FINAL SAR 98-2
STRATEGIC ANALYSIS REPORT on TRAFFIC IMPACTS in SOMA

Initiated by Commissioner Leno
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I. INTRODUCTION

Purpose of Document

This report provides the SFCTA Board with a brief but comprehensive summary of transportation-related issues in the South of Market Area (SOMA). This Strategic Analysis Report, or SAR for short, highlights for the Board the significance of these issues in areas of SFCTA jurisdiction, and identifies implications for future policy decisions by the Board in its capacity as administrator of Proposition B (sales tax) funds and Congestion Management Agency for San Francisco. Every effort was made to make this a factual document, avoiding speculation, and leaving judgment to the reader. This document was designed to inform policy-level decision-making, and its abbreviated length (only 14 pages plus attachments) optimizes its usefulness to Authority Board members. Technical discussion has been condensed and only facts deemed essential to outline the policy-level issues are included. Additional information is available from the sources cited, or by calling Carmen C. Clark, Executive Director, at (415) 522-4802.

Executive Summary

South of Market (SOMA) is the most dynamic growth area in the City. Once a warehousing district, it is a geographic area larger than downtown, and it is called to play a number of distinct roles. It includes housing, industry, office buildings, retail areas, and major entertainment and cultural destinations. SOMA is also the gateway to the regional freeway system for a large portion of the City, including the Bay Bridge, I-80 (the West Approach), US 101 and I-280. It is also the location of the CalTrain Depot and the Transbay Terminal, which are served by regional transit operators from the North, South and East Bay. This means that as new land uses take hold, SOMA's streets must continue to act as a critical physical link to the regional transportation system, handling through traffic to and from the freeways as well as SOMA's own growing internal traffic and balancing regional connectivity, the economic vitality of the City and neighborhood livability concerns.

A number of significant transportation projects are either planned or already underway in SOMA, including the replacement of the West Approach to the Bay Bridge (estimated by CalTrans to be a 6-year project), the seismic retrofit of the Bayshore Viaduct (US 101), the Mid-Embarcadero Roadway, the Third Street Light Rail Line and Central Subway, the extension of CalTrain to Downtown and the replacement of the Transbay Terminal.

In order to succeed in meeting the challenge of absorbing growth and freeway construction impacts at the same time, the City must set out to answer three key questions. First, it must decide what it wants SOMA to look like in the future. No matter what scenario, there will be more people living and working in SOMA, and many more visiting the area. Many more trips will be made every day in and out of, and within SOMA. So, inevitably, there will be more congestion, more demands on the transit system, more pedestrians and cyclists on the streets, and more competition for parking. Depending on how the land use is structured, there may be opportunities to absorb significant numbers of trips by transit, walking and biking. Second, the City must decide what transportation conditions or standards it wants for SOMA: how much congestion on the streets, what levels of delay, how much crowding on transit vehicles, etc. Third, the City must put in place improvements to the transportation system to ensure that the desired standards can be met. The City must do all this while working around a large CalTrans construction site for the next six years.

During this period, the City faces several challenges and opportunities. From a transportation system performance perspective, the challenge will be to put in place interim solutions that help minimize construction impacts and keep the City moving and SOMA growing throughout the freeway reconstruction period. From a fiscal perspective, the challenge will be to find and put in place interim transportation strategies that also can be the basis for longer-term solutions, so that transportation investments are additive, rather than duplicative or wasteful. By working in partnership with CalTrans, MUNI and regional

transit operators to put in place a good traffic management plan for the freeway construction period, the City has the opportunity to permanently influence travel behavior, establish the right mix of auto, transit and other trips, and keep SOMA and the City moving and thriving for years to come. There is an opportunity to shape SOMA and its transportation system so that what results is an area that is more livable and makes full use of the potential of walking, biking and transit trips to eliminate some auto trips. This will help alleviate congestion, reduce the demand for new parking, reduce accidents, improve safety, and ensure that transit vehicles and freight can get around.

The SAR analyzes the demand for new trips due to expected new development in SOMA, focusing on the next 5 years. It also makes reasonable assumptions about new transportation infrastructure and services expected to be in place in that time frame, and evaluates the resulting conditions on the roadway and transit networks, and the need for parking. The SAR also includes a master schedule analysis of all transportation construction projects in SOMA, as well as key private development projects, to try to establish construction impacts on the capacity of the roadway network.

A key finding of the SAR is that a critical factor in determining how many people will actually drive in SOMA is the capacity of the freeway ramps, in addition to parking supply and demand. As more demands are placed on the Bay Bridge and freeways, p.m. peak back-ups onto SOMA streets could be exacerbated, impacting motorists with both regional and San Francisco destinations, and resulting in potentially significant impacts on intersections that are key to maintaining a reliable flow of surface transit.

The SAR makes several key conclusions and follow-up recommendations, which, to avoid repetition, are found in Section IV of this report.

II. BACKGROUND

A. Planning Context

Transportation

Every day, around 1 million trips take place with a destination in the northeast quadrant of San Francisco. This is the area bounded by Van Ness Avenue to the west, the Bay on the north and Townsend and the Central Freeway to the south. This area encompasses SOMA, as well as downtown, Chinatown, North Beach and Fisherman's Wharf, and it holds some 400,000, or about two thirds, of the roughly 580,000 jobs in the City. The northeast quadrant has the densest job concentration and it contains the richest supply of transit services and infrastructure anywhere west of the Hudson River. In that section of the City, transit accounts for nearly 56 % of work trips, while single-occupant automobiles carry only 22% of the workers and, of the rest, 16 % share rides, 5 % walk and around 1% bike to work. It would be physically impossible to accommodate that many jobs in downtown San Francisco if transit wasn't carrying such a large proportion of work trips. Finally, there are about 125,000 parking spaces in the northeast quadrant, counting on-street and off-street spaces, private and public.

The transportation strategy that permitted the prodigious growth of downtown San Francisco and sustained its employment base over the last 30 years is one of overriding emphasis on the supply of transit service and parking control policies intended to support the use of transit. Parking supply has been curbed and discouraged and, as occurs in most large central cities of the world, market forces have determined parking rate levels in private garages. The only exceptions have been the municipal parking garages where artificially low parking rates have been in effect to support the vitality and reinforce the competitiveness of the downtown retail district. In short, San Francisco has supported an approach to the supply and management of transportation that emphasizes person throughput rather than vehicle throughput. This is the context within which the transportation challenges of SOMA should be considered.

Land Use

We have approached the SAR's travel demand analysis task from the understanding that SOMA is the most dynamic growth area in the City. SOMA occupies a geographic area larger than downtown and a good portion of that area is on bay fill. SOMA originally developed as a warehousing and light industry district for the City, but it has been transitioning away from that role for several decades, due among other factors to the decline of the port, the radical changes in the nature of industrial production and of the U.S. economy, and the steadily increasing value of land in San Francisco.

SOMA has been called to play a number of distinct roles: as the extension of the downtown high-rise and retail district; as the home of major regional attractions like the Pacific Bell Ballpark, the Moscone Convention Center, and the Yerba Buena Center/Metreon; as the location of new housing throughout the area, and of residential enclaves like South Beach; and as the incubator of hi-tech and multimedia start-up firms in the area now known as Multimedia Gulch. While located outside of the study area designated for this report, the new UCSF campus and Mission Bay will also have impacts on the local SOMA transportation system and the regional transportation

system, which is accessed through SOMA. The analysis of the transportation problems affecting SOMA, and the formulation of short and long-term responses, must recognize the need to support and balance all of these roles.

B. Previous Transportation Studies

Strategic Analysis Report on China Basin Ballpark
This section summarizes the findings of the Authority's China Basin Ballpark SAR. The City's Ballpark/Mission Bay Transportation Coordination Committee has subsequently developed a transportation mitigation plan that addresses many of the issues discussed below.

The ballpark SAR looked primarily at transit capacity, roadway capacity and parking issues related to the proposed ballpark. The analysis estimated system performance based on travel assumptions provided by the Giants. At the time of the SAR analysis, the Giants estimated about 73 weeknight and weekend games and 8 weekday games per year. Maximum capacity of the ballpark was estimated at 42,000.

The Giants assumed a conservative transit mode split of 14% to 20%, although they indicated that the ultimate goal was a 50% transit share. Based on the Giants' assumptions, the SAR estimated that additional passenger capacity ranging from 1,800 to 4,000 passengers would be needed on MUNI to meet demand for weeknight and weekend games, but noted that the additional vehicles required might be available from the existing MUNI fleet. However, this would not be the case for weekday games if they end later than 3 p.m., since they would overlap with the p.m. peak when all of MUNI's available service is deployed. Possible ways to respond to the capacity deficits include reducing service elsewhere in the MUNI system, acquiring additional vehicles, or allowing AC Transit and Golden Gate Transit to provide direct service to the ballpark.

Given the available information, the roadway capacity analysis was done at an order of magnitude level. The SAR concluded that there would be significant congestion in the area around the ballpark, and on city arterials leading to and from I-280 and I-80, probably for an hour before and after a game.

The Giants parking analysis estimated sufficient parking available for weekend and weeknight games, but also projected a 1,400-space deficit for the 8 weekday games each year. Clearly, addressing this issue will require an amount of creativity, because it doesn't make sense to size transportation facilities for an event that only takes place 8 days a year. The Giants did assume use of on-street, off-street, public and private parking for fans.

Some of the SAR's suggestions for more efficiently managing the ballpark travel demand included: aggressive marketing so that fans know they have travel options when they buy their ballgame tickets; charging for parking as an add-on to the price of admission as a disincentive to driving and as a potential source of revenues to subsidize transit services; striping transit preferential lanes on SOMA streets so that MUNI could run dependable service to and from the ballpark; and pedestrian improvements such as overcrossings and sidewalk widenings to handle the flood of pedestrian traffic after games.

Strategic Analysis Report on Multimedia Gulch
The Gulch SAR focused on two main issues: unmet transportation needs in the Multimedia Gulch and potential solutions, and the impact of transportation issues on multimedia business retention. The SAR noted that the Gulch is one of the most accessible areas of the City, well served by freeways and regional transit. However, traveling *within* the Gulch by transit can be difficult. North/south service in the area between 5th and 8th Streets is the most limited in the greater downtown area and there is a gap in east/west service between Bryant and 16th Streets. There also is no direct connection from the Mission District to the Caltrain Depot. The SAR pointed out that a number of MUNI improvements are planned or underway that will improve transit service in the Gulch such as the Third Street light rail line. The most important improvement in regional transit access to the Gulch is improving MUNI service between Gulch destinations and regional transit.

The SAR pointed out that alternatives to both transit and automobiles could fill some gaps in the transportation picture. Taxis could play a role in improving Gulch transportation options, particularly during the midday or evening when transit service is less frequent. The relative lack of transit service in some areas of the Gulch and parking and congestion problems make bicycle travel a comparatively attractive option. Furthermore, the Gulch is quite flat, making travel by bicycle relatively easy and fast compared to other parts of the City. Both cyclists and pedestrians face safety issues in the Gulch with fast moving traffic and freeway ramps. Long blocks and the absence of pedestrian amenities make the Gulch less attractive for pedestrian trips.

Key follow-up steps recommended by the SAR include: revisiting the transit preferential street network to consider inclusion of additional SOMA streets; smart management of the existing parking supply, applying high technology to encourage ridematching and carpooling, exploring high tech approaches to the enforcement of transit lanes; and re-evaluating the overall role of transit in SOMA.

1995 Citywide Travel Behavior Survey Final Report
The 1995 CTBS was a travel behavior survey of San Francisco employees. Among other findings, the survey corroborated for San Francisco what we already knew to be true elsewhere: that there is a strong correlation between the cost of parking and the decision to drive alone to work. For instance, the survey found that 47% of commuters who drove alone to work parked for free. On the other hand, when transit commuters were asked how much they would have to pay for parking if they drove to work, only 12% indicated that they would have free parking. Another analysis of survey responses showed that commuters who had free parking drove alone to work 90% of the time while commuters who reported parking costs greater than $5 per day indicated that they drove alone to work only 70% to 75% of the time.

Doyle Drive Intermodal Study Data Collection Report
As part of this 1995 study, the Authority conducted license plate surveys of Golden Gate Bridge users to gain a better understanding of travel behavior. The survey found that 30% of Golden Gate Bridge automobile traffic is destined for the northeast quadrant of the City. The report noted that this was surprising given the high level of transit service provided in this area. One possible explanation cited by the report was the availability of inexpensive parking: over 40% of survey respondents indicated that they park for free in the City's downtown (i.e. northeast quadrant), and over 55% park for less than $5 per day.

III. STRATEGIC ANALYSIS

A. Construction Impacts & Mitigation Plans

The evaluation methodology in this SAR focuses on two areas: transportation impacts generated by land use development, and transportation impacts generated by construction of major transportation projects. In addition to permanently increasing the total number of people traveling, private development can also have impacts on the transportation system during the construction period, when construction equipment or safety considerations may necessitate the closure of street lanes and the detouring of traffic, and it can interfere with traffic mitigation strategies such as the addition of temporary lanes and bus-only lanes.

Private Sector Projects
For purposes of this analysis, SOMA was divided into eight study areas or subzones, taking into account the present neighborhood character, land use and transportation infrastructure (see Attachment I). In order to perform a schedule analysis and to estimate future travel demand in SOMA, we had to develop estimates of land use growth and changes resulting from private sector development in each subzone. The SAR analyses for year 2005 were based on an inventory of development projects already in the approval pipeline, rather than on regionally modeled growth projections. We coordinated with City departments with jurisdiction over development in SOMA (the Planning Department, the Redevelopment Agency and the Port) to gather information on all projects currently in pre-planning stages, under review, already approved for development, under construction, or constructed within the last year. Project size thresholds were used to limit the number of projects for the analysis to those that would be significant trip generators and thus present more substantial implications for the area's transportation system. For commercial developments the threshold was 40,000 square feet of either new development and/or rehabilitated space for new use (e.g., warehouse conversion to office use). For residential developments the threshold was 20 dwelling units. It might be noted that this 20-unit threshold probably screens out many of the "live/work" developments occurring in SOMA, which often tend to be smaller projects on smaller infill lots. Nevertheless, in the overall context of future development in the study area over the coming five-year period, these small residential projects will generate relatively insignificant numbers of new person-trips.

Transportation Projects
As part of the evaluation of construction impacts we developed a master schedule of transportation projects expected to occur within the same 5-year time frame (see Attachment II). They range from installation of traffic signal and guidance devices to construction of the Third Street light rail transit line to implementation of BART's new train control system to various bicycle and pedestrian improvements. Attachment III shows the location of the most significant transportation projects in SOMA.

In addition to the construction impacts associated with some of these projects, there will also be system performance benefits such as increases in capacity, efficiency and safety. These are accounted for in the travel demand analysis section.

The West Approach and Bayshore Viaduct Projects
There is not a formal traffic management plan (TMP) for the Bayshore Viaduct seismic retrofit project since Caltrans is able to do most of the work beneath the overhead freeway structure without disrupting the flow of traffic. The work has required the temporary removal of parking under the Bayshore Freeway (about 1500 spaces total, up to 500 spaces at a time), but most of that is expected to return after the seismic work is completed. All the Bayshore-related contracts are already under construction.

The West Approach, which is more of a replacement project than a retrofit, will have a San Francisco TMP to address impacts on city streets and a regional TMP to address impacts on the Bay Bridge/I-80 corridor. Caltrans has been meeting regularly with City staff to discuss the San Francisco TMP. Some key issues have already been resolved. For instance, Caltrans and the City, under the lead of DPT, have agreed on time windows for construction work, to minimize traffic disruptions during weekday peak traffic periods and minimize noise impacts on residents during nighttime hours. For these reasons, Caltrans intends to schedule construction-related closures in the vicinity of the bridge anchorage area on weekends only.

Caltrans has prepared draft plans for construction staging that provide a preliminary schedule for the sequence of construction, approximate time frames for each project phase and identification of local street, on/off-ramp and freeway lane closures. The preliminary schedule shows a six-stage project lasting approximately six years. Due to the complex nature of the project, which includes demolition and reconstruction of a significant portion of the West Approach, the plans include a number of arterial and ramp closures that will require some sort of mitigation in the TMP. Some of these closures include:

- Transbay Terminal bus on-ramp — closed 20 weekends over a period of six years.
- Essex Street on-ramp — closed 50 weekends and up to 18 months during Stage 5. The Essex Street traffic will be routed onto the Sterling Street on-ramp, which will be widened to provide an exclusive lane on the bridge.
- Harrison Street off-ramp — potentially closed for 4.5 years. A new Folsom Street off-ramp, temporarily striped with three lanes and including a new branch touching down at Folsom (known as the Folsom leg), will carry this traffic. The Folsom leg will be constructed during the first phase of the West Approach project.

The City and Caltrans are working together to develop detours, as appropriate, for all of these closures. While Caltrans is making an effort to minimize impacts on local streets, particularly during the weekday peak periods, it is clear that there will be impacts on local streets. For instance, some of the detours associated with ramp and street closures effectively reduce capacity on local streets, and while a widened Sterling Street on-ramp will facilitate better absorption of traffic detoured from the closed Essex Street on-ramp, there will still be less capacity than if both the Essex Street and Sterling Street on-ramps were open.

The complex nature of the West Approach project, involving demolition and construction of temporary and permanent structures, will require the temporary loss of approximately 4,000 spaces, all at once, for the duration of the project. While these spaces are all expected to be restored at the end of the project, the effect of their temporary loss is unknown. The City is considering ways to address this issue through the TMP process.

One way to provide a context for understanding the relative magnitude of this loss is to compare the 4,000 spaces to the number of currently available parking spaces in SOMA. Unfortunately, this number is not available at this time, but an estimate should be available after the Department of Parking and Traffic completes the SOMA parking study that is currently underway. In the meantime, we do know that there are approximately 125,000 parking spaces located in the northeast quadrant, which encompasses the area east of Van Ness Avenue and north of the Central Freeway and Townsend Street. This includes almost the entire South of Market Area as defined for this report (see Attachment 1) as well as downtown, Chinatown and Fisherman's Wharf. Although SOMA (approx. 1.9 sq. miles) represents about 50% of the area of the northeast quadrant (approx. 4 sq. miles), other factors such as the type and density of land use and the distribution of parking supply should be considered to get a more complete understanding of this parking issue.

The City is reviewing the construction staging information and providing comments to Caltrans on potential mitigation measures such as traffic and transit detour routes, traffic control officers to help direct traffic at key intersections and construction of overhead contact system (e.g. wires) so MUNI trolley routes can detour when necessary. The City is preparing cost estimates for the TMP that include both capital and operations costs.

The current schedule for the West Approach project shows that the TMP will be finalized in December 1999. Following approval of the TMP, Caltrans and the City need to execute a Cooperative Agreement, which is the formal financial agreement that allows implementation of the TMP. The Cooperative Agreement is scheduled for approval by the City in April 2000 and by Caltrans in May 2000. Construction is scheduled to begin in September 2000. This may not allow sufficient time for implementation of the TMP since some of the implementation measures may require a longer lead-time. For instance, DPT needs time to hire and train traffic control officers, and transit operators need time to acquire additional vehicles and negotiate labor contracts to allow provision of additional service.

MTC and Caltrans are taking the lead on the regional TMP, the focus of which will likely be provision of

additional transit service (e.g. BART, AC Transit, ferries, MUNI, etc.). San Francisco needs to actively participate in the development of the regional TMP since its success or failure will directly impact SOMA streets. For instance, if traffic on the West Approach is gridlocked, traffic queuing on the on-ramps will spill onto local streets and cause congestion.

There are many details about the construction schedule and construction staging that won't be known until a contractor is on-board to design the final staging plan. Furthermore, on a project this size, schedule delays and changes in construction activities are certain to happen. Given this, the City needs to maintain good lines of communication with Caltrans to ensure an expeditious flow of information from the contractor, to Caltrans, to City staff. This will allow sufficient lead-time to ensure that the public is informed of changes and that the proper mitigation measures are in place.

Another area that will require on-going coordination with Caltrans relates to street excavation work and approval of construction permits in SOMA. DPW's Street Coordination Center (SCC) already faces the challenge of coordinating street resurfacing and street excavation work performed by various utilities and city departments. While it is unreasonable to ban all street excavation work in SOMA for the duration of the West Approach project, the SCC can try to limit the amount of work that is done, and avoid scheduling street excavations that would exacerbate the impacts of Caltrans retrofit work. Similarly, City approval of construction permits should be coordinated with the West Approach work and TMP mitigation measures. For example, the City should not allow a private contractor to use a parking lane for equipment storage if that parking lane is needed to carry traffic as part of a TMP detour route.

Providing good information both through the media and through traffic operations systems (TOS) (e.g. changeable message signs) will be critical mitigation measures. The TMP should ensure that the Caltrans TOS system is functional and integrated with the City's Integrated Traffic Management System, which is in the design stages.

Finally, congestion on the bridge (I-80) and U.S. 101 routinely causes congestion on SOMA and north of Market streets. As part of the TMP, Caltrans should undertake a freeway operations analysis to explore ideas such as ramp metering that could allow San Francisco traffic more efficient access to the freeway and an HOV lane on the bridge. These improvements could help during the West Approach seismic retrofit, and also remain as permanent improvements after the retrofit is completed.

B. Travel Demand Analysis

1. Analysis Process

Overview

Our analysis process is outlined in the flowchart displayed in Attachment IV. First, we divided the area into eight subzones based on land use and transportation characteristics, as shown in Attachment I. Then we developed an estimate of likely development in the next 5 years for each subzone and calculated from it the likely growth in total trips (work and non-work). Next we estimated (using information from the regional travel model and the Citywide Travel Behavior Surveys) the pattern of trip origins and destinations linking each of the subzones in SOMA to the four quadrants of the City and to the North, South and East Bay. Then (again using existing information) we estimated the percentages of those trips that would take place by automobile, by transit, by bicycle, walking, and in car or vanpools. Finally, we identified the transportation improvements that are likely to be implemented in the same 5-year time frame and, reconciling capacity and demand for all transportation modes, we arrived at an assessment of how the transportation system is likely to perform in those time frames. The performance of the system is typically described using variables like congestion, transit vehicle crowding and schedule reliability, travel times, safety, parking supply vs. demand, and/or their surrogates, depending on what data is available and at what level of reliability. Our entire analysis was performed for the p.m. peak hour, because we wanted to be certain that we could address the most challenging scenario. Key assumptions for our analysis process are highlighted in the sections that follow.

Development Projections

The demand analysis for year 2005 was based on an evaluation of development projects already in the approval pipeline, rather than on regionally modeled growth projections. The process and assumptions that went into the development of the land use inventory were discussed previously in Section III. A. under 'Private Sector Projects.' The one significant project in the SOMA study area that was not included in the demand analysis is the Giants Ballpark because the performance analysis focuses on the *typical* weekday p.m. peak period (4 to 6 p.m.), whereas the Giant's weekday games are scheduled to either end by 3 p.m. or begin at 7:30 p.m. Ballpark congestion will occur primarily for one hour preceding and following ballgames, and is outside the time window we are examining. Nevertheless, the potential overlap of ballpark events with peak periods is a concern, and it is being addressed by the City's Ballpark/Mission Bay Transportation Coordination Committee. In addition,

coordination between the ballpark and West Approach TMPs is recommended as one of the follow-ups to this study.

To put the demand projections resulting from this methodology into perspective, our consultant compared the land use calculations to ABAG's modeled projections for Year 2005. The comparison indicated that the actual development projects in the pipeline for the next five years far surpasses ABAG's projections, which are based on regional economic competition for new jobs and population. This being the case, and given that for the sake of the analysis we are assuming that 100% of the pipeline projects would actually materialize (which is never the case), we opted to not add a background growth factor.

Travel Demand Projections

Trip generation rates based on land use types were derived from the Planning Department's current transportation impact guidelines as were the percentage of trips coming into the area versus the percentage leaving the area. The transportation impact guidelines showed a roughly 50/50 split between work and non-work trips for daily trips. Since non-work trips are discretionary and more likely to be foregone during the congested peak period, we adjusted the split to 60% work trip vs. 40% non-work for the peak hour.

The *trip purpose* was taken from the MTC trip tables, which include work and non-work trips. Non-work trips combine shopping, social/recreational, and non-home-based trips.

Origin-destination figures came from the MTC model as well. Inside San Francisco, we grouped the origins into San Francisco's four superdistricts. Outside of San Francisco, we grouped the origins into South Bay (San Mateo and Santa Clara counties), East Bay (Alameda, Contra Costa and Solano counties) and North Bay (Marin, Sonoma and Napa counties).

Mode Splits

The current mode splits for both work and non-work trips to SOMA are based on year 2000 MTC Trip Tables. The tables are for all daily trips, not just for peak period trips. Therefore we adjusted them for peak period factoring.

Work trips — Transit, rideshare and auto trips were based on the MTC trip tables. Since the trip tables don't include bike or walk trips, we adjusted them to include a 3.7% bike mode split for work trips with San Francisco origins, based on a Binder research poll from 1997 provided by the San Francisco Bicycle Coalition. Since about half of the work trips are from inside San Francisco and half outside, the overall bike mode split for all work trips to San Francisco reduces to 2%. The mode split distribution (e.g. origin/destination information) for bicycle trips within San Francisco was based on the 1992 Citywide Travel Behavior Survey (CTBS). The walk mode split was based on the 92 CTBS for superdistrict 1 (e.g. the northeast quadrant, including SOMA).

Taxi trips are considered under different categories (e.g. transit, rideshare, other) depending on the source. For purposes of this SAR, we assumed that taxi trips were included under the rideshare mode.

Non-work trips — Transit, drive alone and rideshare mode splits were based on the MTC trip tables. The bike and walk mode splits were based on the 1990 MTC Travel Survey Working Paper #4, Table 5.3.

Forecast Mode Split Scenarios

In order to provide a context for SOMA travel demand projections, we developed two potential future mode split scenarios as policy objectives against which we evaluated transportation system capacity and performance. The scenarios were developed by first looking at existing travel and land use patterns in SOMA, both for the area as a whole and within the various subzones that we defined for the SAR study. *It is important to note that while mode split is ultimately the aggregated result of numerous individual travel decisions (e.g. where to travel, when to travel, how to travel — by bus, car, etc.), policymakers have a tremendous influence on mode split through the actions they take related to land use patterns, urban design standards, provision of transportation infrastructure and services, and policies such as parking pricing. It is in this context that we have developed two different, but foreseeable mode split scenarios for this SAR, so the types of policy decisions that are needed to achieve the scenarios and their associated trade offs are brought to light.*

Of the two future mode split scenarios, Scenario 1 is a continuation of current mode split while Scenario 2 reflects a shift in travel behavior with relatively minor reductions in auto travel and commensurate increases in transit, walk and bike modes that might be accommodated by a variety of transportation system improvements (see table below). While both of these scenarios are reasonably realistic and foreseeable, they would be brought about by a different set of policies that the City could choose in order to shape the way the transportation system in SOMA functions. They would allow the City to accommodate the same amount of projected growth in the area, but with different outcomes in terms of system performance and livability.

Future Mode Split Scenarios (P.M. Peak)

	Scenario 1 (same as current)	Scenario 2
Work trips:		
Auto – drive alone	34%	26%
Rideshare	15%	16%
Transit	45%	50%
Walk	4%	5%
Bike	2%	3%
Non-work trips:		
All auto trips[1]	56%	50%
Transit	17%	21%
Walk	26%	27%
Bike	1%	2%

Travel behavior varies considerably within various subareas of South of Market. The defined study area for the SOMA SAR covers an area nearly equal in size and functional variety to that of North of Market from the financial district to the northern waterfront to the Van Ness corridor. The 1998 employment density figures that were used in the Multimedia Gulch SAR show that the Market Street corridor, particularly from 4th Street to the waterfront, has by far the greatest concentration of workers in the study area. The remaining portions of South of Market south of about Howard Street have significantly lower employment densities. We should keep in mind, however, that this situation is likely to change in the coming 5-year study horizon as commercial development continues to grow in areas south of the Market Street corridor. Thus, to the extent that travel behavior is influenced by employment density, transportation patterns in the deeper reaches of SOMA are likely to change more significantly in the future than they will for the already well-established areas in the Market Street core.

Transportation Network Assumptions

Several transportation projects are expected to be implemented over the next five years and have been considered in the system performance analysis as baseline improvements for both scenarios. They are shown in Attachment III. Some of the projects are expected to bring significant added capacity to the system while others are relatively minor improvements that mainly increase the safety, efficiency or convenience of certain components of the local and regional transportation system.

Parking Supply/Demand

Parking supply and demand associated with new SOMA development projects were estimated for 2005 as follows: parking *supply* was estimated by adding up all of the new spaces to be provided as part of development projects (information from the Planning Department and project environmental studies) and subtracting existing (surface) parking that will be eliminated by construction of new developments (information from field surveys conducted by Wilbur Smith Associates in August/September 1999.) *Demand* was estimated for weekday midday conditions (the period of peak parking demand) using mode split information from the *Citywide Travel Behavior Study,* the Planning Department's guidelines for transportation studies, and existing demand (e.g. occupancy rates) obtained through surveys conducted by Wilbur Smith Associates. The temporary loss of 4,000 parking spaces associated with the Caltrans' retrofit projects was not included in the calculation of new parking demand. It is assumed that these spaces will be restored after completion of the Caltrans' projects. In the meantime, the City is working on ways to address the temporary loss of these spaces.

2. Interpretation of Analysis Results

Demand Analysis — *New trips by land use & subzone*

The total *new* p.m. peak hour demand in South of Market created by the pipeline land use projects through year 2005 is projected to be 47,150 person trips, using all modes of transportation.

Figure 1
New Person Trips by Land Use

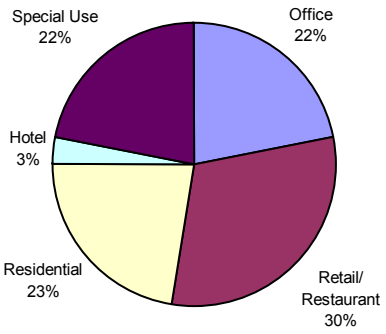


Figure 1 shows these total new trips in the SOMA study area by type of land use. The analysis indicates that there is a roughly even distribution of new development over the five-year time frame of office, retail, residential and special-use projects (such as entertainment, cultural, and convention facilities).

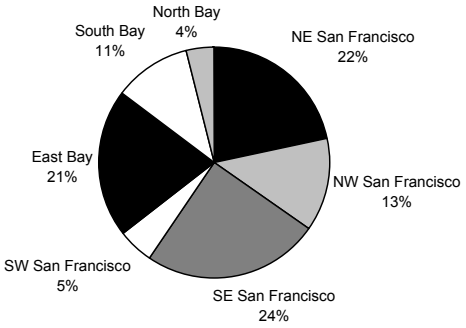
Attachment V shows that these new trip-generating developments will be concentrated in a few of the study subzones. For instance, subzone 2 is the C-3 downtown district on the south side of Market Street, encompassing the Transbay Terminal area. Not surprisingly, most of the

[1] The source for mode splits, the MTC Trip Tables, does not distinguish between single occupant and rideshare auto trips for non-work travel.

new office growth will occur in this subzone, along with some retail and residential development. It is unlikely a coincidence that most of the new growth is located in subzones 1-4 (along Market Street in the downtown, The Embarcadero, and 4th/King Streets. area near the Caltrain Depot), which are the areas with the highest level of transit service and good connections to both local and regional transit. There is a smaller amount of new growth that is expected in the remaining subzones, in the vicinity of the freeways and the west-southwest parts of SOMA. These areas have relatively lower levels of transit service and consequently, a greater proportion of the new travel demand might be expected to be accommodated by automobiles versus transit, given the current transportation system.

Origin/Destination: Figure 2 summarizes the origins and destinations of these new trips affecting the SOMA landscape. As mentioned earlier, origins and destinations are assumed to remain the same as today and are based on MTC model assumptions. Figure 2 shows that over 60% will be destined for San Francisco locations (Note: destinations are shown since the analysis is based on the p.m. peak). The majority of the remainder of the new trips will be to and from the east bay (21%) and a significant portion will also originate in and be destined to the south bay (11%).

Figure 2
New PM Peak Hour Person Trips by Destination



Mode Split: The demand analysis indicates that under Scenario 1, about 13,000 new vehicle trips would be generated from this total demand, 7,000 of which would be from residents of San Francisco, and approximately 16,000 new transit trips using both local and regional carriers. Of those new vehicle and transit trips, about two-thirds are outbound from SOMA during the p.m. peak hour. Scenario 2, which sets higher goals for transit usage than does Scenario 1, results in about 11,500 vehicle trips from new development, 6,000 of which would be to and from San Francisco locations, and approximately 18,000 new transit trips. Not insignificantly, under both scenarios there is expected to be a large number of new walk trips in the SOMA study area, 5,500 or more during the p.m. peak period. And similarly, there will be a fairly significant number of new bicycle trips on South of Market streets, upwards of 1,150 under Scenario 2 assumptions.

New P.M. Peak Hour Trips by Mode[2]

	Scenario 1	Scenario 2
Vehicle trips (drive alone and rideshare)	13,000 (7,000 from SF)	11,500 (6,000 from SF)
Transit trips	16,000	18,000
Walk trips	5,500	6,000
Bike trips	750	1,150

Transit Analysis

For each of the two scenarios, the total transit ridership created from new development through year 2005 was distributed to MUNI and regional carriers based on current patterns of origin and destination distribution. As summarized in Figure 2 above, 60% of the trips are expected to be within San Francisco and the remainder distributed between the east bay, south bay and north bay corridors, with the east bay being the dominant regional corridor. The screenline analysis, shown in Attachment VII, uses these major directional corridors to determine the degree to which transit carriers will experience increased ridership demand along the indicated desire lines or corridors. It needs to be emphasized that screenline analysis is an accepted sketch level planning technique for providing an order of magnitude level estimate of how well forecasted ridership demand matches with available capacity. However, our screenline analysis only provides detail at the corridor level, not at the route level. Therefore, our analysis may indicate a potential capacity shortfall in a corridor (e.g. the Geary corridor), but it doesn't tell you which routes (e.g. 1-California vs. 38-Geary) would experience the shortfall. Similarly, our analysis does not capture trips that occur entirely within the screenline or study area. It only captures trips which cross a screenline.

Given the above limitations of the screenline analysis, the SAR concludes that, in general, the projected ridership increases could potentially be absorbed by the various carriers without significant increases in service, after taking into account existing unused capacity and planned efficiency improvements and new service increases. In the case of BART, although the numerical increase is substantial, additional standing room capacity does exist and implementation of the new train control system, which will allow trains to run at closer intervals through

[2] One vehicle trip may include more than 1 *person* trip, depending on the number of vehicle occupants. Transit, walk and bike trips are all *person* trips.

the Transbay Tube, may some provide some additional capacity. For BART, accommodating the projected ridership increase is primarily a question of how much additional crowding riders will tolerate. Caltrain, SamTrans, and Golden Gate Transit all appear to have capacity sufficient to meet the projected demand. AC Transit and the East Bay ferry system have recently increased service or have plans to increase service within the five-year time frame of our analysis, which should enable them to absorb the expected ridership increases.

A key factor in determining whether AC Transit, Samtrans, Golden Gate Transit and MUNI (discussed below) will be able to handle the projected increased ridership is the level of congestion on surface streets and freeways. During the 5-year time frame of the SAR analysis, vehicle trips are expected to increase, which will cause delays to the surface routes of these operators. Minimizing and perhaps even reducing traffic-related delays to transit would likely be necessary to enable transit to absorb the expected amount of new trips.

For MUNI, the SAR analysis shows that the system's ability to handle additional riders varies by screenline. The northwest San Francisco screenline (trips to the Richmond) appears to have sufficient capacity to meet the increased demand. For the southwest (Sunset, etc.) screenline, the projected transit ridership increases would stretch MUNI's capacity to near its limit. The K, L, M and N subway lines, which carry a significant amount of the transit trips currently destined for the southwest quadrant of the City, are already very crowded at peak periods. Improving the reliability of these lines would likely be necessary to help meet the expected growth in this corridor. Replacement of the entire LRV fleet and continued refinement of the new automatic train control system should partially address this need.

For the southeast screenline (trips to the Mission, Bayview, etc.), the projected increase in ridership is more than double the current unused capacity for the p.m. peak hour — a shortfall of approximately 1500 new trips. To provide a context, 1500 new trips would require additional capacity equivalent to approximately 24 regular trolley buses, 16 articulated trolley buses, or 13 light rail cars. Although MUNI's Third Street light rail line — expected to be in operation by 2004 — could absorb some of these new trips, it would not help address potential capacity deficits in the Mission or Potrero/San Bruno subcorridors where buses are already at capacity. Additional analysis, beyond the scope of this SAR, would be needed to identify the specific subcorridors and/or routes which would need to serve the projected new trips.

The screenline analysis is very difficult to interpret for the northeast (greater downtown area to Fisherman's Wharf) because of the significant number of internal trips that would be expected in SOMA as a result of new development. These trips wouldn't be captured by the screenline analysis. The Multimedia Gulch SAR did highlight some deficiencies in current MUNI service South of Market, such as a gap in east/west service between Bryant and 16th Streets and the need for better connections to regional transit (see Section II. B.). The Gulch SAR suggested that MUNI consider a restructuring of service in SOMA, a suggestion made even more urgent by the dynamic growth that SOMA is expected to experience over the next 5-years. MUNI has already responded to this need and has undertaken a study that is looking at the possible restructuring of its service within South of Market. There are also several transit projects underway, such as the F Market extension to Fisherman's Wharf and the F line connector (formerly known as the E line connector), that can help better connect the eastern side of SOMA to north of Market.

In order to achieve the transit mode splits forecast by either scenario used in the SAR analysis, the City will have to increase MUNI capacity and improve reliability. The capacity increases don't necessarily need to be achieved by adding new service. For example, reducing bunching, minimizing breakdowns, and ensuring that scheduled vehicles are put in service will all effectively increase capacity. As mentioned above, the replacement of MUNI's entire fleet is currently underway and should result in noticeably improved reliability. Other strategies that need to be considered include improved enforcement of transit-only lanes (perhaps electronically), striping of additional transit-only lanes, transit signal pre-emption and the expansion of MUNI's proof of payment.

Roadway Analysis

Similar to the transit analysis, the total vehicle usage created from new development through year 2005 was distributed to local roadways and the freeway system and analyzed for each of the two scenarios. As Attachment VIII shows, the results of the analysis indicate that the Bay Bridge and I-280 and their street-level connecting ramps will be most severely impacted by the added demand from growth in South of Market through year 2005.

A key finding of the SAR is that a critical factor in determining how many people will drive to SOMA from the east and south bay is the capacity of the freeway ramps. Congestion on the mainline freeway and on the on-ramps backs up traffic onto surface streets, causing gridlock at intersections, and restricting auto and transit mobility during the peak commute periods. For example, traffic control officers (TCOs) are needed at the

intersection of First and Market Streets to keep cross-traffic from blocking transit traffic on Market Street because of backups on the Bridge and/or the 1st Street on-ramp. As more demands are placed on the Bay Bridge and freeways, p.m. peak back-ups onto SOMA streets could be exacerbated, resulting in potentially significant impacts on intersections that are key to maintaining a reliable flow of surface transit and traffic.

Key conclusions of this analysis are that given that the Bay Bridge and ramps are already operating at capacity (as evidenced by the regular back-ups of freeway-bound traffic on surface streets) and that the mainline's inability to absorb any substantial number of new trips results in surface street congestion, the projected increase of between 2,700 and 3,000 new p.m. peak hour trips in the Bay Bridge corridor would not realistically be accommodated. Many of those trips would need to shift to off-peak hours, shift to a transit travel mode, or be forgone. A similar situation can be expected with the I-280, though it is somewhat less constrained than the Bay Bridge. Nevertheless, between 3,000 and 3,500 trips to I-280 are expected to enter at the King Street on-ramp, drawing significant surface street traffic *through* SOMA and along the Embarcadero and threatening congestion at the ramps if the capacity on the freeway itself is surpassed.

In addition to the congestion caused by freeway related back-ups, congestion will increase on local SOMA streets as a result of increased demand associated with new developments. The two mode split scenarios used for the SAR analysis estimate between 11,500 and 13,000 new p.m. peak hour vehicle trips. For context, a single lane on an arterial like Folsom can handle between 750 and 900 cars per hour.

Although completion of The Embarcadero Roadway (early 2000) may provide some traffic relief to Main, Beale, Fremont and First Streets between Market and Harrison Streets, the SOMA transportation system won't be able to accommodate a significant number of increased vehicles trips during the p.m. peak, nor would it be consistent with current City policy to do so. The City's ability to sustain so many jobs in the downtown is directly dependent on the ability of transit to carry a significant portion of work trips. Any increase in p.m. peak vehicles would be competing with surface transit for limited roadway space, making transit less reliable, slower and a less viable commute option. Given this, the most appropriate roadway improvements might involve better enforcement (e.g. don't block the intersection, traffic control officers) and projects such as the integrated traffic management system which will help improve traffic and transit flow during special events. At the same time, transportation demand strategies could be used, such as encouraging employers to offer staggered work hours and telecommuting options to their employees.

Another finding is that p.m. peak hour crossings of Market Street will have major impacts at the intersections east of 6th Street. About 1,200 to 1,500 vehicles are expected to desire to cross Market at the four intersections between 6th and Montgomery, and 550 to 900 vehicles will use crossings at the five intersections further east to the foot of Market Street.

The bottom line for local street level of service and increased traffic volumes will probably be that capacity limitation on the freeways, bridges and ramps will likely keep local street volumes near current levels and increase the proportion of trips using transit (in fact, potentially well beyond the mode share shift assumed under Scenario 2 for this analysis) or shifting some of the vehicle trips to peak shoulder travel times. In addition, capacity limitations related to freeways will almost certainly increase the frequency and incidence of spillover gridlock impacts on SOMA streets. This conclusion may present a strong argument for an even more aggressive policy objective for transportation in South of Market, for example setting a 55% transit mode share objective for all SOMA work trips during the p.m. peak and an overall 45% transit share for all trips during the p.m. peak, regardless of purpose.

Bicycle and Pedestrian Analysis

While the SAR's order of magnitude travel demand analysis does not lend itself to making project specific recommendations about needed SOMA bicycle and pedestrian improvements, we can draw some general conclusions. For instance, no matter what future mode split is assumed for SOMA, with over 47,000 new p.m. peak hours trips forecasted for 2005, there will be more bicyclists, pedestrians, and vehicles in SOMA. Since there is usually a direct correlation between increased vehicular volumes and bicycle and pedestrian accidents, we can expect that additional safety improvements will be needed. As discussed in the Multimedia Gulch SAR, heavy traffic volumes; wide one-way streets which allow autos to travel relatively fast; the presence of freeway ramps; lack of bicycle lanes and lack of pedestrian amenities such as sidewalks and street lighting in many parts of SOMA pose particular challenges to safe non-motorized travel.

Some localized bicycle and pedestrian improvements will be put in place as part of land use projects (e.g. Mission Bay, Pacific Bell Ballpark, etc.), and other improvements are currently planned or underway such as the 4th Street sidewalk widening, installation of downtown pedestrian signage and various bicycle lanes. It should be noted that there are tradeoffs to be considered with some types of

improvements, such as removing a lane of traffic to add a bicycle lane. Generally, improvements in bicycle safety and convenience must be balanced with possible increases in traffic congestion and delays to surface transit. Given the dynamic changes expected in SOMA over the next 5 years, the City may wish to undertake an areawide analysis of SOMA bicycle and pedestrian issues to ensure that there are no significant gaps in access for these modes.

By improving conditions for cyclists and pedestrians, we can encourage the shift of some vehicle trips to these modes and thereby help ease traffic congestion. This might be particularly true for areas where new residential growth is expected in SOMA. Pedestrian travel could become even more viable in these areas if neighborhood serving land uses (e.g. grocery store, dry cleaners) are located within walking distance. Finally, pedestrian improvements can also be supportive of transit, for example by providing a well-lit sidewalk between the SOMA origin or destination and the transit stop.

C. Implications for Authority Policy Making

Mitigation Costs

City departments are currently developing cost estimates for likely mitigation activities that can be safely assumed to be needed in order to cope with the West Approach Replacement project. As discussed in the sections above, congestion on the Bay Bridge and US 101 is clearly responsible for significant back-ups on SOMA streets, and construction activity, including the closure of on-ramps, will likely result in a worsening of such conditions. It can be expected that the costs of preparing the SOMA transit and roadway system for this challenge will run into the many millions of dollars.

One potential mitigation measure — relocating trolleybus catenaries (overhead wires) to re-route the 30 Stockton and the 45 Union-Stockton lines around the freeway construction — is estimated to cost around $5 million. Perhaps more important, given how critical it is to maintain surface transit service in and out of the area, it may be necessary to post traffic control officers at many intersections in SOMA, perhaps over the entire construction period, to ensure that transit vehicles will not be impeded by gridlocked traffic. The City should not be expected to shoulder the burden of managing impacts on city streets resulting from freeway back-ups and construction-related detours, especially as they affect transit service. The West Approach project budget should clearly reflect such considerations.

Parking Supply

There has been debate about the need to expand the parking supply in SOMA, to respond to development. In order to understand the associated tradeoffs, the parking discussion needs to be set in the transportation and land use context described in Section II.A. It is not consistent with current City policy to encourage more vehicle trips during peak periods since this would work at cross purposes with the City's approach to handling the peak traffic demand in the downtown by relying on transit to carry a significant portion of trips. Increasing vehicle trips would result in increased delays to surface transit, making it less reliable and a less viable alternative to travel by autos. Finally, any new parking lots or garages should be located so as to avoid congested spots and to minimize access conflicts with transit traffic.

In this context, the conclusions about future parking demand in SOMA are as follows: 1) After adding up the new spaces expected to be provided by new SOMA developments and subtracting existing spaces expected to be lost, there is an estimated net gain of about 3,000 spaces in SOMA. 2) Even after accounting for the net gain in parking spaces, there may be a need for 2,600 to 3,600 additional parking spaces in SOMA in the next 5 years to meet maximum weekday midday parking demand. 3) There are strong reasons to suggest that any additional new parking be located either south or under I-80/U.S. 101 versus north of the freeways. This would avoid adding increased automobile traffic on streets near the Market Street corridor that carry the highest volume of surface transit in the City, and help maintain access to the freeways from north of Market for existing vehicle volumes. On the other hand, south of the I-80/U.S. 101 there is relatively less auto congestion, lower levels of transit service and lower land use densities so it would be reasonable to expect that a relatively higher proportion of trips would happen by auto, which would benefit from the additional parking.

The decision to provide additional parking needs to be made in conjunction with consideration of ways to better manage parking supply and demand. This can be achieved by *travel demand management strategies* (e.g. offering real-time rideshare matching services, employer-based trip reduction programs), *by making alternatives to automobiles more attractive and viable as travel options* (e.g., designating rideshare parking near key destinations, providing bicycle lanes, rerouting transit service to serve new trip generators, enforcing transit lanes, etc.), and *by making more efficient use of the existing parking supply* (e.g. instituting valet parking or adjusting parking rates to encourage more frequent turnover.)

IV. CONCLUSIONS & RECOMMENDATIONS

A key finding of the SAR is that critical factors in determining how many people will actually drive to

SOMA include the capacity of the freeway ramps (particularly for trips to and from the east and south bays), parking supply, parking demand and roadway capacity. As more demands are placed on the Bay Bridge and freeways, p.m. peak back-ups onto SOMA streets could be exacerbated, impacting motorists with both regional and San Francisco destinations, resulting in potentially significant impacts on intersections that are key to maintaining a reliable flow of surface transit, and potentially impacting transit service.

For the next 5 years, assuming that the current pace of development will hold up, this report concludes that:

1. Because of freeway and intersection capacity limitations, only a multimodal approach, relying heavily on transit service, will provide an adequate response to the transportation challenges in SOMA.
2. Congestion on the mainline freeway (US 101) and on the Bay Bridge is responsible for evening peak back-ups onto SOMA streets as traffic is prevented from leaving San Francisco, affecting the functioning of the local street network and the effectiveness of surface transit service. The additional trips in SOMA will exacerbate street network congestion in the vicinity of freeway on-ramps, and in the corridors leading directly to the on-ramps, in the p.m. peak.
3. What is known about the traffic management plans for CalTrans construction work in SOMA suggests that the Caltrans projects will further exacerbate the point made in 2) above, particularly through the closure of on-ramps in San Francisco for extended periods of time. Mitigating these impacts will likely necessitate extensive use of traffic control officers and careful and costly re-structuring and augmentation of transit service.
4. Given the significance of the expected impacts, the City should require that CalTrans demonstrate the adequacy of the traffic management plan and ensure mitigation funding availability to deal with the above issues in advance of proceeding with construction in the Fall of 2000, or modify the schedule to allow sufficient time for implementation of all necessary mitigation measures.
5. After accounting for the net gain of approximately 3,000 spaces as expected to be constructed as part of new developments, there may be a need for 2,600 to 3,600 additional parking spaces in SOMA in the next 5 years, which should be located under or south of I-80/US 101. These numbers are likely to be refined as a result of the Department of Parking and Traffic's parking study, which is currently underway.

Suggested Follow-Ups

Below is a listing of potential follow-up actions, based on the SAR's findings:

- Muni should complete and implement its South of Market Service Concept Plan, now under development, to better serve transit patrons in SOMA.
- The Department of Parking and Traffic should complete their parking study (currently underway), which will assess the need for parking in the short and long-term, as well as identify potential sites for additional parking. The study should also look at ways to improve the efficiency of the current parking supply by identifying innovative parking supply management techniques for application in SOMA, including valet parking at major garages, robot parking, parking pricing structures, secondary use of private parking facilities, and the like.
- The Authority and the Planning Department should consider the possibility of preparing a follow-up report, developing specific recommendations for land use policies and techniques and specific transportation investments that would provide a coordinated transportation and land use vision for SOMA and in particular, improve pedestrian environments in SOMA neighborhoods and permit the replacement of certain automobile trips by walking or bicycle trips.
- The Planning Department should continue to encourage travel demand management (TDM) techniques, including expansion of employer assistance programs, as a way to help reduce peak period demand. TDM techniques include ridesharing, telecommuting, staggering work hours, offering transit subsidies, etc.
- The Department of Parking and Traffic and MUNI should work together to achieve close coordination between the Pacific Bell Ballpark and West Approach TMPs to ensure that adequate mitigation measures are in place on game days.
- Using the results of surveys currently being conducted, CalTrans, in coordination with the Transportation Authority, MTC, and adjacent counties should address freeway traffic management techniques, including congestion pricing on the Bay Bridge and freeway ramp metering.
- The Department of Parking and Traffic and MUNI should further explore the potential role of taxicabs and dial-a-ride services in SOMA.

V. BIBLIOGRAPHY/SOURCES

1992 Citywide Travel Behavior Survey — Employer, Employee and Visitor Surveys, The Planning Department.

1995 Citywide Travel Behavior Survey Final Report, J.D. Franz Research, et al for the San Francisco County Transportation Authority, April, 1996.

Doyle Drive Intermodal Study Data Collection Report, San Francisco Guideway Associates for the San Francisco County Transportation Authority, March, 1995.

Guidelines for Environmental Review: Transportation Impacts, The Planning Department, July 1991.

Strategic Analysis Report on China Basin Ballpark Transportation Issues, San Francisco County Transportation Authority, April 15, 1996.

Strategic Analysis Report on Multimedia Gulch, San Francisco County Transportation Authority, March 8, 1999.

VI. CREDITS

José Luis Moscovich was the principal author of this report. He had assistance from Authority staff Maria Lombardo and Matthew Seubert, and from our consultants Peter Cohen and Wilbur Smith Associates. We also are thankful for the many comments and helpful suggestions received from a number of individuals from City departments and other agencies, in particular Amit Ghosh, Hillary Gitelman, Paul Lord, and Fred Ridel from the Planning Department; Jack Fleck, Jerry Robbins, Stuart Sunshine and Bond Yee from the Department of Parking and Traffic; Duncan Watry and Peter Straus from MUNI, José Campos from the Redevelopment Agency and Caltrans West Approach staff.