$0	$0	$0	$0	$1,296,243
GRAND TOTAL		**$11,241,422**	**$1,572,597**	**$523,245**	**$1,047,447**	**$204,962**	**$7,574,188**	**$22,163,860**

Table 26: Additional Annual O&M Cost by Cost Driver by Object Class for Ridership Growth Scenario 2 (47.5 percent)

Cost Driver or Driving Variable	Additional LOS for 47.5% Ridership Growth	ADDITIONAL ANNUAL O&M COST BY COST DRIVER BY OBJECT CLASS (in FY 2007 Dollars)						
		Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials & Supplies	Electricity Propulsion	Benefits + Miscellaneous Expenses	Total Annual O&M Cost
Peak Bus/Rail Car Day								
Motorbus	32,443	$1,750,220	$266,216	$0	-$127,279	$0	$547,780	$2,436,937
Trolleybus	8,245	$440,681	$67,627	$0	-$33,283	$0	$138,146	$613,171
Light Rail	23,171	$1,238,451	$190,052	$0	-$93,535	$0	$388,232	$1,723,200
Historic Streetcars	5,875	$314,009	$48,188	$0	-$23,716	$0	$98,436	$436,917
Cable Car	0	$0	$0	$0	$0	$0	$0	$0
Peak Weekday Revenue Bus/Train Hour								
Light Rail + Historic Streetcars	16,701	$63,231	$0	$0	$0	$0	$0	$63,231
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	15,960	$64,827	$0	$0	$0	$0	$0	$64,827
Motorbus	55,670	$165,005	$0	$0	$0	$0	$0	$165,005
Revenue Bus/Train Hour								
Paratransit Service	0	$0	$0	$0	$0	$0	$0	$0
Weekday								
Light Rail + Historic Streetcars	58,268	$3,518,611	$493,534	$0	$18,984	$0	$1,075,903	$5,107,032
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	56,261	$2,977,393	$487,398	$0	$17,364	$0	$1,156,407	$4,638,562
Motorbus	157,243	$8,257,206	$1,361,234	$0	$46,925	$0	$3,211,432	$12,876,798
Saturday								
Light Rail + Historic Streetcars	8,285	$456,271	$70,175	$0	$2,699	$0	$152,982	$682,127
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	8,732	$393,842	$75,648	$0	$2,695	$0	$179,482	$651,667
Motorbus	23,599	$1,041,717	$204,295	$0	$7,043	$0	$481,974	$1,735,028
Sunday								
Light Rail + Historic Streetcars	7,161	$410,383	$60,654	$0	$2,333	$0	$132,227	$605,597
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	7,966	$384,612	$69,013	$0	$2,459	$0	$163,742	$619,827
Motorbus	22,792	$1,090,541	$197,311	$0	$6,802	$0	$465,497	$1,760,151

Table 26 (Continued)

Cost Driver or Driving Variable	Additional LOS for 47.5% Ridership Growth	ADDITIONAL ANNUAL O&M COST BY COST DRIVER BY OBJECT CLASS (in FY 2007 Dollars)						
		Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials & Supplies	Electricity Propulsion	Benefits + Miscellaneous Expenses	Total Annual O&M Cost
Revenue Bus/Car Mile								
Motorbus	1,859,216	$2,548,048	$467,951	$1,959,043	$682,507	$0	$1,394,704	$7,052,253
Articulated Motorbus	542,876	$126,912	$0	$0	$279,487	$0	$0	$406,399
Standard Motorbus	1,316,340	$256,004	$0	$0	$504,127	$0	$0	$760,131
Trolleybus	493,307	$553,983	$121,261	$0	$62,125	$68,281	$381,940	$1,187,590
Articulated Trolleybus	99,588	$56,757	$0	$0	$48,356	$0	$0	$105,113
Standard Trolleybus	393,719	$185,700	$0	$0	$213,574	$0	$0	$399,275
Light Rail	734,484	$2,097,472	$313,485	$0	$924,665	$366,275	$1,441,329	$5,143,227
Historic Streetcars	237,325	$1,067,813	$100,698	$0	$466,379	$118,350	$328,141	$2,081,381
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Other								
Unlinked Passenger Trips (Directly Operated)	99,156,759	$168,101	$14,621	$0	$3,762	$0	$8,695,473	$8,881,957
Unlinked Passenger Trips - Light Rail	22,474,423	$0	$0	$0	$0	$0	$0	$0
MUNI Maintenance Garages	2	$970,320	$193,725	$0	$99,920	$0	$819,018	$2,082,984
Manned Stations	0	$0	$0	$0	$0	$0	$0	$0
Manned Stations and Wayside Platforms	0	$0	$0	$0	$0	$0	$0	$0
Total Track Miles (Light Rail + Historic Streetcars)	0	$0	$0	$0	$0	$0	$0	$0
Total Track Miles -- Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Miles of Overhead Trolleywire Lines	0	$0	$0	$0	$0	$0	$0	$0
Parking Meters	0	$0	$0	$0	$0	$0	$0	$0
Lane Miles	0	$0	$0	$0	$0	$0	$0	$0
Number of Citations	0	$0	$0	$0	$0	$0	$0	$0
Number of Hearings	0	$0	$0	$0	$0	$0	$0	$0
Residential Parking Permits	0	$0	$0	$0	$0	$0	$0	$0
Number of Substations	0	$0	$0	$0	$0	$0	$0	$0
FIXED COSTS								
Corrective Maintenance Cost per Light Rail Passenger.	22,474,423	$3,518,373	$0	$0	$0	$0	$0	$3,518,373
GRAND TOTAL		**$34,116,484**	**$4,803,089**	**$1,959,043**	**$3,114,396**	**$552,906**	**$21,252,843**	**$65,798,761**

Table 27: Additional Annual O&M Cost by Cost Driver by Object Class for Ridership Growth Scenario 3 (77.5 percent)

Cost Driver or Driving Variable	Additional LOS for 77.5% Ridership Growth	ADDITIONAL ANNUAL O&M COST BY COST DRIVER BY OBJECT CLASS (in FY 2007 Dollars)						
		Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials & Supplies	Electricity Propulsion	Benefits + Miscellaneous Expenses	Total Annual O&M Cost
Peak Bus/Rail Car Day								
Motorbus	54,294	$2,929,027	$445,518	$0	-$213,003	$0	$916,720	$4,078,263
Trolleybus	19,590	$1,047,052	$160,680	$0	-$79,079	$0	$328,232	$1,456,885
Light Rail	35,507	$1,897,789	$291,234	$0	-$143,331	$0	$594,922	$2,640,614
Historic Streetcars	8,575	$458,319	$70,334	$0	-$34,615	$0	$143,675	$637,713
Cable Car	0	$0	$0	$0	$0	$0	$0	$0
Peak Weekday Revenue Bus/Train Hour								
Light Rail + Historic Streetcars	31,047	$117,542	$0	$0	$0	$0	$0	$117,542
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	38,710	$157,232	$0	$0	$0	$0	$0	$157,232
Motorbus	132,376	$392,360	$0	$0	$0	$0	$0	$392,360
Revenue Bus/Train Hour								
Paratransit Service	0	$0	$0	$0	$0	$0	$0	$0
Weekday								
Light Rail + Historic Streetcars	108,315	$6,540,819	$917,440	$0	$35,290	$0	$2,000,018	$9,493,568
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	136,455	$7,221,373	$1,182,137	$0	$42,115	$0	$2,804,751	$11,250,376
Motorbus	373,903	$19,634,491	$3,236,826	$0	$111,582	$0	$7,636,340	$30,619,240
Saturday								
Light Rail + Historic Streetcars	15,401	$848,172	$130,450	$0	$5,018	$0	$284,381	$1,268,020
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	21,179	$955,226	$183,476	$0	$6,537	$0	$435,316	$1,580,555
Motorbus	56,116	$2,477,060	$485,785	$0	$16,746	$0	$1,146,066	$4,125,657
Sunday								
Light Rail + Historic Streetcars	13,312	$762,869	$112,752	$0	$4,337	$0	$245,799	$1,125,756
Cable Cars	0	$0	$0	$0	$0	$0	$0	$0
Trolleybus	19,321	$932,839	$167,385	$0	$5,963	$0	$397,140	$1,503,329
Motorbus	54,197	$2,593,154	$469,178	$0	$16,174	$0	$1,106,888	$4,185,394

Table 27 (Continued)

ver or Driving Variable	Additional LOS for 77.5% Ridership Growth	ADDITIONAL ANNUAL O&M COST BY COST DRIVER BY OBJECT CLASS (in FY 2007 Dollars)						
		Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials & Supplies	Electricity Propulsion	Benefits + Miscellaneous Expenses	Total A O&M Cost
Car Mile								
	4,381,611	$6,004,978	$1,102,820	$4,616,872	$1,608,464	$0	$3,286,896	$16,6
	1,439,732	$336,578	$0	$0	$741,211	$0	$0	$1,07
rbus	2,941,879	$572,142	$0	$0	$1,126,670	$0	$0	$1,69
	1,199,968	$1,347,561	$294,968	$0	$151,118	$166,092	$929,069	$2,88
d Trolleybus	263,710	$150,293	$0	$0	$128,047	$0	$0	$27
rolleybus	936,258	$441,593	$0	$0	$507,876	$0	$0	$94
	1,366,086	$3,901,143	$583,059	$0	$1,719,808	$681,245	$2,680,765	$9,56
ars	410,755	$1,848,138	$174,285	$0	$807,194	$204,837	$567,936	$3,60
	0	$0	$0	$0	$0	$0	$0	
enger Trips (Directly	161,782,080	$274,270	$23,855	$0	$6,139	$0	$14,187,350	$14,4
enger Trips - Light Rail	36,668,795	$0	$0	$0	$0	$0	$0	
nance Garages	2	$970,320	$193,725	$0	$99,920	$0	$819,018	$2,08
ns	0	$0	$0	$0	$0	$0	$0	
ns and Wayside Platforms	0	$0	$0	$0	$0	$0	$0	
es (Light Rail + Historic	0	$0	$0	$0	$0	$0	$0	
es -- Cable Cars	0	$0	$0	$0	$0	$0	$0	
ead Trolleywire Lines	0	$0	$0	$0	$0	$0	$0	
	0	$0	$0	$0	$0	$0	$0	
	0	$0	$0	$0	$0	$0	$0	
tions	0	$0	$0	$0	$0	$0	$0	
rings	0	$0	$0	$0	$0	$0	$0	
l Parking Permits	0	$0	$0	$0	$0	$0	$0	
stations	0	$0	$0	$0	$0	$0	$0	
aintenance Cost per Light Rail	36,668,795	$5,740,503	$0	$0	$0	$0	$0	$5,74
AL		**$70,552,842**	**$10,225,909**	**$4,616,872**	**$6,670,182**	**$1,052,174**	**$40,511,283**	**$133,62**

4.4.2 O&M Cost Impact of Other Operating Activities

The following activities will also be affected by the proposed fare free system:

- **Additional staffing at manned stations:** The increase in ridership due to a fare free system would result in SFMTA adding more staff at manned stations. In FY06, the station operations unit had about 57 employees. Assuming that the station staffing increases with ridership, the 17.5 percent growth scenario would require 10 more employees, the 47.5 percent growth scenario would require 27 more employees, and the 77.5 percent growth scenario would require 44 more station employees. Table 28 shows the additional annual salaries, health benefit and other benefit costs for the additional station employees. The additional O&M cost (in 2007 dollars) is around $1.09 million for the 17.5 percent growth scenario, $2.96 million for the 47.5 percent growth scenario, and $4.83 million for the highest ridership growth scenario.

Table 28: Additional O&M Cost for Increased Station Staffing

Additional Annual O&M Cost by Ridership Growth Scenario	Salaries and Wages	Health Benefits	Fuel and Lubricants	Materials and Supplies	Electricity Propulsion	Other Benefits and Miscellaneous Expenses	Total O&M Cost
Growth Scenario 1 - 17.5 percent	$867,415	$80,938	$0	$0	$0	$143,288	$1,091,641
Growth Scenario 2 - 47.5 percent	$2,354,413	$219,688	$0	$0	$0	$388,924	$2,963,025
Growth Scenario 3 - 77.5 percent	$3,841,410	$358,438	$0	$0	$0	$634,560	$4,834,409

- **Fare policy research and planning:** Any fare policy research and planning related activities currently performed by SFMTA's finance department would be eliminated with the fare free system. The elimination of this function would likely result in redeploying the staff resources to other functions and hence would not have any O&M cost impact.

- **Customer service unit:** The increase in ridership due to a fare free system would likely increase the number of customer complaints reported to the customer service unit. This would likely result in more staffing in this department. In the O&M cost model, the expenses associated with this unit are driven on an indirect basis – on the basis of cost associated with hours, miles, and vehicles. Hence, the increased O&M cost impact of additional customer complaints has already been accounted for with the increase in hours, miles, vehicles, and ridership for the three growth scenarios.

- **Proof of payment initiative on other SFMTA modes:** The POP began as a small initiative, which was implemented only in metro lines and the E-line. In FY 2006, SFMTA had only 17 employees who served as fare inspectors and supervisors/investigators. However, SFMTA is in the process of expanding this initiative and have programmed about 69 employees in FY 2008 increasing to 84 employees in FY 2012. With the implementation of the fare free system, these expenses would not be required. Table 29 provides the annual O&M expense and headcount that is planned in the operating budget between FY 2008 and FY 2012.

Table 29: Budgeted Proof of Payment Expenses Between FY08 and FY12 To Be Eliminated with Fare Free System Implementation

Fiscal Year	Budgeted O&M Expense in Fiscal Year	Budgeted Headcount in Fiscal Year
2008	$6,127,376	69
2009	$6,433,745	72
2010	$6,755,432	76
2011	$7,093,204	80
2012	$7,447,864	84

- The O&M cost model used does not include the cost of POP related functions. This was one of the cost centers that were eliminated while adapting the model from the TEP study to Fare Free System study. The budgeted costs, shown in Table 12, would be incurred in a future fiscal year if SFMTA continues to be a fare-based system. However, with the implementation of a fare free system, these activities would be eliminated and hence would result in savings from the respective future fiscal year's operating budget. While calculating the net O&M cost impact, this would represent a cost in the future fiscal year and a savings in the same fiscal year due to fare free system implementation. Hence, the net effect or the net O&M cost impact is zero.

- **TransLink®-Related Operating Costs:** TransLink® is a regional fare coordination program, designed to develop a single fare instrument that can be used on all of the San Francisco region's public transportation services. SFMTA and five other regional transit operators is part of this effort, which is sponsored by the Metropolitan Transportation Commission (MTC). SFMTA is assumed to be revenue ready for TransLink® in FY 2007/2008. As part of already negotiated agreement, SFMTA is obligated to pay for a portion of the administrative costs associated with the program based on the number of TransLink® transactions that occur on a SFMTA vehicle or in a SFMTA station. The implementation of fare free system would result in SFMTA withdrawing from this regionally coordinated effort. This would also result in SFMTA withdrawing from its obligation to comply with the terms already established under the agreement with MTC. It is not clear what the legal implications to SFMTA are due to the withdrawal from TransLink® implementation.

Table 30 shows the SFMTA share of TransLink® operating cost owed to MTC that would not be paid if fare free system is implemented. Also shown in this table are the budgeted O&M cost and headcount for maintaining the TransLink® car-borne equipment.

Table 30: SFMTA Share of TransLink® Operating Costs, Nominal $

Fiscal Year	SFMTA Share of TransLink® Operating Cost Owed to SFMTC	O&M Cost of Maintaining TransLink® Equipment	Planned Headcount for Maintenance
2007	$0	$0	0
2008	$0	$0	0
2009	$1,805,661	$383,656	4
2010	$4,770,859	$402,839	4
2011	$4,799,489	$422,981	4
2012	$4,919,051	$444,130	5
2013	$5,045,262	DNA	DNA
2014	$5,175,538	DNA	DNA
2015	$5,310,023	DNA	DNA
2016	$5,448,867	DNA	DNA
2017	$5,592,226	DNA	DNA
2018	$5,605,579	DNA	DNA
2019	$5,779,729	DNA	DNA

DNA- Data not available

The O&M cost model is based on actual historical expenses in FY 2006, any planned or budgeted O&M activities in the future that did not exist in the FY 2006 and would be eliminated under fare free system would have a neutral effect to the net O&M cost impact. For example, TransLink® operating cost owed to SFMTC and maintenance of TransLink® equipment is not planned to occur until FY 2009. In FY 2006, these costs did not exist and with the implementation of the fare free system would be eliminated. Hence the net O&M cost impact is zero.

4.4.3 O&M Cost Impact of Fare - Related Capital Initiatives Programmed in Capital Improvement Program

SFMTA's Capital Improvement Program (CIP) identifies the list of capital projects to be implemented in the near future. Some of these projects are directly related to fare-related activities and some are impacted by implementation of fare free system. The following are the list of fare-related capital projects that have an O&M impact.

- **Kiosks, media sales:** In FY 2008 operating budget, about $130,000 and 2 full time staff were budgeted for this activity. If the fare free system is implemented, this activity would be discontinued and the staff personnel would be redeployed to other functions and hence there is no net O&M cost impact.

- **Cable Car turnaround booth sales**: In FY 2008 operating budget, about $600,000 and 7 full-time staff were budgeted for this activity. This expense would be incurred because the cable car service is exempt from fare free system.

- **Automatic Passenger Counting System**: In FY 2008 and FY 2009 operating budget, about $1,000,000 and $1,090,000, respectively, have been budgeted for this activity. This expense would be incurred with the implementation of a fare free system.

- **Transit Preferential Streets (TPS)**: In FY 2008 operating budget, about $438,000 was budgeted for this activity. With the implementation of a fare free system, to accommodate additional bus and rail vehicle more TPS initiatives would be required to speed the transit vehicle flow throughout the system. At this time, sufficient data is not available to determine what the net O&M cost impact of increased TPS initiatives would be in a fare free system.

4.5 Paratransit O&M Cost Impact Analysis

As stated in Section 3, within the SF Access category there are two types of trips: ADA Access and Lift-Van. Table 31 summarizes the breakdown of trips, costs, and cost per trip for ADA Access and Lift-Van service. As shown on the table ADA Access accounts for 64 percent of the trips and 46 percent of the costs while Lift Van accounts for 36 percent of the trips and 54 percent of the costs.

Table 31: Summary of FY 2005 - 06 SF Access Trips and Costs

	FY 2005-2006 Trips	FY 2005-2006 Costs	Cost Per Trip
ADA Access	147,997	$2,686,086	$18.15
Lift Van	85,533	$3,141,263	$36.73

Note: ADA access includes East Bay Paratransit passenger trips (10,766) and Annual Costs ($83,469)

Table 32 summarizes the increased passenger trips and O&M costs that would result with the three growth scenarios for the SF Access service. This analysis assumes the current ratio of ADA Access and Lift Van trip would remain at the FY 2005 – 06 levels. As shown in the table, growth scenario 1 would result in an increase of approximately $1.0 million, while scenarios 2 and 3 would result in an increase of $2.8 million and $4.5 million.

Table 32: Fare Free Service Impact on Paratransit O&M Costs

	Estimated Annual Passenger Trips	Estimated Annual Costs	Change in Annual Costs Compared to FY 2005 - 2006
Existing Conditions	**233,530**	**$5,827,773**	
ADA Access	*147,997*	*$2,686,146*	
Lift Van	*85,533*	*$3,141,627*	
Growth Scenario 1: 17.5% Increase	**274,398**	**$6,847,633**	**$1,019,860**
ADA Access	*173,896*	*$3,156,221*	
Lift Van	*100,501*	*$3,691,412*	
Growth Scenario 2: 47.5% Increase	**344,457**	**$8,595,965**	**$2,768,192**
ADA Access	*218,296*	*$3,962,065*	
Lift Van	*126,161*	*$4,633,900*	
Growth Scenario 3: 77.5% Increase	**414,516**	**$10,344,296**	**$4,516,524**
ADA Access	*262,695*	*$4,767,908*	
Lift Van	*151,821*	*$5,576,388*	

The additional annual O&M cost of paratransit service was inflated to 2007 dollars using San Francisco CPI-U. The additional annual O&M costs for the low, medium, and high ridership growth scenarios in 2007 dollars is $1,043,588, $2,832, 596, and $4,621,604 respectively.

4.5.1 Net O&M Cost Impact Summary

Table 33 below summarizes the impact of additional service (hours, miles, vehicles, ridership, and maintenance facility), other operating activities, capital projects, and the Paratransit service to compute the net O&M cost (in 2007 dollars) increase for the three ridership growth scenarios.

Table 33: Net O&M Cost Impact of Fare Free System Implementation

Net O&M Cost Impact Resulting From	O&M Cost by Ridership Scenario in 2007 Dollars		
	17.5 Percent	47.5 Percent	77.5 Percent
Additional Level of Service	$22,163,860	$65,798,761	$133,629,263
Increased Station Staffing	$1,091,641	$2,963,025	$4,834,409
Additional Paratransit Service	$1,043,588	$2,832,596	$4,621,604
Grand Total	**$24,299,089**	**$71,594,381**	**$143,085,276**

The 17.5 percent growth scenario results in additional annual O&M cost of $24.30 millions in 2007 dollars, which is 4.27 percent greater than FY 2006 operating expenses. The 47.5 percent growth scenario results in additional annual O&M cost of $71.59 million in 2007 dollars, which is 12.59 percent greater than FY 2006 operating expenses. Finally, the high 77.5 percent growth scenario results in additional annual O&M cost of $143.09 million in 2007 dollars, which is 25.17 percent greater than FY 2006 operating expenses.

4.6 Capital Cost Impact of Fare Free System

This section identifies the capital projects that would be eliminated with the implementation of a fare free system. The capital expenditure associated with these projects is summarized based on data provided in SFMTA's Capital Improvement Program (CIP). The CIP lists all capital projects and the associated year-by-year expenditure between FY 2007 and FY 2037. This section also summarizes the capital projects that have to be executed prior to the implementation of the fare free system.

4.6.1 Capital Projects Eliminated Due to Fare Free System

SFMTA's CIP identifies the list of capital projects to be implemented in the near future. The capital projects that would be eliminated in a fare free system are:

- **Kiosks, media sales:** Purchase and installation of Kiosks for media and advertisement sales.
- **Administrative & training facilities:** Only one of the following activities is directly impacted by the fare free system. However, the CIP reports the combined capital cost for all three activities.
    - One South Van Ness: Renovation of the space in this building to accommodate various administrative, operations, and management offices within the SFMTA. This activity is not impacted by the fare free system.
    - Revenue center replacement: Includes Coin Sorter Replacement and renovations of the existing facility. This activity is clearly impacted by the fare free system.
    - Training center – SFMTA-wide: Development and construction of a combined operations and maintenance training facility to replace the existing facility.
- **Fareboxes replacement program:** Procure new fareboxes and replace existing fareboxes which have reached their useful life. Purchase and install 1,400 Inductive Coin Sensors (ICS), and automatic transfer/receipt printers.
- **Fare collection system:** Replacement of the existing Metro Subway fare collection system with a new state-of-art fare collection system. Includes the replacement of fare gates, ticket vending machines, and agent's booth control panel and display.
- **Third Street phase 1 – Ticket Vending Machines (TVM):** Procurement and installation of ticket vending machines to allow faster boarding at high volume stops by providing the option of paying before boarding on the Third Street IOS. This project will be combined with the procurement of TVM projects in the Metro System including 19th Avenue platforms on the M-Line.

Table 34 below shows the planned capital project expenditures for every five-year CIP between 2007 and 2037. The elimination of these projects result in capital cost savings of $255,163,755.

Table 34: Capital Projects Eliminated Due to Fare Free System

Fare Related Capital Projects	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	200
KIOSKS, MEDIA SALES - Purchase and installation of Kiosks for media and advertisement sales.	$0	$1,200,000	$1,200,000	$0	$1,200,000	$1,200,000	$2,400,000	$7,200,000
ADMIN & TRAINING FACILITIES: ONE SOUTH VAN NESS : Renovation of the space in this building to accommodate various administrative, operations, and management offices within the SFMTA. REVENUE CENTER REPLACEMENT: Includes Coin Sorter Replacement and renovations of the existing facility. TRAINING CENTER - SFMTA Wide: Development and construction of a combined operations and maintenance training facility to replace the existing facility.	$916,550	$46,761,114	$0	$0	$0	$0	$0	$46,761,114
FAREBOXES REPLACEMENT PROGRAM: Procure new fareboxes and replace existing fareboxes which has reached their useful life. Purchase and install 1,400 Inductive Coin Sensors (ICS), and automatic transfer/receipt printers.	$0	$34,946,755	$0	$0	$1,538,000	$1,538,000	$1,538,000	$39,560,755
FARE COLLECTION SYSTEM: Replacement of the existing Metro Subway fare collection system with a new state-of-art fare collection system. Includes the replacement of fare gates, ticket vending machines, and agent's booth control panel and display.	$546,851	$97,582,296	$5,000,000	$5,000,000	$41,000,000	$5,000,000	$5,000,000	$158,582,296
THIRD STREET PHASE 1 - TVMS: Procurement and installation of ticket vending machines to allow faster boarding at high volume stops by providing the option of paying before boarding on the Third Street IOS. This project will be combined with the procurement of TVM projects in the Metro System including 19th Avenue platforms on the M-Line.	$0	$3,059,590	$0	$0	$0	$0	$0	$3,059,590
l Expenditure	**$1,463,401**	**$183,549,755**	**$6,200,000**	**$5,000,000**	**$43,738,000**	**$7,738,000**	**$8,938,000**	**$255,1**

Note: In the capital project named "Admin & Training Facilities" the Revenue Center Replacement is the only activity eliminated by the fare free system. However, due to lack of sufficiently detailed cost data, the capital cost for the entire project is reported.

4.6.2 Capital Projects that are Critical Prior to Fare Free System Implementation

The following projects have been identified to be extremely critical to the operations of SFMTA and hence they have to be completed prior to the implementation of fare free system.

- **New Central Control Facility:** SFMTA is currently in critical need of a new central control facility. This project would involve the design and construction of a new central control facility to replace the existing facility which is undersized for its existing use and hence contributing to inefficiencies. The capital cost of this project is $75 million based on data from CIP.

- **Bus Maintenance Facility:** SFMTA's bus maintenance facilities are critically above capacity and hence a new facility would be required prior to the implementation of the fare free system. The capital cost of a maintenance facility like Islais Creek, which can accommodate 165 standard motorcoaches, is around $90 million. Using this estimate, the rough cost of an additional maintenance facility was estimated by accounting for capacity constraints in existing garages and the number of additional bus vehicles to be accommodated under each ridership growth scenario. The capital cost of additional maintenance facility range from $49 million for the 17.5 percent ridership growth scenario to $112 million for the 47.5 percent ridership growth scenario, and $156 million for the 77.5 percent growth scenario. These costs are rough estimates only and a thorough cost estimate should be performed prior to implementation of the fare free system. Alternatively, SFMTA could choose to contract out the maintenance service, which has to be studied prior to fare free service implementation.

- **Rail Maintenance Facility:** SFMTA's rail maintenance facility is also critically above capacity and hence an additional facility would be required prior to the implementation of the fare free system. To accommodate the additional rail vehicles, it was assumed that the Metro East facility would be restored to its original scope to ensure a fully functional rail maintenance facility at a total cost of $50 million based on estimate from CIP.

4.6.3 Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation

The following are the list of projects for which SFMTA should have made significant progress toward executing them prior to the implementation of the fare free system. Considering that many SFMTA's capital assets are not in a state of good repair and already have significant real and potential safety and reliability impact, lack of investment in these capital projects prior to fare free system implementation could make such impacts even more severe. Table

35 provides a top-level summary of capital costs for these projects between FY 2007 and FY 2037 for the major capital project categories.

Table 35: Capital Cost by Major Asset Category (in millions)

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure (in Millions)						30 Year CIP
		2007-2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
Equipment Projects	$11	$188	$154	$154	$154	$236	$243	$1,129
Facility Projects	$73	$340	$35	$35	$36	$52	$55	$553
Fleet Projects	$989	$637	$778	$669	$1,091	$1,104	$1,104	$5,382
Infrastructure Projects	$217	$483	$265	$296	$465	$428	$416	$2,354
GRAND TOTAL	$1,290	$1,647	$1,233	$1,154	$1,747	$1,820	$1,818	$9,418

Tables 36 to 39 provide the detailed description of and cost associated with the equipment, facility, fleet, and infrastructure related projects respectively.

Table 36: Capital Cost of Equipment Related Projects Requiring Significant Progress Prior to Fare Free System Implementation

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
EQUIPMENT RELATED PROJECTS								
SHOP EQUIP PROGRAM: On-going acquisition and replacement of the equipment needed to support all aspects of SFMTA operations, maintenance, and admin functions; SIGNAL VITAL RELAY TEST SYSTEM - procurement of a computer based tester for subway surface signaling system relays; SPECIAL MACHINE SHOP HEATERS - Purchase of special machine shop heaters; SHOP HOIST REPLACEMENT - Purchase and replace four shop hoist.	$1,290,731	$21,554,562	$21,254,390	$21,254,390	$21,254,390	$25,600,000	$25,600,000	$136,517,732
DATA PROCESSING -CURRENT/ FUTURE PHASE: Procurement and replacement of data processing and office equipment to support management, administration, planning, operations, and engineering services of the SFMTA.	$3,802,446	$27,142,469	$27,883,155	$27,883,155	$27,883,155	$30,000,000	$30,000,000	$170,791,934
MIS: SYSTEMS UPGRADES & REPLACEMENT: Purchase, installation, replace, and upgrade of RUCUS, PBX telephone system, incident management system, GIS, Revenue DB, worker's compensation, capital asset tracking, capital investment program, financial system upgrade, human resources system, LED Signage (Next Bus) expansion, SCADA System upgrades, Motive Power SCADA system, and GPS/GPM Upgrades.	$4,181,934	$19,059,266	$5,000,000	$5,000,000	$5,000,000	$55,145,794	$62,645,794	$151,850,854
SECURITY EQUIPMENT & SYSTEMS - Purchase and installation of a Tunnel Intrusion, yard intrusion, facility video cameras connectivity, portal employee access, security inspection system, security signage, security software, security video, video surveillance.	$1,878,789	$19,900,000	$0	$0	$0	$0	$0	$19,900,000
VARIOUS PROJECTS - SFMTA- Wide for all divisions' routine facility maintenance and equipment.	$0	$100,000,000	$100,000,000	$100,000,000	$100,000,000	$125,000,000	$125,000,000	$650,000,000
TOTAL EQUIPMENT RELATED PROJECTS	**$11,153,900**	**$187,656,297**	**$154,137,545**	**$154,137,545**	**$154,137,545**	**$235,745,794**	**$243,245,794**	**$1,129,060,520**

Table 37: Capital Cost of Facility Related Projects Requiring Significant Progress Prior to Fare Free System Implementation

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
FACILITY RELATED PROJECTS								
BURKE AVENUE FACILITY: REAL ESTATE: To acquire a 103,000 square-foot warehouse at 1570 Burke Avenue for use as SFMTA's new Central Warehouse and Overhead Lines Facility and replace the current facility located at 1401 Bryant which is required to be seismically strengthened by the City's unreinforced masonry building code; BURKE AVENUE FACILITY IMPROVEMENTS: Rehabilitation of the warehouse purchased at 1570 Burke Ave for use as the new Central Warehouse and overhead line facility.	$10,294,949	$17,936,051	$0	$0	$0	$0	$0	$17,936,051
GREEN FACILITY: Rehabilitation and renovating to the Green Facility, replace roll-up doors, LRV Washer, rehab roof, HVAC, maintenance, spray cabinet/oven, mezzanine remodel, ATCS Test & Repair shop improvements.	$344,000	$38,047,499	$0	$0	$0	$0	$0	$38,047,499
ISLAIS CREEK FACILITY: Development of a maintenance facility to replace the Kirkland motor coach maintenance facility. The replacement facility will accommodate 165 standard motor coaches.	$12,828,318	$77,073,860	$0	$0	$0	$0	$0	$77,073,860
FLYNN FACILITY: VENTILATION SYSTEM & ROOF: Replacement of the ventilation system at this facility to evacuate the exhaust fumes caused by the diesel vehicles. This project improves the health and safety of employees.	$7,725,253	$5,303,206	$0	$0	$0	$0	$0	$5,303,206
PRESIDIO FACILITY: Rehab and renovations to the Presidio Facility, includes purchase and install of fire alarm system, yard repaving, roofing, install TC Lifts, CCTV improvements, long-term deferred maintenance.	$2,414,959	$27,848,486	$0	$0	$0	$0	$0	$27,848,486

Table 37 (Cont)

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
SUBWAY STATION IMPROVEMENTS: FIRE ALARM & DETECTION: Replacement of the existing fire alarm and detection systems in the West Portal, Forest Hill, Castro, Church, and Van Ness) subway stations. SUBWAY RELAY ROOM SECURITY /ACCESS: Procure and install equipment.	$0	$7,985,038	$2,000,000	$2,000,000	$2,737,138	$2,737,138	$5,474,276	$22,933,590
MUNI METRO EAST - RESTORE SCOPE: To restore the scope of work to the project to ensure a fully functional maintenance facility.	$0	$50,000,000	$0	$0	$0	$0	$0	$50,000,000
FACILITY REHABILITATION, PRESERVATION, & IMPROVEMENTS Includes the rehabilitation, renovations, preservation, and improvements of existing operating, storage, maintenance, and administrative facilities to rectify problems of system deterioration.	$16,673,387	$35,005,233	$33,287,200	$33,387,200	$33,487,200	$49,300,000	$49,300,000	$233,766,833
POTRERO REHABILITATION: Rehabilitation and improvements to the paint and body facility. Prior project phases included rehab of the roof and parking deck structure to eliminate roof leakages.	$2,796,002	$6,436,997	$0	$0	$0	$0	$0	$6,436,997
CENTRAL OPERATION UPGRADES TO EXISTING FACILITY: Major focus of this project is the rehabilitation of this facility. Includes minor improvements, replacement and installation of small equipments items such as Voice Data Recorder for Central Control, Voice Data Recorder Motive Power, Replacement of computers, and Installation of Motive Power Maintenance Telephone System.	$0	$10,655,153	$0	$0	$0	$0	$0	$10,655,153

Table 37 (Cont)

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
KIRKLAND MOTOR COACH FACILITY REHAB: Major renovation of deteriorated office building, shop building, operator break room, and addresses environmental remediation.	$0	$10,000,000	$0	$0	$0	$0	$0	$10,000,000
BRYANT STREET FACILITY SEISMIC: Rehabilitation and seismic retrofit of the current warehouse located at 1401 Bryant Street.	$0	$18,000,000	$0	$0	$0	$0	$0	$18,000,000
WEST PORTAL FACILITY MAINTENANCE: Major renovations and improvements to correct facility deficiencies resulting from long-term deferred maintenance. Includes modernization of major maintenance/overhaul of equipment.	$0	$3,000,000	$0	$0	$0	$0	$0	$3,000,000
BUS RAPID TRANSIT (BRT) FACILITY: Develop maintenance facilities and yard at the Kirkland yard for the new Van Ness BRT and Geary BRT Lines.	$0	$20,000,000	$0	$0	$0	$0	$0	$20,000,000
WOODS FACILITY -FUEL, WASH & LIFTS: Replace underground fuel tanks and repave the bus parking yard. Includes the replacement of piping and electrical systems, and rehabilitation of the fueling islands and bus wash.	$20,279,130	$12,322,268	$0	$0	$0	$0	$0	$12,322,268
TOTAL FACILITY RELATED PROJECTS	$73,355,998	$339,613,790	$35,287,200	$35,387,200	$36,224,338	$52,037,138	$54,774,276	$553,323,942

Table 38: Capital Cost of Fleet Related Projects Requiring Significant Progress Prior to Fare Free System Implementation

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
FLEET RELATED PROJECTS								
MOTOR COACH FLEET: Replacement of Hybrids, diesel, Gilligs, articulated buses, mid-life rebuild, and reserve end of life rehab.	$222,204,810	$253,708,211	$504,421,640	$195,676,640	$198,516,640	$198,516,640	$198,516,640	$1,549,356,411
PARATRANSIT VEHICLES: Purchase and install vans, AVL system, and Debit Card system.	$5,976,195	$10,095,478	$4,982,139	$4,982,139	$4,982,139	$4,982,139	$4,982,139	$35,006,173
LIGHT RAIL FLEET : Purchase 128 Light Rail Vehicles, Replace 151 BREDA LRVs., BREDA Safety Modifications, and midlife overhaul program, and J, K, L, and M expansion.	$515,281,420	$113,257,524	$151,057,646	$102,975,646	$744,287,646	$744,287,646	$744,287,646	$2,600,153,754
TROLLEY COACH FLEET: Replacement of future trolley coaches, replace 33 ART/240 STD, trolley coach midlife rebuild, and rebuild 60 Articulated buses.	$224,612,962	$144,975,275	$56,172,000	$266,192,000	$98,566,000	$98,566,000	$98,566,000	$763,037,275
NON-REVENUE FLEET: Purchase and replace non-revenue vehicles such as specialized maintenance vehicles, light and heavy duty trucks and sedans that are used agency-wide.	$0	$37,144,260	$37,144,260	$37,144,260	$37,144,260	$50,000,000	$50,000,000	$248,577,040

Table 38 (Cont)

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
FLEET & VEHICLE EQUIPMENT REPLACEMENT: Replace existing bus door system and on-board video system; Install DVAS on motor coaches and trolleys, and install diesel powered buses with low emission traps clean air devices, and purchase and install safety rear wheel guard devices on motor and trolley coach fleet.	$8,134,577	$21,667,368	$541,630	$540,800	$584,930	$600,000	$750,000	$24,684,728
AUTOMATIC PASSENGER COUNTING SYSTEM: Procure and install on-board automatic passenger counting (APC) equipment on SFMTA's revenue fleet, exclusive of historic rail and cable cars. The APC system counts on- and off- passenger loading and logs the data to an on-board computer.	$1,013,976	$10,110,480	$0	$0	$0	$0	$0	$10,110,480
TOTAL FLEET RELATED PROJECTS	**$988.5 Million**	**$636.7 Million**	**$778.1 Million**	**$668.7 Million**	**$1,090.9 Million**	**$1,103.8 million**	**$1,103.9 Million**	**$5,382.2 Million**

Table 39: Capital Cost of Infrastructure Related Projects Requiring Significant Progress Prior to Fare Free System Implementation

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
INFRASTRUCTURE RELATED PROJECTS								
OVERHEAD REHAB 1998-3637: Phased design and replacement of the overhead wires and are related poles and traction power systems serving the light rail and trolley coach lines. The projects included in this program are designed to reduce operational problems.	$51,689,932	$101,837,886	$75,000,000	$86,057,072	$102,642,679	$102,642,679	$102,642,679	$570,822,994
RAIL REPLACEMENT 1998-2009: Phased design and replacement of the trackway and related systems serving the light rail and cable car lines as part of a regular replacement program and to mitigate excessive noise and/or vibration while improving system reliability.	$63,939,543	$175,355,414	$150,000,000	$177,106,682	$250,145,390	$250,145,390	$257,990,073	$1,260,742,949
METRO ACCESSIBLE PROJECTS & CURB RAMP REMEDIATION: Lift Replacements, metro accessibility, accessibility beyond key stops. Repair or reconstruct curb ramps that are on the path of travel to MUNI Key transit stops and stations which FTA assessments have identified as non-ADA compliant.	$20,291,600	$7,349,197	$2,155,236	$3,232,854	$2,155,236	$0	$0	$14,892,522
SUBWAY INFRASTRUCTURE PROJECTS: Improvements to Muni Metro stations restrooms (Van Ness, Church Street, Castro Street, Forest Hill and West Portal). Installation of Talking Signs, replace blue-light phone system, replace PA system, rehab restrooms and seismic study.	$0	$22,144,297	$0	$0	$5,000,000	$25,000,000	$25,000,000	$77,144,297

Table 39 (Cont)

Capital Projects Requiring Significant Progress Prior to Fare Free System Implementation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	2007-2037
TRAIN CONTROL SYSTEM: Replacement or improvements of the subway data transmission systems, subway signal cutover, Van Ness power supply for the wayside/central train control system; upgrades to Advanced Train Control system (ATCS), ATCS System management center.	$69,218,289	$26,765,000	$17,500,000	$9,159,967	$85,000,000	$27,000,000	$6,500,000	$171,924,967
RADIO REPLACEMENT PROGRAM: 1) Replacement of the existing obsolete Radio Voice/Data Communications and Computer Aided Dispatch (CAD) systems with a new state-of-the art radio communication system. The FCC requires SFMTA to migrate to a newer narrow-band radio system before 2013. 2) Includes the purchase and replacement of handheld mobile radios for the Safety and Security staff. 3) CABLE CAR RADIO: Procurement and installation of fixed on-board radios for 40 Cable Cars (including hardware and software for central control), 4 spare sets to replace the existing handheld radios currently used by Cable Car Operators.	$468,017	$82,777,753	$9,000,000	$9,000,000	$9,000,000	$9,000,000	$9,000,000	$127,777,753
ESCALATOR & ELEVATOR REHABILITATION: Rehabilitation or replacement of existing escalators and elevators in various stations to conform to current building codes and incorporate modern safety features.	$55,459	$40,054,541	$2,500,000	$2,500,000	$2,500,000	$3,000,000	$3,000,000	$53,554,541

Table 39 (Cont)

cts Requiring Significant r to Fare Free System ntation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	200
TIC VEHICLE LOCATION (AVL) : Continue the integration and on of the Global Positioning d AVL system with the or SFMTA's revenue fleet. CEMENTS - NEXT MUNI: ents to the AVL/GPS project xpanding deployment of wayside rmation signage and ival messages in the Metro	$11,401,984	$12,306,166	$5,000,000	$5,000,000	$5,000,000	$7,500,000	$7,500,000	$42,3
TION CONNECTIVITY CE YARDS NETWORK: of the utilization of unallocated existing fiber-optic cables to gh-speed connectivity with the way. Includes two large (60") itors in concourse areas. This ill enhance and facilitate on of safety, security, and rmation and control system ENANCE YARDS ation of high- reless networking access points at sing 80211.A standard.	$0	$2,728,160	$2,620,000	$2,620,000	$2,620,000	$2,620,000	$2,620,000	$15,8

Table 39 (Cont)

cts Requiring Significant r to Fare Free System ntation	Actual Expenditures as of 01/23/07	Capital Improvement Program Expenditure						30 Year CIP
		2007- 2012	2013-2017	2018-2022	2023-2027	2028-2032	2033-2037	200
EMBARCADERO & CIVIC CENTER CROSS PLATFORM: Project will create direct, open connections between BART and Muni Metro at Civic Center and Embarcadero Stations. Project includes faregates, structural modifications, security/surveillance systems, and new electrical infrastructure. Project will improve transfer convenience and immediacy, patron orientation and satisfaction. Project will also increase exit/egress capacity at two heavily used BART Stations.	$0	$1,800,000	$0	$0	$0	$0	$0	$1,800,000
BOARDING/PLATFORM ISLAND REPAIR: Include improvements for the repair and maintenance of the boarding/platform islands in the transit system. Includes the purchase of railings, equipment, and other materials.	$0	$4,560,635	$1,250,000	$1,250,000	$1,250,000	$1,500,000	$1,500,000	$11,310,635
ASTRUCTURE RELATED	$217,064,824	$483,411,530	$265,025,236	$295,926,574	$465,313,304	$428,408,069	$415,752,752	$2,35

4.6.4 Capital Cost of Procuring Additional Vehicles

All modes combined, the implementation of the fare free system would result in SFMTA procuring 89, 267, and 451 additional vehicles for the three ridership growth scenarios. Based on the unit cost by vehicle type data provided by SFMTA, the capital cost of procuring additional vehicles, including spares, was calculated and shown in table 40 below. The capital costs shown in the table do not include the cost of financing and assumes no annual rate of increase in cost per vehicle.

Table 40: Capital Cost of Procuring Additional Vehicles to Accommodate Additional Ridership

Vehicle Type	Unit Cost	Additional Vehicles (including spares) by Growth Scenario		
		17.5 % Increase	47.5 % Increase	77.5 % Increase
60" Articulated Hybrid Motorbus	$920,000	7	40	66
30" Hybrid Motorbus	$840,000	0	3	3
40" Hybrid Motorbus	$860,000	32	84	142
40" Electric Trolleybus	$800,000	1	27	59
60" Articulated Trolleybus	$1,200,000	1	3	13
Light Rail Vehicle	$4,000,000	37	90	138
Historic Street Car	$2,000,000	11	20	30
Vehicle Type		**17.5 % Increase**	**47.5 % Increase**	**77.5 % Increase**
60" Articulated Hybrid Motorbus		$6,440,000	$36,800,000	$60,720,000
30" Hybrid Motorbus		$0	$2,520,000	$2,520,000
40" Hybrid Motorbus		$27,520,000	$72,240,000	$122,120,000
40" Electric Trolleybus		$800,000	$21,600,000	$47,200,000
60" Articulated Trolleybus		$1,200,000	$3,600,000	$15,600,000
Light Rail Vehicle		$148,000,000	$360,000,000	$552,000,000
Historic Street Car		$22,000,000	$40,000,000	$60,000,000
Grand Total		**$205,960,000**	**$536,760,000**	**$860,160,000**

The capital cost to accommodate the additional riders range from $206 million for the low ridership, $537 million for the intermediate ridership growth scenario and $860 million for the high ridership growth scenario.

4.6.5 Expenditures for Multi-Agency Fare Collection process

As stated earlier, SFMTA is currently a partner agency in the development of a regional fare payment system known as TransLink®. Development of the TransLink ® program was initiated in 1999, with the Metropolitan Transportation Commission (MTC) entering into a contract with Motorola, Inc. to design, build, operate and maintain TransLink® a regional transit-fare payment system that allows transit riders to use a single high-tech "smart card" to pay fares on different public transit systems in the Bay Area.

In 2003, SFMTA, MTC, and five other Bay Area transit operators formed the TransLink® Consortium. The purpose of the Consortium is to provide joint agency decision-making for the ownership and operation of TransLink®. The charter members of the Consortium are SFMTA, MTC, Bay Area Rapid Transit District (BART), Alameda-Contra Costa Transit District (AC Transit), Golden Gate Bridge Highway & Transportation District (Golden Gate Transit), Santa Clara Valley Transportation Authority (VTA), and San Mateo County Transit District (Samtrans). In addition to the charter members, General Members that have joined the Consortium include the Peninsula Corridor Joint Powers Board (Caltrain), Tri Delta Transit, Livermore Amador Valley Transit Authority (LAVTA), City of Benicia, and City of Rio Vista. The Consortium is governed by the TransLink® Management Group, consisting of the general managers or executive directors of the SFMTA, BART, AC Transit, Golden Gate Transit, VTA, Samtrans, the MTC, and Tri Delta Transit, as representative of the General Members which are smaller agencies.

TransLink® is being implemented in two phases. Phase I is a six-operator demonstration and Phase II is a gradual roll-out throughout transit operators' route and station networks. TransLink® is currently in operation on AC Transit and Golden Gate Transit and Ferry. Based on an April 17, 2007 report to the SFMTA Board (Calendar Item No. 10.3), TransLink® will continue rolling out in sub-phases. By late 2007, SFMTA, BART, and Caltrain are anticipated to begin accepting TransLink®. SamTrans and Santa Clara VTA will start accepting TransLink® in 2008, and 19 additional Bay Area transit agencies are expected to allow payment with TransLink® by 2010.

To date, the MTC has been the primary agency involved in funding the development of TransLink®, with a combination of federal, state, and local funding totaling approximately $4.70 million. SFMTA has contributed to this effort and has begun installing TransLink® equipment at its stations. Over the FY 2008-2012 CIP period, additional expenditures totaling $1.70 million are proposed.

In April 2007, SFMTA accepted $450,000 in TransLink® funding from the MTC to provide resources to oversee the installation of TransLink® equipment on Muni vehicles. The funding will enable SFMTA to undertake its own independent equipment installation and operations oversight and quality assurance program for three installation and testing phases: vehicle installation oversight and acceptance testing, pre-launch inspection, and pre-launch intensive equipment monitoring and random testing.

Other TransLink® expenditures totaling $ 1.84 were approved by the MTC in April 2007. These expenditures include:

- Installation support: $112,000
- Design and engineering $1,348,000
- Advertising $300,000
- Marketing and communication $75,000

Implementation of the TransLink® system requires adding fare collection equipment in the SFMTA stations and stops and on all SFMTA vehicles, as well as overall changes in the fare collection and management system. If the agency were to transition to a fare free system, the status of its participation in the regional fare system would have to be resolved. As a Charter Member of the TransLink®) Consortium, SFMTA's participation is an important component of the success of the TransLink® system.

4.7 Cost Impact Analysis Conclusions

Table 41 summarizes the net financial impact of the implementation of the fare free system.

Table 41: Financial Impact of Converting SFMTA to a Fare Free System

All Costs in 2007 Dollars	Net Financial Impact by Ridership Growth Scenario		
	17.5 % Increase	47.5 % Increase	77.5 % Increase
Annual Operating & Maintenance Impacts			
O&M Cost of Additional Directly Operated Service[1]	$23,255,501	$68,761,785	$138,463,671
O&M Cost of Additional Paratransit Service	$1,043,588	$2,832,596	$4,621,604
Fare Revenue Loss[2]	$111,907,000	$111,907,000	$111,907,000
Total Annual Operating & Maintenance Impact	**$136,206,089**	**$183,501,378**	**$254,992,275**
Capital Costs			
Additional Vehicles[3]	$205,960,000	$536,760,000	$860,160,000
Fare Related Capital Projects Not Implemented[4]	-$255,163,755	-$255,163,755	-$255,163,755
Central Control Facility[5]	$75,000,000	$75,000,000	$75,000,000
Rail Maintenance Facility[5]	$50,000,000	$50,000,000	$50,000,000
Bus Maintenance Facility[6]	$49,000,000	$112,000,000	$156,000,000
Net Capital Cost	**$124,796,245**	**$518,596,245**	**$885,996,245**

1. Incremental Additional Annual O&M Costs includes expenses for increased level of service and station staffing.

2. Fare revenue for motorbus, trolleybus, light rail, and historic street cars based on unaudited actual FY 2007 fare revenue data provided by SFMTA.

3. Capital cost of motorbus, trolleybus, light rail vehicle, historic street cars based on unit cost estimates provided by SFMTA.

4. Capital Cost Estimates in 2007 dollars based on 30-year spending on fare related capital projects. Used total cost of project "Admin & Training Facilities" because sufficiently detailed capital cost data was not available for "Revenue Center Replacement".

5. Capital Cost of Central Control Facility based on estimate from SFMTA CIP. For Rail Maintenance Facility, assumed that Metro East facility to be restored to its original scope. Capital cost estimate from SFMTA CIP.

6. Capital Cost of Bus Maintenance Facility estimated based on number of buses to be accommodated in the maintenance facility, which includes current capacity constraints and additional buses required for each growth scenario. The capital cost was scaled based on Islais Creek Facility Cost - $90 million to accommodate 165 motorcoaches.

As shown in the table, the annual operating and maintenance impact of accommodating the additional riders ranges from $136 million for the low, to $184 million for the intermediate, to $255 million for the high ridership increase scenarios. The net change in capital cost to accommodate the additional riders ranges from $125 million for the low ridership increase scenario, to increases of $519 million and $886 million for the intermediate and high ridership increase scenarios respectively.

5. POLICY ISSUES ANALYSIS

The purpose of this section is to identify key policy issues associated with converting SFMTA's transit services to a fare free system. Four issue areas are described:

- Institutional issues
- Implementation issues
- Regional issues
- Funding issues

These policy issues emerge from the particular institutional and political context within which approval and implementation of a fare free system would occur. As the context is unique to SFMTA, there is limited ability to draw from the lessons learned from other areas discussed in the Section 3 review of other US fare free service experience.

5.1 Institutional Issues

Among the key institutional issues related to the elimination of fares are the following:

- Relationship to the City and County's Transit-First Policy
- Relationship to the City and County's Environmental Policies
- Process for proposed fare changes
- Approval process for the SFMTA annual budget
- Relationship to farebox recovery and local support requirements under the Transportation Development Act and AB 1107

As these issues demonstrate, it is critical that all policy bodies, including the Mayor, the Board of Supervisors, the SFMTA Board, and the MTC Board must affirmatively support fare free service to make the effort successful. Additionally, a vote of the public may be warranted given that a fare free system will require substituted local revenue streams, most likely from taxes, fees and fines.

5.1.1 Relationship to the Transit-First Policy

The institutional basis for converting SFMTA to a fare free system would be rooted in the City and County's Transit-First Policy (Section 16.102 of the San Francisco City Charter). Consistent with the ten principles of the Transit-First Policy, fare free service would be part of a larger effort to increase use of public transportation and to utilize the transportation system to "ensure the quality of life and economic health in San Francisco“ and “the safe and efficient movement of people and goods” (Principle 1). Fare free service could serve to make “public transit … an economically and environmentally sound alternative to transportation by individual automobiles” (Principle 2). By encouraging additional transit ridership, fare free service could assist in reducing traffic congestion (Principle 9), particularly if tied to the provision of transit priority improvements and improvements to facilitate safety and comfort of pedestrian and bicycle travel. These principles are both retained and expanded in the Preamble to the proposed Charter Amendment to be considered by the electorate in the City and County of San Francisco in November 2007.

To be fully consistent with the Transit-First Policy, the implementation of a fare free system would require that additional revenues be secured to replace the revenue that would otherwise have been derived from the farebox. By expanding the level of funding available, elimination of fares would be an “innovative solution to meet public transportation needs” as called for under Principle 10. With supplementary funding, fare free service would not “adversely affect the service provided by the Municipal Railway (SFMTA)” by diverting funds away from other system-wide operating and capital needs. Such needs are extensive, with a large backlog of capital projects, including fleet replacement and expansion, maintenance facility upgrade and expansion of capacity, system modernization and safety enhancement, as well as the introduction of new services to meet the growing demand.

5.1.2 Relationship to City’s Environmental Policies

By encouraging increased use of transit as an alternative to automobile travel, fare free service would support the City’s environmental objectives to make San Francisco the Greenest City. The City and County is committed to implement greenhouse gas and emissions reduction goals through a variety of policies and programs, including the Climate Action Plan, SFMTA’s Zero Emissions 2020 Plan, the Electricity Resource Plan, Green Building Task Force, and the Business Partnership for Climate Change. Through such programs, the City and County monitors greenhouse gas emissions in an effort to chart San Francisco's progress towards achieving a target reduction in emissions to 20 percent below 1990 levels by 2012, as called for in its Climate Action Plan.

- **Climate Action Plan:** San Francisco's Climate Action Plan was created by the Department of the Environment (SFE), the Public Utilities Commission (PUC), and the International Council for Local Environmental Initiatives. The Plan identifies benchmark greenhouse gas emissions, projects the impacts global warming might have on the region, and outlines specific actions in the key areas of transportation, solid waste management, energy efficiency, and renewable energy. The plan also presents steps to aid the City in reducing its emissions.

- **Zero Emissions 2020 Plan:** The Zero Emissions 2020 Plan commits the City to develop a clean air plan for public transit. In coordination with SFMTA, "Zero Emissions 2020" focuses on the purchase of cleaner transit buses including hybrid diesel-electric buses. This will be the first in California where a transit agency purchases the technology, while taking advantage of the California Air Resource Board (CARB) regulations.

- **Electricity Resource Plan:** The SFE and the PUC developed the Electricity Resource Plan after a series of public meetings to leverage existing policy to help shut down power plants in Bayview, Hunters Point and Potrero Hill. The plan makes recommendations on energy efficiency, and the production of clean electricity through renewable means including solar, wind, and the ocean tides and waves.

- **Green Building Task Force:** The goal of the Task Force is to establish mandatory environmental standards for private sector commercial and residential buildings, similar to those already in place for municipal buildings in San Francisco. The Task Force is comprised of ten members of San Francisco's building ownership, developer, financial, architectural, engineering, and construction communities, selected for their knowledge of the building industry and commitment to San Francisco’s long-term sustainability.

- **Business Partnership for Climate Change:** The United Nations Global Compact, the City of San Francisco, the Bay Area Council and a wide array of Bay Area businesses have joined together to provide meaningful actions that businesses can take to combat global warming. The program, called Business Council on Climate Change (BC3), provides a forum to share best practices to reduce greenhouse gasses in both large and small businesses. In addition, BC3 creates a model for climate action in the commercial and public sectors that the United Nations Global Compact will seek to place in companies and cities worldwide.

- **Urban Environmental Accords:** As part of June 5, 2005 United Nations World Environmental Day, the City of San Francisco joined with cities around the world in signing the Urban Environmental Accords which create a set of objectives for an urban future that would be "ecologically sustainable, economically dynamic, and socially equitable." The Urban Environmental Accords are based on existing best practices and apply to issues related to energy, waste reduction, urban nature, transportation, and water. On March 27, 2007, the City adopted Resolution 002-07-COE which prioritized the following three Urban Environmental Accords:

  - **Water Reduction** - **Action 5:** Adopt a citywide program that reduces the use of a disposable, toxic, or non-renewable product category by at least fifty per cent in seven years;
  - **Urban Design - Action 8:** Adopt urban planning principles and practices that advance higher density, mixed use, walkable, bikeable, and disabled-accessible neighborhoods which coordinate land use and transportation with open space systems for recreation and ecological restoration; and

– **Transportation - Action 15:** Implement a policy to reduce the percentage of commuter trips by single occupancy vehicles by ten per cent in seven years

5.1.3 Process for Proposed Fare Changes

The institutional process for converting SFMTA to a fare free system would require technical analysis, environmental review, support and approval by other agencies and departments, public hearings, approval by the SFMTA Board, and approval by two-thirds vote of the Board of Supervisors.

Under Section 8A.108 of the City Charter, "any proposed change in fares shall be submitted to the Board of Supervisors as part of the Agency's budget… and may be rejected at that time by a two-thirds' vote of the Board." While the criteria under which fare changes shall be proposed all relate to increasing fares, the authority provided to the Board of Supervisors is not limited to fare increases; rather, it applies to any proposed fare change. Under the proposed Charter Amendment to be considered by City and County voters on the November 2007 ballot, fare changes or route changes must be approved by the SFMTA Board. However, the Board of Supervisors can reject the entire Budget by a vote by 7 of the 11 members, thus decreasing the number of votes required, from 8 to 7.

5.1.4 Approval Process for the SFMTA Annual Budget

In addition to actions specific to fare changes, the operating and capital costs and revenues associated with conversion to a fare free system would be included in the annual budget of the SFMTA. On this basis, the provisions of Section 8A.106 related to the SFMTA Budget approval process would apply. These require the following:

Provision (a): By March 1, the SFMTA must submit its proposed budget for the following year to the Mayor and the Board of Supervisors for review and consideration. Prior to submittal, the proposed budget is subject to professional review, public hearing, and Citizen's Advisory Council recommendations. Additionally, the Controller has a key role in developing the SFMTA's annual operating budget. Under the terms of Proposition E, the Controller is responsible for determining, by formula, the base contribution ("Base Amount") to the SFMTA budget from the City General Fund and other specified revenue sources. The proposed budget must be balanced, without the need for additional funds over the "Base Amount" determined by the Controller. Fare increases and decreases, and changes in service can be included. The Mayor may make technical corrections and then submits the base budget to the Board of Supervisors. If the Agency requests additional funding support over the Base Amount, it submits a supplemental request, which must go through the same process outlined above.

Provision (b): With budget adoption, SFMTA must certify that the budget is adequate to allow it to make "substantial progress toward meeting its goals, objectives, and performance standards" called for under Section

8A.103. Included among these are standards related to vehicle pass-ups due to crowding (A-4) and peak period passenger load factors (A-5), both of which focus on the need for sufficient system capacity to accommodate the increased passenger loads associated with fare free service.

Provision (c): Action by the Board of Supervisors on the Agency's budget is yea or nay, without modification. "No later than August 1, the Board of Supervisors may either allow the Agency's base budget to take effect without any action on its part or it may reject but not modify the Agency's base budget by a two-thirds' vote. Any fare or service change proposed in the base budget shall be considered accepted unless rejected by a two-thirds' vote on the entire base budget." If the Board rejects the base budget, it can make interim appropriations to the Agency from the Municipal Transportation Fund to allow it to maintain operations until a base budget is adopted. As noted above, under the proposed Charter Amendment, the two-thirds vote requirement would be changed to a vote of 7 of the 11 members of the Board of Supervisors.

5.1.5 Relationship to Farebox Recovery and Local Support Requirements under the Transportation Development Act and AB 1107

To qualify for State and regional funding under the Transportation Development Act (TDA) and AB 1107, SFMTA is required to meet certain performance standards with respect to farebox recovery and local financial support. While SFMTA currently meets and exceeds these standards, the elimination of fare revenues would require the Agency to replace fares with local financial support in order to continue to meet the requirements of these programs.

- **Transportation Development Act (TDA):** SFMTA receives approximately $34 million annually in Transportation Development Act (TDA) funding. Under the TDA program, ¼ percent in State sales tax revenues are distributed by formula to the counties for public transit purposes, with SFMTA's funding allocated through the Metropolitan Transportation Commission (MTC). To qualify for funding, SFMTA must meet a "50 percent expenditure limitations test," whereby TDA funds cannot exceed 50 percent of the Agency's capital and operating funding. As TDA funds comprise less than 5 percent of SFMTA's total funding, the elimination of fares would not impact SFMTA's ability to continue to meet the 50 percent expenditure limitations test.

- **AB 1107:** AB 1107 (PUC Section 29142.5) established a permanent ½ percent sales tax for public transportation in the counties of San Francisco, Contra Costa, and Alameda. The funding generated through AB 1107 is allocated by the MTC, with 3/4ths allocated to BART and the remaining 1/4th allocated by MTC, with SFMTA, AC Transit, and BART as the eligible recipients. Historically, only SFMTA and AC Transit have received the last quarter. SFMTA's annual funding through AB 1107 is approximately $34 million. To qualify for funding, SFMTA must achieve a 33 percent farebox recovery, with both fares and local revenues counting toward this requirement. As local revenues currently comprise more than 50 percent of SFMTA's funding, the Agency exceeds this requirement. Even with the elimination of fares, SFMTA would continue to exceed this requirement.

5.2 Implementation Issues

SFMTA could learn from the experience of other areas in anticipating and preparing for policy issues that could be encountered during implementation of fare free service. Key lessons learned include the following:

- Advanced Planning to Prepare for Increased Ridership Levels
- Timeline to Acquire Vehicles and Hire Additional Staff, including Drivers
- Timeline for Expanding Existing System Capacity

5.2.1 Advanced Planning to Prepare for Increased Ridership Levels

Comprehensive and coordinated service planning and capital programming will be required to accommodate the increased ridership levels that will result from the introduction of fare free service. The anticipated ridership increase is supported by the experience of other systems and by the travel demand forecast conducted of a fare free system scenario, as prepared for SFMTA by the San Francisco County Transportation Authority. Based on the travel demand forecast, the increased ridership levels are projected to be within the mid-range ridership increase scenario considered in this study. Additional O&M costs will be incurred related to the additional levels of service; increased security staff and activities; increased facilities' maintenance staff and potentially increased levels of telephone support staff. Capital expenditure will increase due to the number of additional vehicles associated with levels of service increases.

Based on the experience of other systems, there will be a need for additional police presence due to potential increases in unruly passengers. In addition, there will be a need to re-examine the passenger code of conduct, develop strict policies regarding inappropriate activities, and initiate strong educational outreach activities. As one option for increasing police presence, consideration could be given to establishing a transit related police unit under the auspices of SFMTA. Re-examination of parking policies, road use and increases in the levels of enforcement will also be important to assure that conflicts between transit vehicles and automobile traffic are minimized.

In advance of moving forward with a fare free system program, SFMTA would be advised to develop strong policies in anticipation of potential negative impacts and implement an aggressive educational campaign prior to the transition. At a minimum the following guidelines should be followed:

- Clearly identify the objectives addressed by the fare free service policy
- Require affirmative support by all policy bodies and voters

- Recognize the importance of total organizational commitment to the policy
- Clearly communicate system objectives and policy to the community including the requirement to build up system capacity and pay for these enhancements several years before a Free Fare system is implemented (see below)
- Deal firmly with unruly riders (based on adopted policies), but use education to reduce problems
- Consider options to increase police presence including creation of a police unit under the auspices of SFMTA
- Be prepared for substantially more riders and requests for more service changes.

5.2.2 Timeline to Acquire Vehicles and Hire Additional Staff

Prior tasks conducted for this study have focused on the projected ridership increases and the associated need for additional vehicles, drivers, support staff, maintenance and storage capacity, and other capital and operating costs resulting from three levels of potential ridership increase. Of these, acquisition of additional bus and rail vehicles and hiring and training of staff are long-lead time items that must be in place at the start of fare free service. Depending on the growth scenario considered, the number of additional buses that could be required ranges from 41 for the low ridership increase scenario, to 157 for the mid-range ridership increase scenario, to 283 for the high ridership increase scenario. In addition to the buses, the number of additional streetcars and LRT vehicles that would be needed ranges from 48, to 110, to 168 for the low, intermediate, and high ridership increase scenarios respectively. Appendix A summarizes the timeline that would be required to develop specifications, secure bids, complete vehicle assembly, conduct testing and acceptance, and achieve full deployment. To accommodate this schedule, procurement policies and practices would have to be in place to provide SFMTA with the ability to move forward with the capital expansion on an expedited and flexible basis.

However, increasing the size of the fleet is only useful to the extent that trained drivers are available to operate the vehicles and adequate facilities are available. In terms of operators, the number of additional bus drivers that would have to be retained to operate the additional bus vehicles ranges from 31 for the low ridership increase scenario, to 170 for the intermediate range ridership increase scenario, to 316 for the high ridership increase scenario. The number of additional rail operators needed ranges from 28, to 64, to 104 for the low, intermediate, and high ridership increase scenarios, respectively. If passed, the increased authority provided by the proposed Charter Amendment may assist the SFMTA to: “manage its employees; 2) establish efficient and economical work rules and work practices that maximize the Agency’s responsiveness to public needs; and 3) protect the Agency’s right to select, train, promote, demote, discipline, layoff and terminate employees, managers, and supervisors based upon the highest standards of customer service, efficiency, and competency. It would also allow the Agency to establish more competitive wage rates for transit operators. However, all of this is only possible to the extent adequate funds are available.

5.2.3 Timeline for Expanding System Capacity

Based on the findings from the previous sections, the existing SFMTA maintenance, vehicle storage, and other support facilities lack sufficient capacity to accommodate the existing vehicle fleet. With the increased bus, streetcar, and LRT vehicle fleets that would be needed under a fare free system, the constraints on existing system capacity would intensify. To provide for the expansion of system capacity, SFMTA would need to develop and implement a strategy to advance the priority of these projects within the Capital Improvement Program of the Short Range Transit Plan, and actively pursue the funding needed for their implementation.

In addition, capacity of the subway system would require expansion. The subway is designed to accommodate 60 trips per hour, (one train every 60 seconds). Under the low and intermediate ridership growth scenarios, the number of trips in the AM and PM peak hour would be less than or equal to the design capacity for the Van Ness / Embarcadero Portal. Under the high ridership growth scenario, the number of trips in the AM and PM peak hour would exceed the design capacity. As a result, under the high ridership growth scenario and with the current subway configuration, passengers would experience significant delays in the AM and PM peak hours due to the “bunching” of trains entering the subway. In anticipation of such issues, detailed operational analysis would be required to maximize the efficiency of the existing system and to identify cost-effective approaches to increasing capacity. Other approaches that could serve to increase the effective capacity of the subway system include the provision of turnaround tracks or locations, use of 3-car trains where possible, Automatic Vehicle Location (AVL), Advanced Train Control Systems (ATCS), radio replacement, and upgrade of central control facilities.

5.3 Regional Issues

As one of the over 20 transit operators providing service to or within San Francisco, the conversion of SFMTA to a fare free system would have potential effects that would extend beyond the Agency. Among these effects are the following:

- Changes in regional transit mode share
- Changes in fare revenue (fare recovery) of other operators
- Relationship to regional fare policy and participation in TransLink®.

5.3.1 Changes in Regional Transit Mode Share

Based on the results of the travel demand forecast conducted by the San Francisco County Transportation Authority of a fare free service scenario, the elimination of fares on the SFMTA system would have three effects: 1) increase ridership on the SFMTA system; 2) reduce ridership on BART and Caltrain; and 3) increase total regional transit mode split within San Francisco. While these are not negative impacts if the SFMTA system was able to handle the increases, they indicate the need to address the system capacity issues discussed above.

Based on the travel forecast results from the SFCTA model, ridership on the SFMTA system was projected to increase 31 percent with the elimination of fares. At the same time, ridership on BART and Caltrain were projected to decrease by 22 percent and 9 percent respectively. The increase in SFMTA ridership was projected to be even greater during the mid-day, with SFMTA ridership increasing 40 percent and BART ridership decreasing 21 percent.

In the aggregate, the travel model results indicated that the percent of trips made by transit within San Francisco would increase 30 percent, from 14 percent in the base case (with SFMTA fares) to 19.5 percent with SFMTA fares removed. About 2/3rds of the new transit trips were projected to be auto trips in the base case, while the remaining third previously traveled by walk or bike.

The results of the ridership forecasts are also of interest when contrasted with the experience over the 2006 Spare the Air/Free Transit Campaign. Spare the Air is an episodic air quality program under which transit fares are eliminated region-wide on days when air quality is forecasted to be unhealthy for the Bay Area. Based on the analysis conducted over the six Spare the Air days in 2006, region-wide transit ridership increased by approximately 15 percent. When all services were fare-less, SFMTA experienced the highest absolute ridership gain, followed by AC Transit (28 percent) and BART (up 8 percent).

5.3.2 Changes in Fare Revenue (Farebox Recovery) of Other Transit Operators

Based on the results of the free SFMTA travel forecast conducted by the TA, the reduction in ridership projected on BART and Caltrain would be accompanied by a reduction in farebox revenues – and thereby, farebox recovery - on BART and Caltrain.

The reduction in fare revenues projected to be experienced by the other operators would require these systems to find other sources of revenue to replace the reduced fares. At the same time as the other operators would be pursuing additional revenue, SFMTA would also be seeking additional revenue to replace its fare revenues and to fund its increased capital costs. Therefore, a fare free system for the SFMTA could result in negative financial impacts on other transit operators.

5.3.3 Relationship to Regional Fare Policy and Participation in TransLink®

Over the past decade, the transit agencies in the Bay Area have been working to establish an integrated, multi-agency electronic fare collection system known as TransLink® SFMTA is a lead agency in this effort and contributes the largest share of funding to the creation and implementation of the program. If SFMTA converted to a fare free system, its action could adversely impact the movement toward an integrated SMART-card based electronic fare collection system in the Bay Area. Conversely, SFMTA could choose to continue participation and use the TransLink® card solely as a means to count riders.

5.4 Funding Issues

The conversion of SFMTA to a fare free system would raise a number of funding policy issues. Among these issues are the following:

- Determining the net financial impact of converting SFMTA to a fare free system
- Potential trade-off between service quality and expansion versus subsidizing of operations for fare free service
- Requirement that funding be available for several years before the fare free system is implemented to have adequate time to build up the system capacity
- Relationship to issues of importance to transit users

5.4.1 Net Financial Impact of Converting SFMTA to a Fare Free System

A key issue in this study is identifying and quantifying the various changes in capital and operating costs and revenues associated with converting SFMTA to a fare free system. Among these changes are capital cost savings, additional capital costs required, reduction in fare related operating costs, incremental operating costs for additional service, and elimination of fare revenues. The results of this study identify the range of additional costs the SFMTA would likely encounter and estimate the level of revenue that would be lost from fares. This gap provides a realistic estimate of the level of supplemental funding that would be needed before the implementation of a fare free system and provides a starting point for discussion of potential sources that could fill this gap.

As shown previously in Table 41, the incremental annual O&M cost of accommodating the additional riders ranges from $24 million for the low, to $72 million for the intermediate, to $143 million for the high ridership increase scenarios. Based on the FY 2007 estimate of fare revenue, the elimination of fares would reduce SFMTA's operating revenues by $111.9 million, in addition to the changes in annual O&M cost and in capital cost. As the O&M cost and fare revenue eliminated would occur annually, the on-going annual net cost of fare free service would be $136.2 million, $183.5 million, and $255.0 million for the three scenarios respectively. The net change in capital cost to accommodate the additional riders ranges from $125 million for the low ridership increase scenario, to increases of $519 million and $886 million for the intermediate and high ridership increase scenarios respectively.

It should be noted that these funding requirements are in addition to any structural deficit that currently exists due to insufficient resources to meet the demands for operating and maintaining SFMTA's existing services.

Additionally, based on the lessons learned from other systems, only six systems in the United States in the last 20 years have implemented and continue to operate a system-wide fare free service: Chapel Hill, North Carolina (2002), Clemson, South Carolina (1996), Logan, Utah (1992), Island County, Washington (1987), Commerce, California (1962), and Vail, Colorado and only one of these, the joint city-University transit operation in Chapel Hill, transitioned from a fare based system to a fare free system. A common characteristic of these systems is that they are located within cities with under 100,000 in population. In most cases, the collection of fares would generate little if any useable revenue for the system due to the day to day operating and maintenance (O&M) costs associated with the fare collection, accounting, and enforcement. This prior experience does not necessarily imply that transition to a fare free system for larger transit systems, such as the SFMTA, is not possible. However, it does serve to emphasize the need to identify the costs for avoided capital and operating costs, potential increases in the day to day O&M costs, long term capital replacement costs, and the loss of fare revenue as a key funding source. The relevant policy makers can include the information on costs in their consideration of the potential conversion of the existing system to fare free service.

In the absence of sufficient funding to accommodate all aspects of transit service, conversion to a fare free system could present SFMTA with a series of trade-offs. SFMTA has a long backlog of high priority capital needs in its Short Range Transit Plan and Capital Improvement Program that have been without sufficient funding to implement. These include upgrading and expanding maintenance facilities and vehicle storage, replacing outmoded communications systems, vehicle replacement and expansion, and other proposed projects. The conversion to fare free service would likely widen the funding gap and create a potential trade-off between upgrading and expanding existing maintenance and other support facilities versus subsidizing transit operations.

In addition to the cost of upgrading and expanding the existing system are the costs associated with system upgrade and expansion, as well as the costs of improvements needed to improve service quality. The conversion to fare free service would likely widen the funding gap and broaden the range of potential trade-offs to include system expansion and service quality; capital maintenance, vehicle replacement, and system preservation and upgrade; and subsidizing transit operations.

5.4.2 Requirement that Funding be Available for Several Years Before the Fare Free System

To prepare for the increase and change in service levels associated with the implementation of a fare free system, additional funding would need to be in place a minimum of five years to adequately fund the capital and operating improvements required to increase capacity. This study did not identify or evaluate potential supplemental revenue streams as this is a primary objective of the Mayor's Blue Ribbon Revenue Panel. The Revenue Panel is exploring a wide range of potential supplemental revenue sources to address the agency's existing structural deficit. Such revenues could also be used to support implementation of fare free service. It is likely that new revenue sources would require voter approval and may also require legislative action.

5.4.3 Relationship to Issues of Concern to Transit Users

As part of the Transit Effectiveness Project, attitude-based market research was conducted to determine the relative importance of key attributes of transit service to San Francisco area residents. In order of importance, respondents ranked transit service reliability and time savings as the top two attributes of importance, followed by comfort, flexibility, cost, and safety. Of the seven market segments into which survey respondents were grouped, only one market segment was most sensitive to cost. This market segment was comprised of women over 65, not working, and persons for whom English was not a native language. For all other market segments, cost was of lesser importance.

The findings of the attitude-based market research are consistent with the relative importance of service attributes within the SFCTA travel forecasting model. The travel model includes transit fare as one component of the transit experience, along with walk access time, wait times, travel times, and transfers, and establishes relative utilities of particular travel mode and route choices based on the combination of such attributes. The other service attributes of importance to users related to service reliability, comfort, flexibility, and safety are not included in the model.

The research conducted with regard to lessons learned further supports the finding that other attributes of transit service are of greater importance than is transit cost. Based on a survey conducted during Austin, Texas' experiment with fare free service, it was determined that of nine factors affecting a person's decision to rider the bus, fare charged was ranked eighth. More important to potential and existing passengers are safety, on-time performance, cleanliness and frequency of service.

With respect to the role of free or reduced fares as a tool to increase ridership, findings from the 1998 National Personal Transportation Study (NTPS) indicated fares to be of relatively lower importance. As noted in "Public Transit in America: Findings from the 1995 Nationwide Personal Transportation Survey," by S. Polzin, J. Rey, and X. Chu (National Urban Transit Institute, University of South Florida, Report #NUT 14-USF-4, September 1998), concerns noted in order of significance were ""crime on public transit, time spent on public transit, having access to a car when they need it, difficulty with crowding or getting a seat, cost of travel by public transit, time of day availability when they need to use it, transit stations and vehicles not being clean, and time and aggravation with transfers."

Finally, in looking at what factors transit systems can control and how they affect ridership, a 2003 study by Brian Taylor of UCLA entitled "Reconsidering the Effects of Fare Reductions on Transit Ridership" determined that improvements in service supply – frequency, coverage, reliability - as well as on-time performance were more important than price (fares) in determining ridership. The Taylor study found that comparative measures of service and price elasticities show that responses to service changes are substantially more elastic than changes to fares. However, when fare programs are targeted to specific populations with relatively high price-elasticities of demand, such as students and the transit dependent, they have been very effective in attracting ridership.

The findings indicate that fares on the system can be increased as long as reliability and service is improved and the option of increasing fares to address the structural deficit and build up the system capacity and service should be considered while planning for a fare free system thereafter.

5.5 Policy Issues Analysis Conclusions

The following key conclusions can be drawn from the discussions in the previous sections:

- **Institutional issues:** While there would be challenges along the way, there are no institutional issues that would prevent the implementation of a fare free service policy. As shown in the examination of institutional issues, it would be critical for local and regional policy bodies to affirmatively support fare free service to make the effort successful. Additionally, a vote of the public may be warranted given that a fare free system will require new sources of local revenue, most likely from taxes, fees and fines paid by residents, businesses and/or visitors.
- **TransLink®:** Prior to implementing a fare free system, consideration should be given to the potential impact on other transit operators in the region and on the TransLink® regional fare program. First, while the SFCTA travel demand model projects a significant increase in transit ridership regionally and on the SFMTA system, the region's other systems could potentially experience a decrease in transit riders and fare revenues. The reduction in fare revenues would result in negative financial impacts to the other transit operators. This would require these systems to find other sources of revenue to replace the reduced fares. At the same time as the other operators would be pursuing additional revenue, SFMTA would also be seeking additional revenue to replace its fare revenues and to fund its increased capital costs. Second, as a lead agency in the TransLink® regional fare program, SFMTA contributes the largest share of funding to the creation and implementation of the program. If SFMTA converted to a fare free system, its action could

adversely impact the movement toward the integrated SMART-card based electronic fare collection system in the Bay Area. Conversely, SFMTA could choose to continue participation and use the TransLink® card solely as a means to count riders.

- **Fleet requirements:** If the decision were made to implement a fare free system, a major challenge would be SFMTA's ability to acquire vehicles, expand vehicle storage and maintenance facilities, and increase staffing levels in a timely manner. Based on the results of the study the capital costs for additional buses and light rail vehicles, and their associated maintenance facilities/storage yards, would range from $261 million to $1 billion. Further, it would take between 5 to 10 years to acquire the additional vehicles and to provide expanded maintenance capacity.
- **Funding:** Finally, a fare free system could present SFMTA with a series of trade-offs in the absence of sufficient funding to accommodate all aspects of transit service. The conversion to fare free service would likely widen the SFMTA existing funding gap and create a potential trade-off between upgrading and expanding existing maintenance and other support facilities, implementing major service expansion projects (such as the Central Subway) versus subsidizing fare free service.

6. RISK ISSUES ANALYSIS

Table 42 summarizes the key risk issues identified in this study. As shown on the table, the primary risk categories relate to:

- Ridership levels greater or less than anticipated in total and in certain routes and the geographic distribution of ridership different than anticipated
- Passenger Incidents
- Political
- Funding
- Storage and Subway Capacity
- Procurement
- Public Support
- Roadway Capacity

Potential mitigation measures are provided for issues identified in each category.

Table 42: Risks Issues Matrix

<table>
<tr><th>Risk</th><th>Description</th><th>Potential Mitigation</th></tr>
<tr><td>Ridership levels greater than anticipated in total and in certain routes and the geographic distribution of ridership different than anticipated.</td><td>• Higher than anticipated ridership levels could lead to an:
▪ Increase in rider complaints regarding overcrowding and service issues
▪ Increase in on-board incidents
▪ Acquisition of too many or too few types of vehicles (rail vs. bus or hybrid vs. electric trolley)
▪ Acquisition of the wrong number of vehicle types
▪ A reduction in on-time performance due to longer dwell times at stations
▪ Schedules not matching ridership needs
• The higher ridership levels may also result in an increase in costs related to providing additional service, increasing maintenance activities (within constrained facilities or new facilities), hiring more operators and acquiring more vehicles.
• Inability to quickly hire additional staff would result in increased unscheduled overtime and potentially missed runs if operators were not available
• Conflict between existing labor work rules and the need for variable scheduling to meet the demand levels</td><td rowspan="2">• The existing SFCTA travel demand model is not designed or calibrated to provide a detailed (route by route or line by line) impact analysis of the SFMTA transitioning to a system-wide fare free service policy. Additional analysis would be needed to be better prepared for the staffing, level of service, and capital needs resulting from the changes in aggregate ridership and the distribution of this ridership.
• If ridership levels resulting from a fare free system exceed estimates, potential mitigation measures might include:
• Contracting out service
• Reducing or eliminating service on unproductive routes and reallocating resources where demand warrants additional service
• Leasing maintenance facilities from other operators</td></tr>
<tr><td>Ridership levels are lower than anticipated in total and in certain routes and the geographic distribution of ridership in areas different than anticipated.</td><td>• Lower than anticipated ridership levels could lead to:
▪ Unproductive routes and/or line due to excess amounts of service provided for ridership levels that did not materialize
▪ Acquisition of more vehicles than required
▪ Over-hiring of operators and safety personnel</td></tr>
</table>

Table 42 (Continued)

Risk	Description	Potential Mitigation
Passenger Incidents	• Based on experiences of other major transit systems that experimented with fare free service, the number of passenger incidents due to disruptive passenger would likely increase. In the other cities, these incidents led to a loss of existing, core riders and a decrease in job satisfaction for operators.	• Increase police force which could include contracting out for security services or creating a SFMTA security force. • Review and possibly revise passenger code of conduct and adopt a strong board policy to ensure operators and security staff have the legal authority to removal disruptive passengers from transit vehicles. • Create a transit-specific monitoring unit to patrol vehicles and call in incidents to security force.
Political	• Political risks could include: ▪ Currently planned capital projects would be delayed ▪ Capital funds would be diverted to projects needed for the implementation of a fare free system (which may conflict with the organization's capital improvement plan priority) ▪ Other regional transit operators could experience a decrease in ridership and fare revenue due to the shift of passengers to the free SFMTA services. This could result in increased competition for limited regional transit funds ▪ If fare free service is implemented and a decision is subsequently made to re-introduce fares, it will take time and additional funding to re-implement the fare collection equipment and staff ▪ Complete buy-in by policy makers for the implementation of a fare free system does not exist	• If the decision in made to implement a fare free system, leaders must know that this is a long term policy decision, not a short term decision. • Ensure that all relevant local, regional and other political bodies affirm their commitment through legislation. Additionally, as part of this commitment, the legislation should include a base number of years the fare free system should be implemented to evaluate its success.
Financial	• Without a new revenue source, funds that could flexibly be used for either operating or capital would likely be used to pay for increased operating costs instead of capital projects. • Without additional funding, implementation of a fare free system would likely further delay capital projects needed to address SFMTA's existing infrastructure needs as well as system expansion projects, including projects pursuing FTA New Starts funds.	• Identify and implement a new, sustainable transit revenue source or sources which could be paid by a wide variety of stakeholders (residents, visitors, businesses) • Provide SFMTA with more autonomy over revenue generation ideas (remove approval from multiple policy bodies) • Allow SFMTA to develop its own assets to support a fare free system without multiple policy body review.

Table 42 (Continued)

<table>
<tr><th>Risk</th><th>Description</th><th>Potential Mitigation</th></tr>
<tr><td>Storage and Subway Capacity</td><td>Additional storage and maintenance space would need to be in place prior to the implementation of a fare free system. SFMTA currently has no excess vehicle storage capacity at its bus and rail yards. The bus fleet is 62 vehicles above the total bus yard capacity and the rail fleet is currently 58 vehicles above the total rail yard capacity. The implementation of a fare free system would result in the need for storage space for additional buses (between 41 and 283) and rail vehicles (48 to 168) depending on the ridership growth scenario.
Additionally, the subway is designed to accommodate 60 trips per hour or one train every 60 seconds. Under ridership growth scenario 2, ridership demand would require 60 trips per hour while ridership growth scenario 3 would 71 trips per hour, exceeding the design capacity.</td><td>With respect to bus and rail capacity:
Complete the Islais Creek Bus Facility identified in the CIP (storage capacity 165 buses)
Expand existing or build new bus and rail yards/maintenance facilities
Contract out maintenance services
For the subway capacity issue:
Develop capability to run three-car trains on busy lines to reduce trip count
Improve signal system to allow two trains to serve downtown platforms simultaneously
Replace existing fleet with higher capacity cars
Expand terminal to provide space for trains to turn around</td></tr>
<tr><td>Procurement</td><td>Procurement risks relate to the acquisition of vehicle and increasing capacity (storage and subway). These risks include:
Funding availability
Level of accuracy on the number and type of additional vehicles to acquire
Limited budget authority from the Board of Supervisors
Length of time to acquire vehicles and implement major capital improvement projects</td><td>Identify and implement a new transit revenue source
More detailed planning and travel demand model runs to better project where ridership occur (trolley coach lines, motorcoach lines, or rail lines) and by how much
Proposed charter amendment provides for greater SFMTA control over procurements.
Expanded procurement staff to facilitate acquisition of vehicles and other capital needs</td></tr>
</table>

Table 42 (Continued)

Risk	Description	Potential Mitigation
Public Support	• Based on the results of the TEP's traveler choice and attitude survey, the most important factors to improve service for existing transit passengers are reliability, frequency, and comfort. Of the six factors considered, cost ranked fifth. If a fare free system is implemented, there is the potential for backlash from existing core passengers and reduction in transit use from passengers that would pay a fare to ensure that service reliability, frequency and comfort are maintained or improved. This backlash may also impact public support for a new transit revenue source if existing riders feel that the new source is primarily a subsidy for those that are currently unable or unwilling to pay fares.	• Make sure the public is actively informed about the decision making process to implement fare free service and to implement a new revenue source • Consider a voter initiative to determine support for a fare free system
Roadway Capacity	• There may be a need to reduce on-street parking to provide additional right-of-way for buses due to high frequencies needed along some corridors to accommodate high ridership levels. The additional right-of-way would allow for more reliable service and faster travel times by reducing the number of potential conflicts with cars parking/leaving parking spaces.	• A compromise between transit and on-street parking needs downtown will need to be reached. A balanced approach would need to be developed that allows increased levels of transit to operate in an efficient and safe environment but still allow for on-street parking or some other parking alternative. One potential approach may be the implementation of transit only corridors during peak periods.

7. CONCLUSIONS

Based on the analysis in previous sections, there are a variety of technical and policy issues SFMTA would have to address if the decision is made to implement a fare free system. This section provides a summary of the key findings and conclusions of this study.

7.1 Lessons Learned from Other US Fare Free Systems:

- Over the last 30 years no transit system with a population over 100,000 residents has implemented a system-wide fare free service policy

- Small cities where net farebox revenue (farebox revenue minus the cost to collect, administer, and enforce) is not a significant funding source for the system have successfully implemented fare free service and in most cases have a dedicated transit funding source

- Of the small city systems, most began operation as a fare free system and only one, Chapel Hill, transitioned to a fare free system

- The three large systems (Trenton, Denver, and Austin) that had year-long experiments with fare free service achieved their objectives of increasing ridership

- The three large systems also identified a need for additional security associated with fare free service due to the significant increases in on-bus incidents. Additionally, although fare free service may eliminate driver-passenger confrontations related to fares, as shown by the Trenton and Austin experiments, based on the increased number of on-board incidents, drivers requested the fare free service programs be eliminated

- Smaller cities have experienced significantly lower levels of on-bus incidents due in part to developing strict policies regarding inappropriate activities and strong educational outreach activities.

- Based on the other system's experiences, introduction of fare free service resulted in increased ridership levels on the order of 50 percent. Additional operating and maintenance (O&M) costs were required related to provide additional levels of service when existing capacity is surpassed; increased security staff and activities; increased facilities maintenance staff and potentially increased levels of telephone support staff. Additionally; capital expenditure increased due to the number of additional buses associated with levels of service increases.

- From the research of systems with fare free service, the boarding process was facilitated with the ability to board using multiple doors due to the elimination of fares. However, the research also identified the potential for on-time performance to decrease due to overcrowding on buses which would delay a passenger's ability to get on and off the bus. Additionally, on-time performance could be impacted due to more consistent regular activity at a higher number of bus stops than under a fare based system.

- Based on a survey conducted during the Austin experiment, it was determined that of nine factors affecting a person's decision to ride the bus, fare charged was ranked eighth. More important to potential and existing passengers was safety, on-time performance, cleanliness and frequency of service.

- Based on the experience in Portland, if a specific zone is designated as fare free, an agency must weigh the benefits its policy decisions (improved mobility; reduced need for downtown parking; improved air quality) against the likely loss of fare revenue due to passengers evading fares for trips that end outside the fare free zone.

7.2 Ridership Impacts

- Three ridership growth scenarios were used to analyze the potential range of impacts associated with implementation of a fare free system: Scenario 1: 17.5 percent increase; Scenario 2: 47.5 percent increase; and Scenario 3: 77.5 percent increase.

- SFCTA conducted a travel demand model run with all SFMTA bus and rails line operating without a fare. The results of this analysis indicated that ridership on SFMTA bus and rail lines would increase on the order of 30 to 40 percent. For the purposes of this study, the results indicated that at this preliminary level of analysis, Scenario 2 (47.5 percent ridership increase) is the most realistic growth scenario.

  It is important to emphasize that the travel demand model was originally developed from household surveys and travel surveys that reflected the transit fares current in the years 2000-2005. While the model was used to test the absence of transit fares on SFMTA bus and rail lines, it is important to note that this is an extreme case, and more importantly is a case which the original data and the travel demand model does not currently reflect or anticipate. As a result, the 30 to 40 percent ridership should be considered a preliminary range of increased ridership since there is no guarantee that the model as currently configured will reflect people's true travel choice behavior in a radically new circumstance where fares have been eliminated.

- As a starting point for identifying the O&M and capital cost impacts of fare free service, a detailed analysis was conducted of the capacity of the existing bus and rail system to accommodate the 47.5 percent increase projected in ridership. Data from the Transit Effectiveness Project (TEP) was used to conduct an analysis of existing passenger capacity by hour for each SFMTA bus and rail line. The existing hourly passenger loads for each line were then assumed to increase by the 47.5 percent. The revised passenger loads were then compared to existing hourly capacity to determine if they exceeded SFMTA's 85 percent load capacity standard. (The 85 percent load capacity standard represents all seats occupied plus a number of standees based on the size of the transit vehicle.) If the 85 percent load standard was exceeded, the number of additional trips needed to reduce passenger loads below the 85 percent standard was calculated.

Table 43 summarizes the results of the hourly capacity analysis. Based on the number of additional trips needed to achieve the 85 percent load standard, the increased levels of hours and miles of service associated with the additional trips was calculated, and the peak vehicles and operators needed to provide the increased service levels. These results were the primary inputs to identifying the O&M and capital cost impacts.

Table 43: Fare Free Service Bus and Light Rail Ridership Impacts

	Increase Compared to Existing Service Levels				
	Total Trips	**Total Revenue Hours**	**Total Revenue Miles**	**Total Peak Vehicles**	**Total Operators**
BUS					
Scenario 1	177	257	2,222	34	31
% Increase	*1.9%*	*3.5%*	*3.8%*	*3.5%*	*1.6%*
Scenario 2	580	832	6,971	130	170
% Increase	*6.3%*	*11.4%*	*12.0%*	*13.4%*	*8.8%*
Scenario 3	1,336	1,988	16,540	236	250
% Increase	*14.5%*	*27.3%*	*28.6%*	*24.4%*	*13.0%*
RAIL					
Scenario 1	56	86	1,189	40	23
% Increase	*3.5%*	*6.8%*	*10.7%*	*35.7%*	*8.8%*
Scenario 2	154	235	3,119	92	53
% Increase	*9.6%*	*18.6%*	*28.1%*	*82.1%*	*20.3%*
Scenario 3	289	437	5,703	140	87
% Increase	*18.1%*	*34.6%*	*51.3%*	*125.0%*	*33.3%*

- The ridership impact analysis also evaluated SFMTA existing bus and rail maintenance and storage facility capacity. Based on the existing bus and rail fleet size, SFMTA current has more buses and light rail cars than existing facilities are design to handle. Due to the increased vehicle needs associated with increased ridership levels associated with a fare free system, SFMTA would need to construct new bus and rail maintenance facilities prior to eliminating fares.

- Subway capacity was another issues associated with increased rail ridership levels. The subway is designed to accommodate 60 trips per hour (one train every 60 seconds). In the peak periods, under ridership growth scenario 2, 60 trips per hour would be needed to address the increased passenger levels and under growth scenario 3, 71 trips per hour would be needed. As a result, under scenario 3, and likely under scenario 2, with the current subway configuration, passengers would experience significant delays in the AM and PM peak hours due to the lack of capacity and the “bunching” of trains entering the subway.

- Consideration was also given to the impact of fare free service on paratransit service. For the paratransit analysis, the number of existing passenger trips was assumed to increase by the three growth scenarios. This unit cost per trip was then used to estimate the cost impact.

7.3 O&M and Capital Cost Impacts

- **Fare revenue:** The FY 2007 SFMTA budget estimated the agency would receive approximately $111.9 million in fare revenue.

- **Operating and maintenance costs:** The O&M cost model developed for the TEP and the Central Subway New Starts application required for Federal funding was used for this study. The model was adapted to reflect cost components that would be eliminated, reduced or increased with the implementation of a fare free system:

  - Costs eliminated: revenue collection, farebox and ticket vending machine maintenance, fare policy research and proof of payment

  - Costs increased: LRT corrective maintenance, staffing at manned stations, and customer service.

  Based on the: 1) results of the bus and rail ridership impact analysis inputs to the refined O&M cost model; 2) cost of the increased paratransit trips based on the 2005-2006 cost per trip; 3) additional cost of station staffing; annual O&M costs in 2007 dollars would increase by the following levels compared to the existing system:

  - $24.3 million for Growth Scenario 1

  - $71.6 million for Growth Scenario 2

  - $143.1 million for Growth scenario 3

- **Vehicles required:** Based on the bus and rail ridership impact analysis, the number of additional vehicles (peak vehicles plus 20 percent spare ratio) for each ridership growth scenario. The following provides the capital cost impacts for the three scenarios based on the existing unit costs for hybrid buses, electric trolley coaches, light rail cars and historic streetcars:

  - Growth Scenario 1: 41 buses, 48 rail cars - $206 million

  - Growth Scenario 2: 157 buses, 110 rail cars - $537 million

  - Growth Scenario 3: 283 buses, 168 rail cars - $860 million

- **Capital projects avoided:** Based on a review of SFMTA's CIP, fare-collection related capital projects that would be eliminated with the implementation of fare free system would result in a savings of approximately $255 million over the 2007-2037 period. The projects that would be eliminated include:

  - Kiosks for media and advertising sales

  - Administrative and training facilities improvements related to fare collection

    - Fareboxes replacement program
    - Muni Metro Subway fare collection system replacement
    - Third Street phase 1 – Ticket Vending Machines

- **Additional capital projects associated with vehicle requirements:** This study identified a number of capital projects that would be critical to the success of a fare free system and would have to be completed prior to the implementation of fare free service. The projects include:
    - New Central Control Facility: approximately $75 million (all scenarios)
    - Bus Maintenance Facility to accommodate increased fleet size
        - $49 million for Growth Scenario 1
        - $112 million for Growth Scenario 2
        - $156 million for Growth Scenario 3
    - Rail Maintenance Facility: approximately $50 million (all scenarios)

- **Other required capital projects:** The study also identified a list of projects for which SFMTA should make significant progress towards implementation prior to the implementation of the fare free system. These groups of projects reflect the fact that SFMTA's current capital assets are not in a state of good repair and already have significant real and potential safety and reliability impacts. The lack of investment in these capital projects prior to fare free system implementation could make such impacts even more severe. Over a 30 year period, the cost of these projects by capital category are:
    - Equipment projects: $1.1 billion
    - Facility projects: $553 million
    - Fleet projects: $5.4 billion
    - Infrastructure projects: $2.3 billion

In summary, including annual fare revenue loss, the implementation of a fare free system would have the following net operating impact (net additional cost):

- $136 million for Growth Scenario 1
- $184 million for Growth Scenario 2
- $255 million for Growth Scenario 3

The net capital cost increase associated with the purchase of additional bus and rail vehicles, implementation of critical infrastructure projects, and elimination of fare-related capital projects would be:

- $125 million for Growth Scenario 1
- $519 million for Growth Scenario 2
- $886 million for Growth Scenario 3

7.4 Policy Issues

- **Institutional Issues:** Although there would be challenges along the way, based on the results of this study there are no institutional issues that would prevent the implementation of a fare free service policy. However, it would be critical for local and regional policy bodies to affirmatively support fare free service to make the effort successful. Additionally, a vote of the public may be warranted given that a fare free system will require new sources of local revenue, most likely from taxes, fees and fines paid by residents, businesses and/or visitors.

- **Regional Issues:** Prior to implementing fare free service, the potential impact on other transit operators in the region and on the TransLink® regional fare program should be considered.

    - Although the SFCTA travel demand model projects a significant increase in transit ridership regionally and on the SFMTA system, the region's other systems could potentially experience a decrease in transit riders and fare revenues. The reduction in fare revenues would result in negative financial impacts to the other transit operators. This would require these systems to find other sources of revenue to replace the reduced fares. At the same time as the other operators would be pursuing additional revenue, SFMTA would also be seeking additional revenue to replace its fare revenues and to fund its increased capital costs.

    - As a lead agency in the TransLink® regional fare program, SFMTA contributes the largest share of funding to the creation and implementation of the program. If SFMTA converted to a fare free system, its action could adversely impact the movement toward the integrated SMART-card based electronic fare collection system in the Bay Area. Conversely, SFMTA could choose to continue participation and use the TransLink® card solely as a means to count riders.

- **Implementation Issues:** If the decision were made to implement a fare free system, a major challenge would be SFMTA's ability to acquire vehicles, expand vehicle storage and maintenance facilities, and increase staffing levels in a timely manner. Based on the results of the study the capital costs for additional buses and light rail vehicles, and their associated maintenance facilities/storage yards, would range from $261 million to $1 billion. Further, it would take between 5 to 10 years to acquire the additional vehicles and to provide expanded maintenance capacity.

- **Funding Issues:** A fare free system could present SFMTA with a series of trade-offs in the absence of sufficient funding to accommodate all aspects of transit service. The conversion to fare free service would likely widen the SFMTA existing funding gap and create a potential trade-off between upgrading and expanding existing maintenance and other support facilities, implementing major service expansion projects (such as the Central Subway) versus subsidizing fare free service.

7.5 Risk Issues

As shown previously in Table 42, although there are many risk areas that would provide challenges to the implementation of a fare free system, including risks with respect to: ridership impacts, passenger incidents, political, funding, storage and subway capacity, procurement, public support, and roadway capacity. There are also activities that could mitigate these risks.

8. Appendix A: Financing Cost of Procuring Additional Vehicles

This section examines a financing program that could be implemented to procure the additional vehicles required to support fare free service. The timing of vehicle acquisition is limited by several factors including design and acceptance of prototypes, vendor production capacity, and SFMTA's ability to inspect vehicles. This analysis assumed that existing vehicle prototypes currently available from manufacturers would be purchased. Should new designs be undertaken, there could be delay in vehicle delivery and possible increase in costs.

The following assumptions were used for the vehicle procurement:

- **Price escalation:** 4% per annum
- **Vehicle acceptance:** hybrid vehicles = 5/week; electric trolley = 2/week; historic street car = 2/week; light rail vehicles = 1/week
- **Expected useful life:** hybrid vehicles = 14 years; electric trolley = 20 years; historic street car = 25 years; light rail vehicles = 20 years
- **Estimated time of first vehicle delivery:** hybrid vehicles = 18 months; electric trolley = four years; historic street car = one year; light rail vehicles = four years
- **Payment schedule:** SFMTA will make progress payments for each vehicle type

The following assumptions were made in financing the vehicles:

- **Delivery schedule:** The vehicles would be ordered in one year; delivery to follow per assumptions outlined above,
- **Financing schedule:** Every 2 to 3 years to comply with spend down requirements under Federal tax law
- **Interest rate:** Tax-exempt bond financing = 5.5 percent
- **Financing structure:** Interest is capitalized for 30 months; no principal is amortized during this period, capitalized interest and project funds are net funded (funds deposited into the accounts combined with interest earned therein is sufficient to meet the funding needs)
- **Payment schedule:** Project fund draw is developed using procurement assumptions outlined above
- **Interest earnings:** On capitalized interest and project funds = 5.0 percent
- **Costs of issuance:** 1.5 percent of par amount of the bonds

- **Term of each financing:** 19 years (estimated average life of all the vehicles to be acquired)

The result of this vehicle procurement financing analysis is as follows:

Table A-1: Estimated Financing Cost of Procuring Additional Vehicles to Accommodate Additional Ridership

Vehicle Type	17.5 % Increase	47.5 % Increase	77.5 % Increase
Total Vehicle Cost (2007 Dollars)	$205,960,000	$536,760,000	$860,160,000
Total Vehicle Cost (Escalated)	233,677,167	616,363,798	1,002,725,857
Number of Financings	2	2	3
Approximate Dates of Financings	1-Oct-08	1-Oct-08	1-Oct-08
	1-Mar-11	1-Mar-11	1-Jun-11
	NA	NA	1-Aug-13
Final Project Fund Draws (Final Vehicle Delivery)	1-Jul-13	1-Aug-14	1-Nov-15
Final Debt Service Payment Date	1-Oct-29	1-Oct-29	1-Oct-30
Total Par Amount	$254,560,000	$663,730,000	$1,115,440,000
Deposit to Project Fund	$220,522,217	$576,274,541	$947,598,652
Interest Earned in Project Fund	$13,154,950	$40,089,257	$55,127,205
Total Available for Procurement	$233,677,167	$616,363,798	$1,002,725,857
Deposit to Capitalized Interest Fund	$30,217,476	$77,497,425	$151,100,983
Costs of Issuance	$3,818,400	$9,955,950	$16,731,600
Net Debt Service	$391,314,474	$998,934,099	$1,615,675,862
Net Bond Interest Expense	$185,354,474	$462,174,099	$755,515,862

The actual financing cost will depend on prevailing market conditions, type of financing used and the actual cost and timing of the vehicles to be acquired.