

MTI REPORT F-04-01

**BUS IN THE FAST LANE:  
A FORUM ON BUS RAPID TRANSIT  
IN THE BAY AREA**

*May 2005*

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**Mineta Transportation Institute**  
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| 16. Abstract<br><br>Bus Rapid Transit planning, development, and implementation in the San Francisco Bay Area was the subject of this public forum held November 12, 2004 in Oakland, California. It was another in a series of Mineta Transportation Institute Hot-Spot Forums designed to explore controversial topics and help participants reach consensus. Steve Heminger, Executive Director of the Metropolitan Transportation Commission, delivered the keynote address which placed Bus Rapid Transit development in context with regional long-range transportation goals. A panel of transportation planners and elected officials reviewed the challenges and responses to the Alameda County Congestion Management Agency SMART Corridors Rapid Bus project on San Pablo Avenue. They also reviewed and discussed proposals for future rapid bus and dedicated Busway transit projects being planned for other corridors in the dense urban areas of the San Francisco region's East Bay. Questions from the audience supplemented discussions by the panel. A concluding capstone presentation aimed at tying together earlier discussions was made by Rex Gephart, Director of Regional Transit Planning for the Los Angeles County Metropolitan Transportation Authority. He compared the local efforts to those of other similar programs elsewhere in the United States and the world. Another short question-and-answer period followed the presentation. |  |   |                      |
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Special thanks go to Rex Gephart, Director of Regional Transit Planning, Los Angeles County Metropolitan Transportation Authority, for delivering the capstone presentation that tied together the day's discussions and for his legacy as a pioneer and worthy advocate for Bus Rapid Transit development in the United States.

Thanks also go to Steve Heminger, Executive Director of the Metropolitan Transportation Commission, for setting the tone for this event with his opening keynote address and for his continuing efforts toward achieving better transportation for the San Francisco Bay Area.

For their expertise, enthusiasm, and generosity with their time, we thank the panelists:

- James Cunradi, BRT Project Manager, Alameda-Contra Costa Transit District
- Cyrus Minoofar, SMART Corridors Program Manager, Alameda County Congestion Management Agency
- The Honorable Dr. Peggy Thomsen, Council Member, City of Albany
- Jon Twichell, Transportation Planning Manager, Capital Projects, Alameda-Contra Costa Transit District
- The Honorable Kriss Worthington, Council Member, City of Berkeley

For guiding the speakers and the audience through the presentations and questions, we thank our skilled moderator, Therese McMillan, Deputy Director for Policy, Metropolitan Transportation Commission.

Special recognition is given to the following advisors for helping set the agenda, sharing their expertise, and working to ensure that the discussions at this well-attended event were informative and constructive:

- Dana Cowell, Deputy Director, Caltrans District 4
- Dennis Fay, Executive Director, Alameda County Congestion Management Agency
- Therese McMillan, Deputy Director for Policy, Metropolitan Transportation Commission
- Nancy Skowbo, Deputy General Manager, Service Development, AC Transit
- Roger Snoble, CEO, Los Angeles County Metropolitan Transportation Authority
- Rod Diridon, Executive Director, Mineta Transportation Institute
- Trixie Johnson, Research Director, Mineta Transportation Institute

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Thanks are also offered to Ellen Griffin, Senior Analyst, Legislation and Public Affairs, Metropolitan Transportation Commission; Linda Craig, President, League of Women Voters of the Bay Area; and to Commonwealth Club of California executives Dr. Gloria Duffy, CEO; George Dobbins, Program Director; and Riki Rafner, Director of Public Relations.

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## FOREWORD

The bus, that most basic staple of public transportation, is being transformed by 21st century high technology. However, new capabilities have also brought challenges to the ability of traditional public transit infrastructures to adapt. *Bus in the Fast Lane: A Forum on Bus Rapid Transit in the Bay Area* looks at the technical, operational, political, and social issues arising around Bus Rapid Transit (BRT) as it is being developed in the San Francisco Bay Area. It continues the long-running series of Mineta Transportation Institute Hot Spot Forums. The goal of these events is to move toward consensus through information transfer. Their success is due to the abilities of willing participants, with the required expertise, to share their knowledge in a meaningful way with the general public.

We were blessed to have such a team co-sponsor this event. Most generous with their time and with the expertise and cooperation of their staff were: Dennis Fay, Executive Director, Alameda County Congestion Management Agency; Ric Fernandez, General Manager, Alameda-Contra Costa Transit District; Steve Heminger, Executive Director, Metropolitan Transportation Commission; Roger Snoble, CEO, Los Angeles County Metropolitan Transportation Authority; and Bijan Sartipi, Director, California Department of Transportation/District 4. Also invaluable to the team were the Commonwealth Club of California and the League of Women Voters of the Bay Area.

Events such as *Bus in the Fast Lane* are always the result of the contributions of many, and I want to personally thank all those referenced in the Acknowledgements.

The Mineta Transportation Institute has three primary functions: research, education, and information transfer. It is in the role of information transfer that we helped organize and present this forum. We hope that this edited summary, which is also available on our Website at <http://transweb.sjsu.edu>, will contribute to an understanding of the issues and their possible solutions for those everywhere who are attempting to address the future transportation needs of our society.



Rod Diridon

Executive Director, MTI



## EXECUTIVE SUMMARY

Bus Rapid Transit (BRT) is a relatively new concept that uses advanced technology, along with different scheduling and operating techniques, in an attempt to make buses a more effective public transportation mode—at a lower cost—than other alternatives. There are only a few working examples of BRT in the United States, one of which is in the San Francisco Bay Area.

Advocates say that rapid bus systems can be deployed for \$100,000 per mile and BRT dedicated Busway systems for \$1 million per mile. This is compared to \$100 million per mile for light rail systems and over \$350 million per mile for subways such as BART (Bay Area Rapid Transit).

Opponents say rapid bus is like the camel's nose in the tent, soon to be followed by the whole beast—under-utilized dedicated bus lanes that will further restrict already congested automobile traffic. Critics also fear that businesses may lose parking and be hurt during construction, and local agencies may inherit unknown maintenance costs.

This Mineta Transportation Institute Hot Spot Forum examines these issues in an effort to achieve consensus through information exchange between transportation experts and community representatives.

### The Forum

People interested in the BRT project filled the Dahms Auditorium in Oakland's Bort MetroCenter on Friday, November 12, 2004. The audience was made up of transportation professionals, elected and appointed officials, community-action groups, and interested private citizens.

Greetings and introductions were offered by the organizational hosts Trixie Johnson, Research Director for the Mineta Transportation Institute (MTI), and Therese McMillan, Deputy Director for Policy, the Metropolitan Transportation Commission (MTC). Ms. McMillan served as moderator and introduced the panelists to the audience.

Steve Heminger, Executive Director of MTC, made the opening keynote address to present BRT in context with the MTC's overall transportation goals for the region. His opening

statement was followed by the panel presentations from the following Northern California transportation policy experts:

- James Cunradi, BRT Project Manager for the Alameda-Contra Costa Transit Agency (AC Transit), explaining the project and introducing the basics of BRT to attendees;
- Cyrus Minoofar, Manager of the Alameda County Congestion Management Agency's SMART Corridors program, who discussed the system's technical, financial and organizational interdependencies;
- John Twitchell, Transportation Planning Manager for AC Transit, who spoke about operational and financial issues, challenges, and possible responses for various neighborhoods;
- Peggy Thomsen, City of Albany Council Member and Congestion Management Agency (CMA) board member, who provided a small community's perspective on the benefits and trade-offs of the rapid bus; and
- Kriss Worthington, City of Berkeley Council Member and CMA board member, who offered a large community's perspective on the proposed BRT program.

An audience question-and-answer period followed the presentations. Written questions were submitted to the dais. The panelists responded to other perspectives presented by transit customers and the business or residential communities along the route.

Rex Gephart, Director of Regional Transit Planning for the Los Angeles County Metropolitan Transportation Authority made the final capstone presentation. His summary provided a national and international perspective and described BRT development in one of the nation's largest and most congested cities—a region where the “car culture” is deeply ingrained. Another audience Q-and-A period followed with Mr. Gephart and the panel.

In advance of the event, the transportation planning professionals on the panel were asked to define BRT as it applies to the projects being discussed. Additionally, all the panelists were asked to address three questions at some time during the forum:

1. Are the BRT systems being proposed the most cost-effective means for moving people in the Bay Area, and how was this determined?
2. What else might be done for the same amount of money being suggested, and how do those alternatives stack up against BRT?

3. What are the economic, social, and environmental equity consequences of this investment—who will use it and who will benefit?

The audience asked very good questions, drawing thoughtful, sometimes light-hearted and always informative responses from the panelists and Mr. Gephart.

## **Conclusion**

The lively three-hour session, which focused on San Francisco Bay Area BRT systems in various stages of planning and implementation, included presentations on technology, operations, costs, and community impacts, with an expert panel discussing the issues and answering questions from the audience. Mr. Rex Gephart wrapped up the forum with a comparison of Bay Area BRT to other systems in the U.S. and overseas.

This document is intended to give the reader an impression of the event in real-time. It is a journal of the event; it is not a verbatim transcript. Some comments are edited to minimize redundancy and some personal greetings, exchanges, and asides not directly related to the subject are removed for the sake of brevity. The question-and-answer periods are described completely. The result is a usable document full of the most recent information regarding BRT.





## INTRODUCTIONS

Bus Rapid Transit (BRT) is a relatively new transportation concept, with only a few systems operating in the United States. The U.S. Department of Transportation, Federal Transit Administration (FTA), released a principle publication on the subject in the early fall of 2004 (*Characteristics of Bus Rapid Transit for Decision Making*, Project: FTA-VA-26-7222-2004.1). In the San Francisco Bay Area, BRT is only in the early stages of development, yet already there are conflicting agendas around it, which makes it a perfect topic for a Mineta Transportation Institute Hot Spot Forum.

BRT proponents claim it can provide important traffic relief and reduce riders' travel times without breaking the budget. Opponents say Bus Rapid Transit only causes more congestion for automobiles and deprives businesses of parking.

Alameda County is leading the region in developing BRT. It launched the San Pablo Avenue "Rapid Bus" in the I-80 corridor in 2003. Soon it will extend the system through the heart of Oakland to San Leandro and beyond in the heavily congested I-880 corridor. What has been their experience with the rapid bus that now leads them to expand the program?

The current Alameda-Contra Costa Transit Rapid service runs every 12 minutes and uses traffic signal priority (TSP) to keep lights green and reduce travel time. Stops are further apart than for regular buses and the rapid buses can zip along in the fast lane until their next stop. The new buses have more doors and lower floors for faster and easier passenger access. Other technologies link them with local public safety agencies and the central dispatch center.



**Figure 1 AC Transit Rapid Bus**

The next BRT route, along Telegraph Avenue, International Boulevard, and East 14th Street in the East Bay, will include all these features and possibly dedicated bus-only lanes in some areas. Critics fear that automobile traffic flow will suffer, businesses will lose parking and will suffer during construction, and local agencies will inherit unknown maintenance costs. Are these fears rational?



**Figure 2 Lawrence Dahms Auditorium**

MTI held the BRT Forum in Oakland, California on November 12, 2004. About 120 people filled the Lawrence Dahms Auditorium in the Joseph P. Bort MetroCenter at 101 Eighth Street, which is home to the Metropolitan Transportation Commission (MTC). The forum was attended by transportation professionals, community leaders, and interested citizens from five San Francisco Bay Area counties and Sacramento. Their questions were interesting and challenging.

A panel of experts prepared to share their experiences and future plans for BRT in the Bay Area. The panel consisted of representatives from the Alameda County Congestion Management Agency, which is leading the BRT effort, AC Transit, the system operator, and the communities being served by the new programs.

## **WELCOMING REMARKS**

### **Trixie Johnson:**

Welcome, and thank you for coming. I am Trixie Johnson, Research Director for the Mineta Transportation Institute (MTI) at San José State University. Welcome to *Bus in the Fast Lane*, the most recent in a series of “Hot Spots Forums” conducted by MTI to provide an opportunity for discussion of regional transportation issues and activities.

I would like to thank our co-sponsors for today's event. First is Caltrans District 4, and especially Deputy Director Dana Cowell for suggesting today's topic. Caltrans is a major funder of MTI, and we appreciate that support. Also co-sponsoring is the Metropolitan Transportation Commission. Steve Heminger, the Executive Director and a member of the MTI Board of Trustees, will be today's opening speaker. Therese McMillan, the Deputy Director for Policy will be moderating the session. She is also a faculty member in the Institute's Master of Science in Transportation Management degree program. And finally, thanks to MTC for providing the refreshments during the break later this afternoon. Additional sponsors include the Alameda County Congestion Management Agency, AC Transit, the Commonwealth Club of California, and the League of Women Voters of the Bay Area. Your presence today is very likely a result of the publicity and outreach by one of these co-sponsors.



**Figure 3 Trixie Johnson**

Now, without further delay, I would like to introduce Therese McMillan, MTC Deputy Director for Policy, who will in turn introduce our panel and conduct the rest of today's forum.

## **INTRODUCING THE PANEL AND KEYNOTE SPEAKER**



**Figure 4 Therese McMillan**

### **Therese McMillan:**

First of all, welcome to MTC. As you may know, our Executive Director Steve Heminger is in a press conference right now relative to our long-range plan, which is quite timely, because the subject of BRT is one of the major new transit elements that we are incorporating in that plan. He'll be able to comment on that when he joins us here.

Let me start by introducing the well-represented panel that we have today.

James Cunradi is the Bus Rapid Transit Manager for AC Transit. As he will be explaining, one of the major focus areas of the seminar today is the proposed project that AC Transit is sponsoring. Jim has worked as a Transportation Planner in the Bay Area for 13 years. He received his Master's of City Planning and Master's of Science and Civil Engineering from the University of California, Berkeley. He has worked on many rail, bus and highway projects throughout California. Since starting work at AC Transit, Jim has managed the planning and engineering work for the agency's BRT project on Telegraph Avenue, International Boulevard, and East 14th Street.

Sitting to his left is Jon Twichell, who is the Transportation Planning Manager for AC Transit. Jon is responsible for capital project implementation and has served as the Project Manager of the San Pablo Rapid Bus for the past two-and-a-half years. That project recently received an MTC Award in conjunction with the SMART Corridor Elements to support it. Jon has recently begun project management of the substantially larger Telegraph Rapid Bus Project, which is scheduled to be implemented in early 2006, as you'll be hearing in more detail later. Some of Jon's other upcoming projects include a major parking garage and transit center, to be constructed subsequent to the Rapid Bus Project. Mr. Twichell lives in Oakland with his family. Prior to AC Transit, Jon was a transportation consultant for 20 years, and he has a graduate degree from the Golden School of Public Policy at the University of California, Berkeley.

Next to him is Cyrus Minoofar, who is the Program Manager for the SMART Corridors program in Alameda County. Cyrus is a principal transportation engineer with the Alameda County Congestion Management Agency, known as the CMA. He has been in that position for the past six years, and he manages a \$20-million, 25-agency ITS or intelligent transportation system program. Prior to joining the CMA, Cyrus spent 17 years working for other public agencies, including the Cities of Hayward and Los Angeles, as well as L.A. County. Cyrus received a Bachelor of Science in Engineering from California State University, Los Angeles, and was honored with an Award of Excellence as Entrepreneur of the Year by the California Alliance for Advanced Transportation Systems.

Next to him is the Honorable Dr. Peggy Thomsen, who's a council member with the City of Albany. Peggy has served in elective office in Albany for 24 years. She was a member and president of the Board of Education and is currently finishing a second term on the City Council, where she served as a member and as mayor. Ms. Thomsen has also been a member of the Boards of Directors of several local and regional and public non-profit organizations,

including the Alameda County CMA. I think she'll have some very unique perspectives on the implementation of BRT in the East Bay.

As should the Honorable Kriss Worthington, who joins us as a council member of the City of Berkeley. For the past seven years, Mr. Worthington has represented District 7, which includes the Telegraph Avenue and the University of California campus. Before his election to the City Council, Mr. Worthington served as Executive Director of the Telegraph Area Association and is manager of a Telegraph Area housing cooperative. Kriss declares that Telegraph Avenue is the heart and soul of Berkeley, and its businesses and residents deserve the very best transportation possible. He represents the City of Berkeley on the Board of the Alameda County Congestion Management Agency.



**Figure 5 Panelists Cunradi, Twichell, Minoofar, Thomsen and Worthington**

From the Southland, we have Mr. Rex Gephart. Mr. Gephart is the Director of Regional Transit Planning at the Los Angeles County Metropolitan Transportation Authority or MTA and is responsible for the planning and design of regional transportation projects and programs. Mr. Gephart has worked exclusively in the development of the Federal Bus Rapid Transit Program and pioneered development of the L.A. Metro Rapid Program. He manages Los Angeles' MTA staff, in partnership with the L.A. Department of Transportation, in the planning, design, and implementation of Metro Rapid, and the design, fabrication, and installation of facilities and amenities that support that service. Mr. Gephart has worked in the public transportation field for over 20 years and has a Master's degree in Architecture and Urban Planning from the University of California, Los Angeles. With that, I think that we would like to welcome all of our panelists and look forward to their presentations.

I'd also now like to introduce Steve Heminger, the Executive Director of MTC. As I mentioned before, MTC is launching a review of our draft long-range plan, so with that, I'll have Steve make opening remarks.



**Figure 6 Keynote Address**



## KEYNOTE ADDRESS

### Steve Heminger:

Thank you, Therese. We did release our long-range plan this morning, and we were with the press upstairs, who were interested in it. You never want to walk away from a bunch of reporters interested in what you're talking about.

Part of the draft plan that we released this morning includes a Bus Rapid Transit Project, the AC Transit Proposal in the East Bay along the Berkeley-Oakland-San Leandro corridor. That project is also in our Regional Transit Expansion Program, known as Resolution 3434. Many of you here probably were gratified, I hope, that the transit expansion program that the Commission approved first in 2001, unlike its predecessor, was not just rail. It had both a rail and a bus element, and by the time we revise it early next year, we'll have a ferry element as well. So it is becoming multimodal, and that, I think, is as it should be.



**Figure 7 Steve Heminger**

The inclusion of the AC Transit project, in our overall program, I think, recognizes several trends. It also provides the opportunity and the experience to answer several questions. One of them is what happens when you introduce this kind of service in the urban core, especially in the urban core where you already have, in our case, quite an extensive rail network. How do those modes do in relation to each other—do they compete, or do they enhance the performance of the other?

I think in a lot of newly urbanizing areas, BRT is proposed as a more cost-effective solution to rail, and in many cases that may be true. When you introduce it into a region that already has

an extensive rail network, I think the answer may be different. But I think that's one of the questions that we can help answer in this forum and others.

On the other hand, what we recognize is that the cost of maintaining the existing transit network is staggering. That's especially true for rail, which is so capital intensive. So BRT holds out the promise of not only being perhaps a mode that is easier to introduce, at least quicker to introduce, but also cheaper to maintain in the long run.

In fact, if you look at our long-range plan, we devote some 64 percent of the money in that plan, some \$73 billion, to public transit. In order to sustain that capital plan over the life of the long-range plan, we have to kick in over a billion dollars of federal highway money to fill the capital shortfalls that are thereby created. Even after doing so, we still have a \$4 billion shortfall for public transit capital investment—that's replacing the buses, replacing the rail cars, maintaining the tracks. In fact, most of that is replacing the rail cars and maintaining the tracks, and that is why it is so significant for us.

I think it's important that we don't let BRT take on the cast of the flavor of the month. There is no mode that is the silver bullet, as much as its advocates would like it to be, and that's as true of this mode as any others.

Some questions that I hope this conference, and other sessions like it, will help us examine are those that I just raised about the relative synergies between bus and rail in the urban core. What about the trade-offs with automobile movements in the BRT corridors? The recent dust-up that we've seen in Los Angeles between the MTA, which is running the bus line, and the L.A. Department of Transportation, which runs the road network; I'm interested to learn what our panelists and others think about that.

Another part of our draft long-range plan that we're releasing today has to do with trying to better knit transportation and land-use decisions and investments. In the case of rail, there's fairly well-established literature about the construction of high-density housing near rail stations and its effect on ridership. Will that same relationship hold true for bus? In other words, will developers see the BRT investment as one permanent, like rail, or as one that might change? So, I think there are several opportunities and challenges with respect to this mode that I think this forum and others would help us answer.



I would like to leave you with a notion that perhaps is not on your agenda today. The Bay Area is very well-blessed by the level of express bus service that we have on in our region. I think about AC Transit's longstanding trans-bay service and the Golden Gate service across the Golden Gate Bridge. We've got a long pedigree, and in those cases, capturing relatively affluent customers who are supposed to hate buses. So that is clearly a victory, a success story that we have in the Bay Area that we need to build on. Recent funding initiatives, both from Governor Davis and Regional Measure 2, provide substantial new funding to that mode. In the case of Regional Measure 2, it provides capital as well as operating support.

We also released as part of our long-range plan the notion that we ought to continue that success by expanding our carpool lane network, the HOV (high-occupancy vehicle) system in the Bay Area, so that we have a complete network of lanes that carpools and express buses can use, and that we finance that expansion by letting single-occupant motorists pay for the privilege of using those lanes—the so-called hot lane idea. That's a pretty good deal if you're a carpooler or an express bus user. It's also a deal, in terms of single-occupant motorists, which they can take or leave, so it introduces the element of choice.

If it's not on your agenda today, that's fine, because BRT is a rich subject all by itself. But I would ask you to keep in mind that in our region, at least, and probably in others, we have the potential to expand the bus mode on both the highways and on the arterials. I think we ought to think about the ways that they relate to each other as well, because many people will be perhaps using both to get to their ultimate destination.

So again, welcome to MTC; welcome to our facility. I look forward to a good discussion with all of you today, as well as to the financial challenge of actually building some of these projects in our region, and elsewhere, in the future.



## BUS RAPID TRANSIT OVERVIEW

### Therese McMillan:

Let's start with the panel presentations. Our first speaker is Jim Cunradi. We've asked our speakers to limit their comments to 10 minutes so that we can have the benefit of hearing your questions and the answers from the panelists. So Jim, let's start.



**Figure 8 James Cunradi**

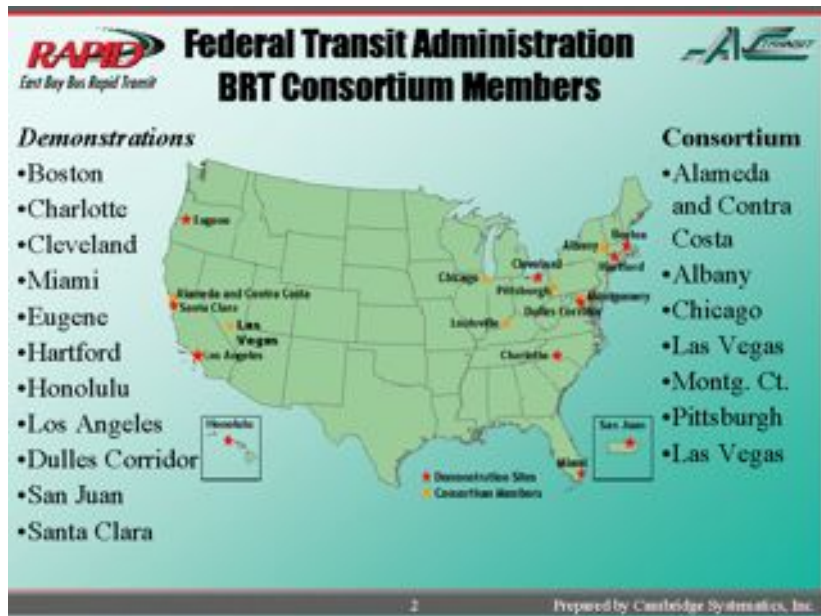


### James Cunradi:

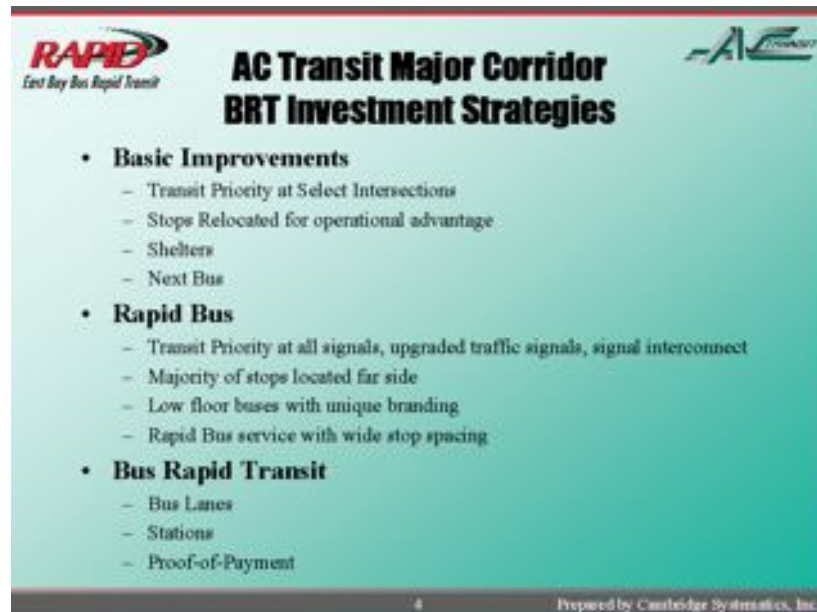
Thanks to the Mineta Transportation Institute for inviting me here today. I especially appreciate the warm remarks from Therese and Steve.

Steve mentioned that he doesn't want BRT to become a flavor of the month. Well, even within AC Transit and within BRT, we have several flavors, so I'm going to talk a little bit about AC Transit's approach, and of our flavor of BRT.

Around the country, BRT is seen as a way to get high-quality transit at a lower cost than you can usually achieve by using rail. Many cities around the country are involved with the Federal Transit Administration in pursuing BRT plans. These range from buses that operate in mixed flow, buses that operate in their own lanes, and buses that have electronic guidance. There's a range of options that are being tried everywhere in the country.



AC Transit operates the service in the East Bay, which is wedged between the hills and the Bay, which carries about 225,000 passengers a day, half of which are on our major trunk routes. This is where we started all of our BRT planning, looking at these major routes that carry 100,000 people a day and tending to focus on a capital improvement program for these corridors. After my presentation, Jon and Cyrus will talk about one corridor that we already have up and running.



The slide is titled "AC Transit Major Corridor BRT Investment Strategies". It features the "RAPID" logo on the top left and the "AC" logo on the top right. The content is organized into three main bullet points, each with sub-points:

- **Basic Improvements**
  - Transit Priority at Select Intersections
  - Stops Relocated for operational advantage
  - Shelters
  - Next Bus
- **Rapid Bus**
  - Transit Priority at all signals, upgraded traffic signals, signal interconnect
  - Majority of stops located far side
  - Low floor buses with unique branding
  - Rapid Bus service with wide stop spacing
- **Bus Rapid Transit**
  - Bus Lanes
  - Stations
  - Proof-of-Payment

At the bottom right, it says "Prepared by Cambridge Systematics, Inc." and there is a small number "4" at the bottom center.

At AC Transit we have three flavors of BRT. Basic improvements are essentially on streets where you can't do a lot due to their narrow width and other constraints. Here we propose small changes, such as just moving bus stops, fixing signals, and adding shelters, adding real-time information. The second level we call rapid bus, which is in place on San Pablo Avenue today. That has a somewhat more expansive approach, with transit priority operating all the traffic signals, locating most bus stops on the far-side of intersections, implementing low-floor buses, unique branding (we call them the rapid bus), and wider stop spacing. Finally, Bus Rapid Transit, by AC Transit's definition, is the most expansive of all. It includes bus lane stations and proof of payment. This means that a bus pulls up to a station, all the doors open, passengers get on at any door, and there's no fare collection on the bus.

Here is our corridor. The shaded area is the older developed area of the East Bay; it's the densest area of the East Bay. There are places that have 23,000 or more persons per square mile, and this is basically the center of it. To the north and to the south, you get more suburban densities, but it has a dense urban core.



### BRT Facts at Glance

- AC Transit's most heavily used route over 30,000 riders/day
- Serves UC Berkeley, Downtown Berkeley, Telegraph Avenue Corridor, Downtown Oakland, Fruitvale District, East Oakland and San Leandro and a major regional shopping mall.
- BRT would increase corridor ridership by 16,000 riders / day
- Major Growth projected for downtown Oakland. Employment projected to rise to 80,000. Mayor's initiative to bring 10,000 residents downtown
- BRT will decrease bus travel time by 1/3
- Faster travel time will allow headways of less than 5 minutes not possible today
- Corridor within a 5 minute walk of 1/2 the jobs in Oakland and 1/3 of city residents



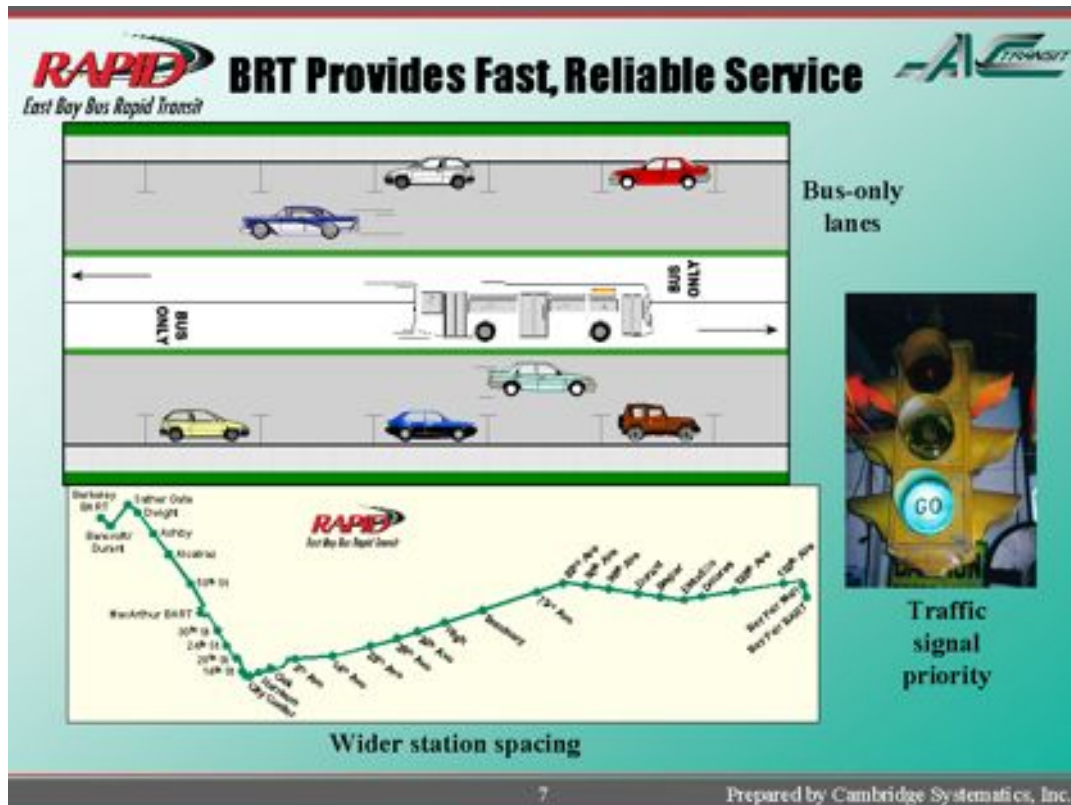
Our project, the Bus Rapid Transit Project, goes essentially on Telegraph Avenue, International Boulevard, and East 14th Street. It extends north to downtown Berkeley and the University of California with 30,000 students and 10,000 employees. Downtown Oakland has about 80,000 employees. It's essentially right in the middle of everything and service to it corresponds to the old trolley system that was in place years ago, the Key System. Our bus line that we're proposing to upgrade to BRT carries 30,000 riders a day—that's already in the range that light rail systems are often considered—and it serves major destinations.

We think that with BRT, we could increase the corridor ridership by 16,000 people. We're expecting major growth, employment growth in downtown Oakland, because there's a move afoot to bring new residents downtown. Also, up and down the corridor, there are proposals to bring in infill developments, small apartment buildings, and commercial projects.

The BRT project will reduce bus travel time by about a third and it will allow us to put bus headways of five minutes or less, which we currently can't do because of traffic congestion and the state of the traffic signal system. When I said that the corridor is in the middle of everything, it's essentially a five-minute walk from half the jobs in Oakland and a third of the city's residents.

BRT has stations that look like light rail stations, such as the Lymmo system in Orlando, Florida. We would have ticket vending machines at the bus stations, real-time information, and insofar as the technology allows, we would have level boarding between the platform and the bus, thus hopefully eliminating the need for the ramps that are currently required for strollers, persons with mobility impairments, and wheelchairs.





BRT gets its speed and its reliability through several features; one is dedicated bus lanes, which are very controversial. They are the biggest visual impact of the system, the biggest impact to traffic, but they also provide the biggest leg-up for the bus in providing high-quality service. Second is wider stop-spacing. Instead of stopping every other block, the bus might stop every half-mile or so. Finally, there is traffic signal priority (TSP), which allows the buses to communicate to the traffic signals to give them extra green lights.



When we're looking at alternatives in the environmental process, we get to a very fine grain. For instance, in downtown Berkeley, we're looking at two alignment options, three ways to rebuild Shattuck Avenue, and so on. In downtown Oakland, we're looking at three different options to get through downtown. We're looking at different options in the East Lake neighborhood, which is just east of Lake Merritt, and in San Leandro, we're also looking at multiple options. The purpose of that is to look at the range of BRT strategies that we can do, measure their environmental impacts, and then report back to the community on them. Essentially we're studying all those alignment options.





We're also studying different operating schemes. Express BRT with Local has the rapid buses in the bus lanes and a local service in the mixed flow. We're looking at another strategy which spaces the BRT lanes closer together, but eliminates local service, so we're testing people's proclivity to walk, and also the frequency of service.

These systems have been done before. There are bus lanes in Vancouver; "Before" is a strip-mall-type development and "After" is with their BRT project.



Here are some of our proposals for the East Bay, starting in the south in San Leandro on East 14th Street and 143rd Avenue.

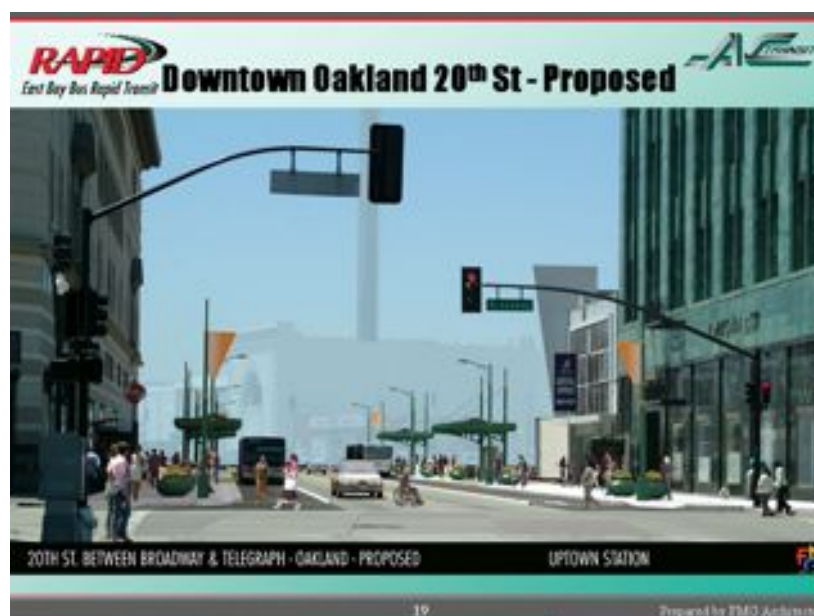




A “Before” and “After” with bus lanes on International Boulevard and 98th Avenue where we’re getting into a more dense residential and commercial neighborhood.



Here's a "Before" and "After" in downtown Oakland—20th Street between Broadway and Telegraph. This would become a major transfer point between the San Pablo Rapid service, the BRT service, local buses, trans-bay buses, and the BART system. This would be a block-long station that facilitates those inter-modal transfers.



Heading north is “Pill Hill” by Summit Medical Center, shown today and with a future BRT station and lanes in the middle.





Downtown Berkeley, what it looks like today and one possible scenario to have BRT lanes and a station in the middle of the roadway.





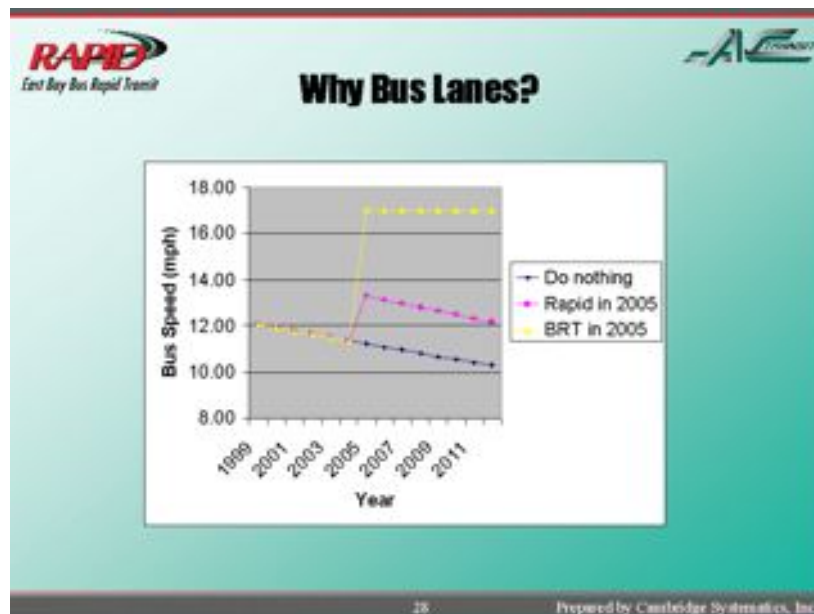
From the air, flying over the Bay Area, this is what it looks like from above. The green areas are areas where you have opportunities to put in landscaping, hardscaping, or other scenic-type features.





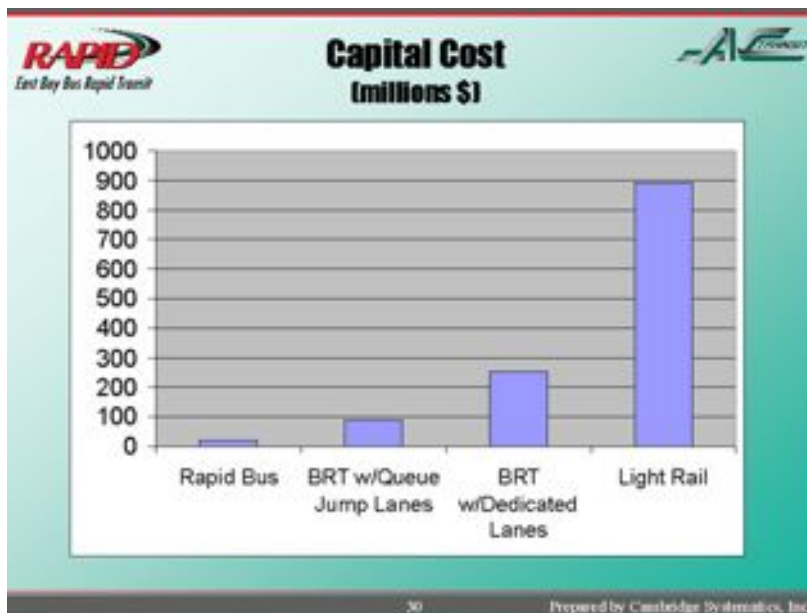
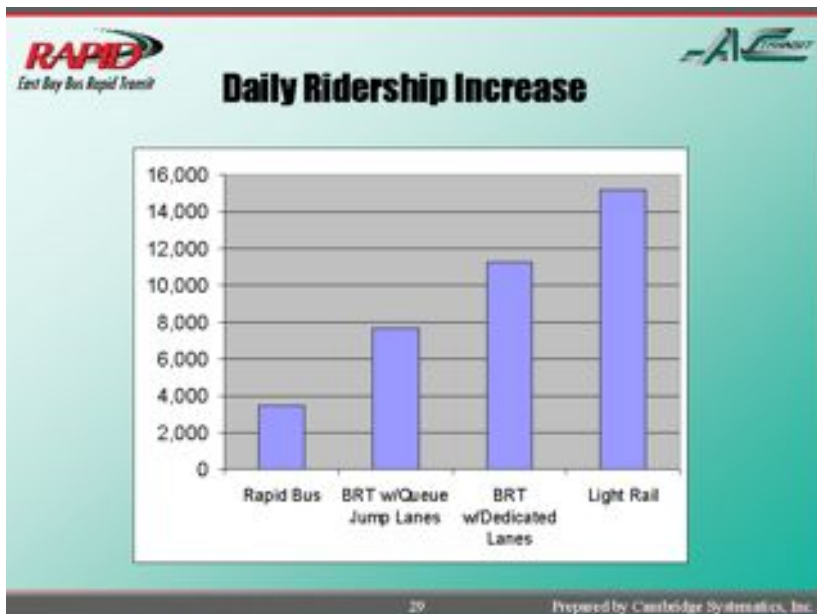
This is at a turn; this is essentially our strategy for placing BRT stations, northbound bus platforms on the north side of the intersection, southbound on the south side of the intersection, on split platforms like this.





Why bus lanes? This graph shows what happens, if we had the money, and we had a choice of putting in a rapid bus, keeping things the same way they are today, or putting in BRT. The trend line starting at 12 miles an hour and going down is our current trend line at AC Transit; that is constant reduction in operating speeds of the buses. The pink line in the middle shows if you're able to get a rapid bus, you're able to get a jump on the loss in speed, but you still suffer the decline as traffic increases. The yellow dashed-and-dotted line shows the speed of BRT, the decline is much slower because you preserve that right of way for dedicated bus lanes. There is some decline because cross-traffic grows, but in general, you're holding that constant in perpetuity.

Here are some ridership increases: with rapid bus in the corridor we'd get around 3,500 riders; if we use a Bus Rapid Transit system with queue-jump lanes, which maybe can be explained a little later, you get around 7,700 new riders to transit; BRT with dedicated lanes puts you up at around 11,000 riders, compared to light rail which gets you over 15,000 new riders.



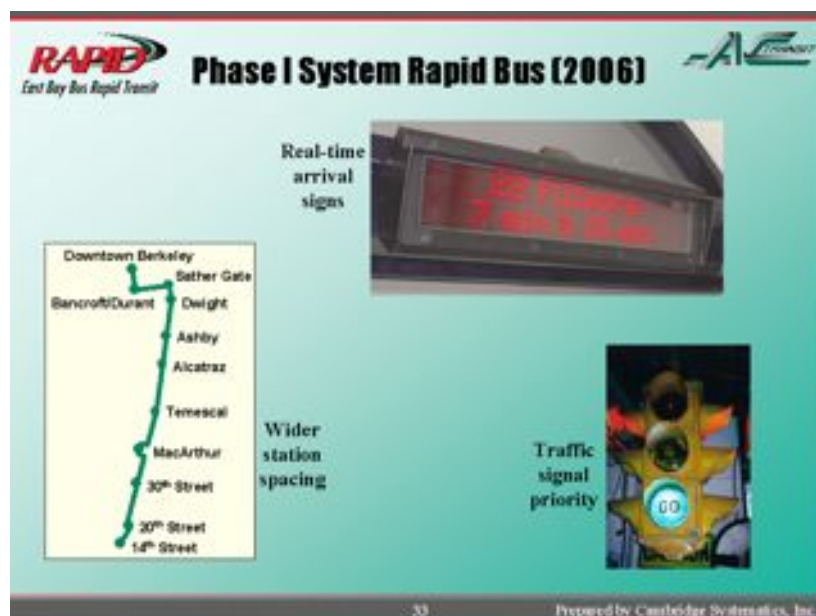


One of the most controversial aspects of taking lanes is what's going to happen to traffic, so we're looking at this at many different levels. The highest level is what happens to traffic on parallel streets. We're also going to look at level-of-service and delay at over a 100 intersections, and we're going to look at neighborhood-level diversions. For instance, "If the traffic's bad, won't they cut through my neighborhood?" is a question everyone is asking, so this is at the highest level.

In the middle is Telegraph Avenue; the darker color is the year 2025 traffic volumes, bi-directional, without BRT; the lighter color is when we add BRT. So, Telegraph has a drop of about a 1000 cars per hour in both directions and we see small increases spread across the board. Essentially people will be changing their decisions on the mode, because some people switched to the BRT, and also people will change their routes from the origin to the destination. Thus, we see small traffic increases spread over many streets.



So where we are is that we selected BRT in a major investment study which we completed in 2001. We are now in the middle of an environmental study, which we hope to release as a draft after the first of the year. We will refine the preferred alternative in the next year, and then go into design in 2006. If all goes well funding-wise, construction could begin around 2008 or 2009.



In 2006, as a first phase to this BRT project, we're going to put in rapid bus, which Jon and Cyrus will talk about in detail.

### Therese McMillan:

Great, thank you. We wanted Jim to take as much time as he could simply because he lays the groundwork and the backdrop I think we need for better understanding the presentations of our other speakers, next of which is Cyrus Minoofar.

## SMART CORRIDOR AND RAPID BUS PROGRAMS

### Cyrus Minoofar:

We worked so well with AC Transit that we decided to combine our presentations; hopefully we can save some time as well.

Good afternoon, thank you for coming, this is very exciting. I want to go through an overview of what the East Bay SMART corridors program is, and then we will turn to the subject at hand, the BRT and rapid bus.



Figure 9 Cyrus Minoofar

Basically, East Bay SMART corridors program is a multi-jurisdictional project that has 25 agencies involved—that really used to be our weak point, but now it has proven to be our strength. I'll quickly go through my presentation and give you an overview of what SMART Corridor is, and then turn it over to transit expert Jon Twichell to talk about San Pablo Rapid Bus.



### East Bay and Project Area

- Bay Area consists of 9 counties
  - » 21 million annual trip made in the Bay Area
  - » Over 600 miles of freeway
- East Bay comprises of Alameda and Contra Costa Counties
  - » Alameda (Pop. 1.4M)
  - » Contra Costa (Pop. 950K)
- I-880 & I-80 are worst congested freeways in the Bay Area
  - » The East Bay SMART Corridors is focused on these two corridors



I know there are a lot of differences between BRT and rapid bus, and there are a lot of challenges. One thing I want to mention is that I never thought people would give up their cars and get into the buses. I think Jon will talk about the fact that about 19 percent of the people that were surveyed on the buses, the rapid bus on San Pablo, used to be single-occupant car drivers.

The East Bay accounts for half of the population in the Bay Area, and of course, is honored with having two of our corridors, Interstates 880 and 80, as being the worst congested areas on the freeways in the Bay Area.

One thing we learned is we cannot really build our way out of congestion, so we're looking at many different tools in our toolbox and one of them is transit. If you look at the top, you see that transit is one of the major things that we are doing. While incidents account for about 40 percent of our congestion, we can't ignore that, but today I'm going to really focus on the transit part of our program.



The slide features a red header with the word "RAPID" in white, a central strip of four small images showing a bus, a car, a person on a bicycle, and a carpool, and a circular "CMA" logo on the right. The main content is on a yellow background with the title "SMART Corridors Description" and a bulleted list of program details.

**SMART Corridors Description**

- A multimodal program to increase efficiency and safety
- Program focus is on the arterials, not the freeways
- The program is a partnership of 25 federal, regional, and local agencies
- Alameda County Congestion Management Agency (CMA) is the lead agency for planning, design, construction, maintenance and management of the system
- Each local agency is responsible for operations under a unified Operations and Management Plan

The SMART Corridor's program, as I mentioned, is a multi-modal program. It deals with transit, motorists, bicyclists, and pedestrians. It has 25 federal, regional, and state agencies, including Caltrans as well as the MTC, our sister agency in Contra Costa County, and other cities in between. The corridor that we're going to concentrate on is about 40 miles long and it has over a hundred traffic signals. One of the successes for our program was that we decided to provide, from a single point for all jurisdictions, some sort of seamless operation in terms of the planning, designing, constructing, inspecting all the improvements, as well as maintaining the system for them. So, basically, we don't burden all the agencies with a bunch of gadgetry.

One of the strengths of the program also has been that it is linked throughout with real technology, and it's intelligent. Now we have a lot better communication between the agencies and, as you know, if you have fifteen agencies with systems, you have fifteen different city councils, fire departments, and police departments; it's a huge task. We have binding agreements in place allowing us to do all this work.



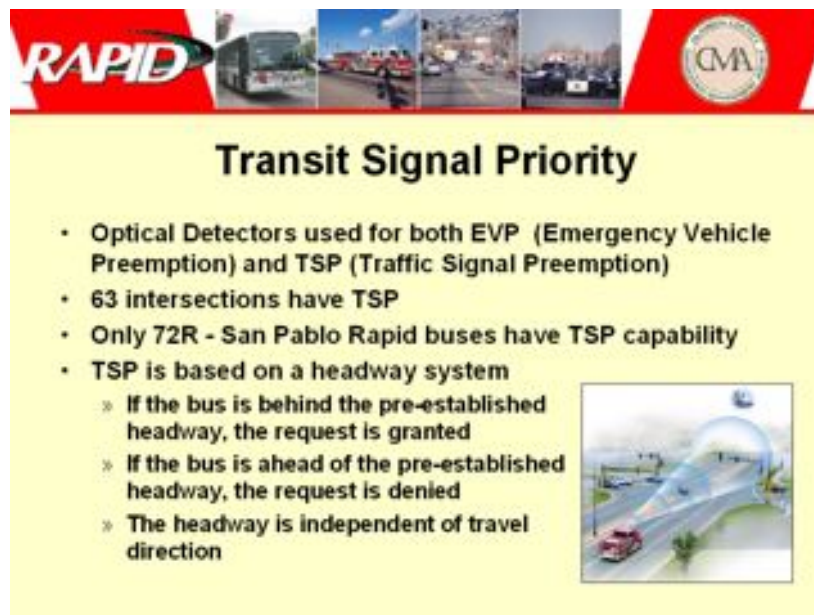
### **SMART Corridors Goals**

- Create monitoring capabilities along the corridor for the transportation agencies
- Collect real time information about corridor conditions and disseminate to the transportation managers and to the public
- Exchange information between agencies
- Improve coordination between agencies
- Improve transit service along project corridors

The goals of our program, as with anywhere around the country, if not the world, with the same type of mission, are trying to improve efficiency as well as safety. We're also trying to provide a little bit of help with decision making for the public. We are trying to empower motorists by providing real-time information about the congestion levels of the corridors so they can react to any changes that we want to make, making it seamless to the motoring public. We're trying to exchange information through all 25 agencies involved, and also improve the coordination between the agencies.

In terms of traffic signals, they would be seamless. If you're starting in Contra Costa County on Highway 4, coming all the way to Oakland, as a motorist you don't really care which agencies you are going through. But every agency has its own definite hardware, software, and policies. We have been able to provide all of these agencies a clearinghouse, and that's why San Pablo rapid bus, among other things that AC Transit has done, has proven to be very successful.


Another of the major points for us is to improve transit. We have to work with transit and get every inch of efficiency out of our existing system, and that's what we have done on the San Pablo Corridor. So, without widening the roadway, without impacting our right-of-ways, because real estate in the Bay Area is so expensive, we hope to be able improve the efficiency. The way we have done it for the San Pablo Corridor is by improving all the traffic signal hardware and loop detectors (sensors for the signals) to make them more efficient. Also, we are providing pedestrian push buttons, again to improve the efficiency of traffic signals. All of these will come into play, because the buses are mixed with other cars along the roadway.



The slide features a red header with the word "RAPID" in white, a small image of a bus, and the CMA logo. The main title is "Transit Signal Priority". The content includes a bulleted list of system details and a diagram of a headway-based system.

**Transit Signal Priority**

- Optical Detectors used for both EVP (Emergency Vehicle Preemption) and TSP (Traffic Signal Preemption)
- 63 intersections have TSP
- Only 72R - San Pablo Rapid buses have TSP capability
- TSP is based on a headway system
  - » If the bus is behind the pre-established headway, the request is granted
  - » If the bus is ahead of the pre-established headway, the request is denied
  - » The headway is independent of travel direction



On top of that, we have provided a traffic signal priority system which is very simple. This has proven to be very, very successful, because it is simple and it works. It provides a headway-based system. Basically, that means instead of having published schedules, you have a bus every 12 minutes, which I think is the case on San Pablo. You really don't need to have published schedules. We're also providing early green, or extending the green, so the bus doesn't have to stop twice to get through an intersection or to the bus stop. The software works, the hardware works, and now what we need to do is operate it and maintain it so it stays a success story.

This is the public Website that we have. We have some challenges with it. We have to make it much, much quicker because of the lack of patience of people these days using the Internet. It takes about 15 seconds, or sometimes 20 to 30 seconds to get real-time video streams to come up; we're working to reduce that to five seconds, because people are not that patient.



This picture of the video stream shows the level of congestion. We have been able to work with the MTC's 511 number, which used to be just travel info. We grab their information and show it on the Website along with the CHP (California Highway Patrol) incidents so all are in one place. Now you can see the volumes of cars. Everybody who has put SMARTcorridors.com into their media players would be able to get these in real-time, 24-7.




So with that, I'll turn it over to Jon.

**Jon Twichell:**

We're trying an experiment here today. Seeing that Cyrus and I work together so closely on all of this, we figured we'd work together on doing the presentation as well. I'll talk a little bit about the San Pablo Corridor, and then I want to talk about the word of the day, which is time, because time is the most important operative thing in what we're up to.




**Figure 10 Jon Twichell**



### San Pablo Corridor Characteristics

- 14-mile long corridor
- Includes 7 cities in 2 counties
- Half of route on state highway
- Corridor population of est. 135,000
- Density of 11,000-18,000 per square mile
- Heavily low income - 14% of population below poverty line



In our case, we have a 14-mile long corridor that runs from Contra Costa College, all the way down San Pablo Avenue to downtown, and then over Broadway to Jack London Square. It includes seven cities, two counties, half of which is Caltrans highway, half is local streets. It serves a very large population in a moderate to low income area. We have had service there for quite a while since the 72 Local bus, and then the Limited.




Depending on the weather and the economy, there are about 15,000 people a day traveling in this corridor. Bus stops average every couple of blocks. You have everything from BART stations to junior colleges to several major shopping centers—just a whole bunch of different places that we serve in the course of the route.



### Transit Conditions Prior to Rapid Bus Deployment

- Served 15,000 passengers daily
- Limited and local service
- Bus stops every 800 ft on average
- Serves Downtown Oakland, major shopping centers, a hospital, a local college, BART train stations, and other attractors

### Definition of Rapid Bus

- Headway based schedule w/ maximum 12-min. headways
- Stops one-half to two-thirds of a mile apart, on average
- As many stops on far side of intersection as possible
- Traffic signal coordination, transit signal priority, queue jump lanes
- Recognizable shelters, with Rapid branding and bus arrival information signs
- Recognizable vehicles, with Rapid branding and features which reduce dwell time.

Here's a definition that we use for rapid bus. As Jim was talking about before, there's a lot of jargon in our business, and rapid bus really is what you'd call the base case, your Level 1 of BRT.

What we're doing here owes a great debt of gratitude to Rex Gephart for what was done in Los Angeles, because they were the first ones to really get out there and do this sort of thing. I think they are expanding to something like 28 routes in the Greater Los Angeles area.

We have more modest ambitions. If we can get our five or six major trunk lines into this sort of service, we would be very happy. A headway-based schedule just means that the buses go out every 12 minutes, and they can get to the other end as quickly as possible, they're not limited by a paper schedule. Stops are a half-mile apart, that's basically how it's working out for us. We move the stops to the far-side of the intersection, so buses get through the intersection before they have to load and unload.

Thanks to the work we did cooperatively on SMART Corridors, the traffic signals in this corridor are not only coordinated, they're all hardwired together. There's been a tremendously high level of investment in technology in order to make a simple thing happen, which is to speed up traffic and speed up bus schedules. We have signal priority, which we talked about briefly before. We have a couple of very simple things for bypassing queues along lines, and we've put a lot of energy into branding this. The shelters are very recognizable, our logo up there is very recognizable; it's on the buses, and you see it on cable TV in commercials. We've put a lot into this, and we've gotten a very, very good response out of it.

We implemented this first line in June of 2003, essentially spending the summer quarter getting all the kinks out and getting things going. It's been running over a year now, and before I talk about how we're doing, let me get back to the time issue.



The fact of life is that time is more important than money these days for people. One way you see that in our business is this thing called fare elasticity. If you make a change in fares, you see a certain change in the results. But if you make a change in the speed of the bus, if you can reduce it dramatically, you see a response in ridership that is far beyond the changes than if you make a change in the fares. If you were to do time elasticity, it would be something like ten times more effective than fare elasticity, so that's a very important thing to consider. Our results essentially mirror the results in Los Angeles, but are less than the results they've had in Boston with the same sort of service. So, this is something that has been replicated in other cities. Las Vegas has a system that's up and running now too.

There is a real definite cause and effect. If you invest this money in what you're doing, you will see these results. It is really a win-win, because not only is it providing better service for people, it is a genuine productivity gain within the bus business, and a productivity gain is a very big thing.

In changing the service that was out there, we went to this headway-based schedule. We replaced the Limited service that was there before with rapid bus. Where we had 45 Limited stops, we now have 26 Rapid stops. We moved from 50-50 to 90 percent of the stops being "far-side." We calculated a 20 percent time savings into our new schedule. Where a lot of this comes from, in terms of technology, is the

3M Opticom system. This has a lot of advantages, because on one level, it provides priority for the signals for emergency vehicles; fire and ambulances get preemption. Then on the second level, buses get priority under appropriate conditions. And we did some queue jumps.



### Service Changes for 72R

- **Headway-based schedule**
  - » 12-minute peak frequency on top of local service
- **25 Rapid stops at major intersections**
  - » 0.64 miles apart on average
- **Far-side stops**
- **20% time savings calculated into schedule**





We have Next Bus arrival systems now operating in all of the shelters outside of Oakland. After a long period of time, an agreement is about to be signed for the bus shelters within Oakland. So we anticipate having this line fully integrated with the Next Bus arrival information, I would hope, by the end of this year. Of course, when we go forward with the International/Telegraph Corridor, we'll be in place to implement it pretty quickly there also.

If you're at a bus shelter or a kiosk, the local routes are predicted for the next two buses, and the Rapid is predicted for the next two buses. This is bringing reality there, instead of a paper schedule that may or may not be accurate. Now you can get accuracy, plus or minus a minute, on when the buses are actually going to be there. One of the things we're talking about these days is further extending Next Bus so all you need is a cell phone and you can call in, enter in a code, and it will tell you when the next buses are coming to your stop, and you don't even have to be there. These types of things we find to be extremely productive.

Again, we've put a lot into marketing and branding. Actually we're going to improve the sign pole; we're doing a revised design of it.

Our part of this, as opposed to the SMART Corridor's part, was put into funding the transit portion.



The slide features a header with the 'RAPID' logo in a stylized font, followed by a row of five small images: a bus, a street scene with a bus, a person walking, a street scene with a bus, and a street scene with a bus. To the right is the CMA logo. Below the header, the title 'Rapid Bus Program Funding' is centered. Underneath the title is a list of funding sources:

- Alameda County CMA
  - » \$3.0 million
- Contra Costa Transportation Authority
  - » \$1.0 million
- FTA Earmark
  - » \$0.5 million

We've got about four-and-a-half million dollars invested in the corridor. That does not include the buses, which are another four-and-a-half million dollars. That does not include a lot of the signal work that was done as part of the SMART Corridor, so this understates a little about what these costs actually run. In any case, you can do the full soup-to-nuts Level 1 of this type of BRT for less than a million dollars a mile.

The slide features a header with the word "RAPID" in a stylized font, a small image of a bus, and a circular logo with the letters "CMA". The main title is "Performance Measures". Below it, there are two bullet points. The first bullet point is "Performance Measures" with two sub-points: "Before and After Studies Completed" and "Evaluation has shown 17% reduction in total travel time and increased ridership of 66%". The second bullet point is "Rapid Bus on other major corridors" with two sub-points: "East 14th/International/Telegraph" and "Macarthur".

**Performance Measures**

- **Performance Measures**
  - » Before and After Studies Completed
  - » Evaluation has shown 17% reduction in total travel time and increased ridership of 66%.
- **Rapid Bus on other major corridors**
  - » East 14th/International/Telegraph
  - » Macarthur

Now here's where we get down to the reality part. Nelson\Nygaard Consulting has done "before" and "after" studies for us. We tried to be "apples-to-apples" as much as possible; we compared the Rapid to the former Limited. The actual rapid bus running time, as opposed to the schedule's running time, has seen a 17 percent reduction over the former running time for the Limited, and that is between 26 percent and 30 percent faster running time than the Locals. The results of that is a 65.8 percent increase in ridership during just the same hours that the Rapid and the Limited run. If you look at a day's total, ridership on the Rapid is three times what it used to be on the old Limited, and that was just in the peak periods.

People thought you couldn't run this sort of service in the middle of the day, but what we found is when we do run all day, we get lots and lots of ridership all day long. Our total all-day ridership is more like a 200 percent increase, and during the peaks, a 66 percent increase. That kind of increase in ridership in our business is a very, very big deal.

Again, these are the same sort of results that have been achieved in other cities. That's why BRT is such a promising thing for the people who want to use it, because it now becomes more competitive with automobiles.

As Cyrus said, one of the things that we found which was very fascinating, because we didn't expect it, was 19 percent of the people on the rapid bus on San Pablo, which is an urban street, used to drive. That's 1,100 car trips a day off San Pablo Avenue. Again that's a win-win for everybody—traffic flows better, and more people are on the buses. The person throughput for the corridor is substantially increased.

Next we are going to implement rapid bus technology on the Telegraph Avenue/International Boulevard/East 14th Street Corridor. Again, CMA and AC Transit are cooperating on this. It's a much larger project, it's a lot more ambitious, and we are investing a lot more money in this particular portion of the work than was invested in the San Pablo Corridor. It's still under a million a mile, but it's still a lot of money. At this point, I'll stop, I'm sure there are lots of questions and we will be happy to answer them.



**Additional Information & Contacts**

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**Web Sites**  
[www.smartcorridors.net](http://www.smartcorridors.net) (project info)  
[www.smartcorridors.com](http://www.smartcorridors.com) (public access)

### **Therese McMillan:**

Thank you, Jon. And we're almost at questions, but I think one thing that all of us in the public transportation business are familiar with is that when you introduce any new concept, having buy-in from the communities is essential to the success of the project. Our next two speakers will give us a flavor of that. First we have Councilwoman Peggy Thomsen from Albany, followed by Kriss Worthington of the City of Berkeley.

## COMMUNITY PERSPECTIVES

### ALBANY—A SMALL CITY VIEWPOINT

#### Dr. Peggy Thomsen:

Good afternoon. Albany was one of the cities interested in having the service and indeed it has, in the last year, proven to be a real service.



Figure 11 Peggy Thomsen

On the one side, though, you have the transit agency which has the goal of seeing this up and running in the most efficient manner as the gentleman said. On the other side, you have the local jurisdictions, and we have a bit of tension. We want that goal to succeed, but we also have local needs, local wants, and local control necessary in some areas. So, I'm going to give you what may seem like examples of minor situations that are not technical. I know most of you are interested in the technical aspects, but these situations need to come up in your discussions with the local jurisdictions, and better early rather than later so that people do feel the buy-in.

One of them has to do with local control. When you join the JPA (Joint Powers Authority), you say okay, I'm willing when I come to the table at CMA. You need an agency like CMA, where the people are really good at bringing groups together, and moderating for all of the groups. That's what we have at our CMA.

One minor situation had to do with street furniture. We just had spent a whole lot of money restoring our major cross street and our street furniture was green. So, when the consultant came, he decided he really wanted berry for the whole corridor. Well, we said, we preferred to have green, but we were outvoted, and we said, okay, we can live with this. Turns out, that later I missed a meeting and happily we ended up with green furniture. These are issues that seem small, but when you're dealing with the local jurisdiction, it's a good idea to really think about them.

On a more significant issue, Jon and I had discussions about far-side versus near-side bus stops. You heard him say he has significantly more far-side stops now. Albany turned out to be one place that doesn't. The problem was that the property owners and the merchants were a bit surprised by the fact that after years and years of having stops in particular locations, they were going to be changed. By the time that discussion came up, our very competent city staff had spent a lot of time working with the community, and the Council also spent a lot of time on this. We ended up with a near-side stop. So, my suggestion is, get these issues out early and talk to the community early when you're making significant changes. I do have to say we made compromises for some of the businesses. AC Transit moved some stops in that vicinity that people wanted to have moved. That helped the atmosphere, and in the year-and-a-half that we have been in operation, we have had no complaints from businesses or the public. AC Transit, I think you might like to hear that.

Also, I would like to mention the signaling. We were concerned about the signals because San Pablo Avenue, as some of you may know, is a very wide street. We were concerned about pedestrian crossings, but that has not been a problem at all. So, that's another area to consider.

Following through is really important. One thing that we were expecting at a major stop was a shelter, but we ended up with a kiosk at first. We said, wait a minute, we really wanted that shelter; we want to serve the people. So by working with AC Transit and Lamar Advertising (they were very helpful)... we now have a shelter and I notice that people are using it regularly. Be sure that when you say you're going to put in one thing, if you put in something else or if you ask staff if you can put in something else, make sure that the elected officials are aware of what you're doing. Given this, I also want to say that currently AC Transit has a system in which they're offering choices as far as amenities go to the local jurisdictions; for example, the tripping of signals and so forth. I think that's a very helpful thing to do. I think that makes for good relationships, to give some choices.

Where would Albany be if we were to do this project again? Albany would probably be right where it was before. What I think is that it has been a learning experience for us. We would know the questions we wanted to ask, before we went in, before we joined the JPA. From our perspective, these projects are good because they serve the wider community, but we do want to be sure that the local communities are preserved as well.



**Therese McMillan:**

Now we have Council Member Kriss Worthington, from the City of Berkeley.

## **BERKELEY– A LARGE CITY VIEWPOINT**

**Kriss Worthington:**

For too many decades, bus service in the Bay Area has been severely under-funded—operations of buses, capital funding for buses. This BRT idea is one of the few cases where we actually have people coming to the table and working together to make what probably will be a dramatic improvement in bus service for the East Bay.

I am thrilled to be able to be here as a small part of this discussion. I have been involved in advocating before the major investment even happened, before I was even elected to the City Council.

Although this is described as a “Hot-Spot” issue, I think that, certainly in Berkeley, I would say Berkeley is hot-to-trot for BRT. When Shirley Dean, who was my arch nemesis on the City Council and as Mayor, and I were both appointed to be on this committee for this Bus Rapid Transit idea, I thought, oh my God, that’s going to be torture in a whole other venue and another city. To my pleasure and great joy, she consulted with many of her more conservative supporters in Berkeley, and I consulted with more liberal supporters, and we both, along with the rest of the City Council, came to the overwhelming conclusion that some kind of BRT is an extraordinarily positive thing for the people of the East Bay and especially for the people of Berkeley.

So, as a person from a city, I have a transit-first policy. Yet most of the cities that have transit-first policies are almost totally hypocritical. We all say we support transit first, but we do next to nothing in comparison to the millions of dollars that we spend on other things. I think this is one of the genuine possibilities for overwhelmingly dramatic improvements and, I am passionately committed to making sure that this moves forward during my time in office. At



**Figure 12 Kriss Worthington**

the same time as I'm passionately committed to it, I know that any progressive idea or positive idea that you ever put forward always has opposition. The simplest thing, like when I proposed broadcasting City Council meetings on the Internet, I thought, oh this is boring, so everybody will be for it. But it was a fight; it took five years to get it done. So this project is probably going to take at least 10 years or maybe a little longer. But we should be moving it as fast as we possibly can, just like we should get these buses running as fast as they possibly can.



## PANEL QUESTION-AND-ANSWER PERIOD

### Therese McMillan:

Now we're going to start the Q and A. I will direct the question, if it has been indicated, to a particular panelist; if not, I'll choose someone to answer it. In this case, the first one is for Jim Cunradi, and the question is: have you considered a single reversible BRT lane to deal with urban constraints?



Figure 13 Trixie Johnson and Therese McMillan

### James Cunradi:

The way we're studying it now for environmental purposes is that we have two 12-foot bus lanes, 12 feet being the standard width of a traffic lane. We would consider having a reversible lane in certain very congested segments of the corridor if a technology like that existed. I should mention that we are working in partnership with the University of California to evaluate guided buses which allow you to use a narrower right-of-way. What that means is that instead of 12 feet, if you can go to 10 feet, you might be able to save parking or put in a bike lane. It opens up a whole new realm of possibilities to make it a better street overall.

### Therese McMillan:

Here are two questions that align, so I'll rephrase them as one that maybe either Jim or Cyrus can answer. To avoid the controversy about taking a lane, is it possible to make these lanes HOV so that carpools could use the lane as well? Could you make the bus-only lanes a HOT (High Occupancy Toll)-type lane so that cars potentially could pay for using it as well?

### James Cunradi:

In general, our concept is to have dedicated bus lanes, meaning for buses only. There are certain areas where we might be open to looking at that, for instance, the south side of the UC Berkeley campus. You might want to allow other buses in there, for instance there are always charter buses, UC shuttles, and Lawrence Berkeley lab shuttles. You might want them to be able to use the facility as well. Also, taxis might be a suitable option for around the university.

But the more you let in, the more problems you get, so we'd have to look at it. By and large, we're looking at a dedicated bus lane where we try to get the frequency up as good as we can, five minutes or less. That doesn't really leave a lot of room for other HOVs except in that specific case.

**Therese McMillan:**

Jon, do you want to add to that?

**Jon Twichell:**

People generally leap to the conclusion that this is some sort of win-lose situation where motorists are being penalized for bus lanes. It's not at all that way. The object is to generate bus lanes in certain areas, not for the whole thing. It's not a matter of arbitrarily taking away lanes, as Jim pointed out in his presentation before. If you look at what happens with lanes, a certain number of people shift from auto use into transit use. Then other people shift from certain streets onto other streets.

In my nefarious past, I spent a good amount of time working on taking down the Embarcadero Freeway in San Francisco. One of our models was Portland, Oregon, because they had parallel four-lane roadways along the river there. Well, they just said, we're going to do it, and they took out one of them. Lo and behold, the world did not come to an end. Traffic did not snarl up. People adjusted their trips accordingly and it worked fine. I have every expectation that if you look at this situation and think of it in terms of people throughput and increasing the efficiency of the transportation system as a whole, it will become a win-win for everybody.

**Therese McMillan:**

Okay, on that note, one interesting question is for our elected officials on the panel. What degree of support do you anticipate in your respective cities for eventually dedicating a lane for BRT?

**Dr. Peggy Thomsen:**

That discussion has not occurred at all. As I said earlier, the one thing that you have to do is to educate people. If that were to occur, there should be a lot of public dialogue before the fact; that's the mode we use in Albany.

**Kriss Worthington:**

There actually has been a lot of discussion of this already in Berkeley, and I think within that conversation you have to realize that nothing is ever going to be a unanimous decision. In everything we try to do, there are going to be some people who are opposed to it. So, I don't think our goal should be to make every single person or every group happy. I think our goal has to be to take into consideration the objections and to focus on what the practical realities are. Many of the people who oppose transit projects, just like the people who oppose affordable housing projects, just are against it, and they're going to be against it no matter what. But to the extent that we can work with them and compromise when they have reasonable objections, I think we should bend over backwards to do that. But we shouldn't limit ourselves to what the strongest opponents will accept. We owe it to our transportation system to make this a success.

**Therese McMillan:**

Here's a last one on the topic of roads, at least in this form. I think it goes to the point that we were talking about concerning education. Maybe one of the things that we need to do is to be able to explain to communities what the anticipated impact would be. This question points to an issue I always see whenever I make the mistake of driving to Berkeley during a football home game. The question is: I agree that moving a lane from Telegraph Avenue will not cause congestion along Telegraph itself, but what about the potential of creating bottlenecks on entrances to Telegraph? How do you model that and how do you explain a model's output to a community in ways that they can understand the ramifications? Jim, I'll have you answer that.

**James Cunradi:**

We used the CMA's model. Actually, that's a really good question, because people either give models too much credence, or they're too skeptical. But they are useful tools.

We did traffic counts at hundreds of intersections. We took floating-car runs where we put an intern in a car and just drove along congested parts of the corridor to measure speed. We were able to set the current conditions using mountains and mountains of information. We tried to get the most mileage we could out of the modeling tools.

We looked to answer this question: if half the people are gone from Telegraph and it's no longer a problem, what about everything else? We actually met with all three cities and with Caltrans and we asked them, what intersections should we be looking at? We had that discussion and then we went back and ran the model to red-flag any intersections that nobody else thought of; ones that might have growth and traffic that might affect delay or the conditions that motorists face.

Doing that kind of multi-step process, we got to the point where we had more than a 100 intersections that we were going to study. Hopefully, we're capturing all of the gateways to that neighborhood and the changes on the traffic. We're also going to do a qualitative analysis of looking at neighborhood circulation patterns to see if people, in fact, do get trapped in congestion, will their instinct be to make the first right turn to go through the neighborhood? We're going to take a close look at the neighborhood networks and see where that's likely to happen and then propose mitigations to it.

**Therese McMillan:**

With the objective of trying to get to the essence of all the questions, if not individually, in this next one I've combined three different perspectives on measuring costs. Maybe Cyrus and Jon, you can take a shot at this.

How do you evaluate the cost and benefits of this new system? Would you evaluate the cost per new riders generated to the system, or is there value in looking at the cost of all riders on the system? I think this is an interesting point as to the comparisons, Jon, that you were comparing the San Pablo effort to what was there before.

A related notion, though, is one of also being able to somehow capture the effect of riders that might be transferring from other modes, be it walking, biking, parallel BART service, or an existing transit line. How would you assess that impact, number one, and two, how would you evaluate it in terms of the benefit?

**Jon Twichell:**

Let me give some answers to different parts of the process. In analyzing the result here, as I said, we had a big jump in terms of ridership on the Rapid itself. In looking at that ridership, 45 percent of those people had not been on a bus before. That was pretty surprising. A good amount of them had been driving; a good amount of them hadn't made the trip before. If (BART Board member) Roy (Nakadegawa) will block his ears, I'll tell you a certain amount of them used to be on BART. A lot of people were just not on a bus before. There was enough here, between the rapid bus system being visible and the results it produced, to make people use it. That in itself is a big response.

In terms of cost benefits, you have to be careful about how you isolate the costs and the benefits in terms of San Pablo Rapid Bus. If you step back and look at our system as a whole, our system has lost ridership over the last three years because of the economy—we've lost 13 percent of our ridership. At the same time, we've been forced by economics to cut back 12 to 13 percent of our service. If you have one trend line like this and the other trend line like that, of course, when you look at it that way, the net impact on the corridor is significantly higher than just to gain ridership on the rapid bus itself.

There are other factors that you really have to look into. As I alluded to before, you can look at this in terms of productivity. Your buses are running 20 percent faster. That means either you can provide 20 percent more service or you can provide the same level of service at 20 percent less cost, so you have some real options there.

I also want to go into another thing that was alluded to before by Jim and that is, we were in sort of a lose-lose situation and I know Los Angeles had the same issue. Over the last ten years, as traffic has increased, the average speed of buses has gradually gone down. Well, that means you either have to spend more money and put more buses out to meet your schedules, or you just have less buses out in the street and you start to lose ridership.

So, in some ways, doing this rapid bus and BRT is a way to revitalize transit in general; it has a broader goal than just: are we making the right amount of money out of doing this particular line? There are a lot of things like that, that come into consideration in addition to just thinking, well, for a million bucks a mile you can do all this stuff, kind of equation. The frank answer is we looked at a lot of these other pieces of the equation rather than just narrowing it down to pure cost/benefit.

**Cyrus Minoofar:**

Just let me add something really quick and that is the public agencies are not only looking at the bottom line, which is the cost, but they're also looking at the social costs. So in a lot of grants that we have from the Air District for example, we are required to show that we are taking pollutants out of the air. And since we're also taking away delay, you can, of course, always take away costs related to delays. Some of these are social costs, so there's not a dollar amount. As a public agency, you have to balance these things. Taking pollution out of the air is one thing we're doing, because a lot of our systems are using solar panels, for example, instead of using the power company. Because of the electricity issues, we have "green" power. So we are trying to achieve balance. We have quantified all of these benefits and they're available if anyone is interested.

**Therese McMillan:**

There was a specific request, Cyrus, that you had mentioned a passenger survey in your remarks and there was a question, can that be obtained by the public and what were some of the highlights?

**Cyrus Minoofar:**

That actually should be answered by Jon. I was referring to an evaluation "after" study by Nelson\Nygaard that acted for AC Transit. It shows that 19 percent of the occupants on the bus used to be driving alone.

**Jon Twichell:**

If anyone wants a copy of that survey, just send me your business card and we will e-mail it to you.

**Therese McMillan:**

Here's a question on which I'm going to put both a technical spin and a political spin, again, for our elected-official representatives. In your experience, what do you believe are the specific characteristics or factors that would make a particular corridor right for BRT? The political question is how would you then take those factors, put them together, and sell that to a

number of jurisdictions that at some level have to all get on the same page in order for this to work?

**James Cunradi:**

When we selected Telegraph, International, and East 14th Street, we actually took a broader approach. Initially we looked at a lot of major corridors including Foothill Boulevard, San Leandro Boulevard, Shattuck Avenue, College Avenue, and we selected these because of several factors. One was that they had high existing ridership, which is important for a bus agency. Two, we looked at the densities, the existing residential and employment densities as well as major trip attractors, such as UC Berkeley, downtown areas and the like. Then we looked at what the cities were doing; what were their plans for the future.

What we found was that these three streets were targeted for redevelopment and for infill by all three cities. So, even before AC Transit approached them with this idea, they were already looking at ways to make it more dense and better for transit. The bones of the system were already good. This is where the Key System (the former rail transit system that ran until the 1950s) used to go, so all the land uses grew up around that pattern of development where those trolley stations used to be. Not many corridors have the advantages that this particular one does.

**Rex Gephart:**

Therese, if I may add to that. In Los Angeles, there was a question about what characteristics of the corridor were important, and we listed them when we picked out a number of our corridors. One was high ridership; the corridor had to have high ridership. The trip lengths of the people had to be longer than average, so you can have fewer stops and faster speeds. Also, the bus ridership had to be really slow. We wanted slow ridership and we wanted it seven days a week. The idea was to get a lot of people traveling really slow seven days a week with longer than average travel times, and that's how you define a rail corridor. But you don't want to put a rail corridor out, or a BRT, in a corridor that runs peak-only five days a week and already has people moving very quickly, because you're not going to accomplish anything. What we did in Los Angeles was take the toughest corridors where the greatest number of people were moving the slowest, and we tried to make a big difference for those folks. We also looked at population density, employment density, and the transit dependency along those corridors as well.



**Therese McMillan:**

Kriss or Peggy, do you want to comment on inter-jurisdictional coordination?

**Dr. Peggy Thomsen:**

I think the San Pablo project is an example of that. Certainly, San Pablo, as some of you may know, is a little dowdy, so we were all trying to make improvements and this certainly was one piece of that. We wanted to look at, and are continuing to look at, ways to connect this long street and make this a regional possibility as far as shopping and going to various venues. I think that in the San Pablo corridor, as he said, ridership was up in this area. We were trying to improve ridership where there is new housing; we were trying to bring transportation to their door. I think this one is a good model.

**Kriss Worthington:**

I think in Berkeley there are some specific, unique circumstances around Telegraph Avenue that make it ideally suited for BRT. One is, we are in the process of doing the south side plan—we've already completed our downtown plan—both of which say we're going to have thousands of additional residents living within a block or two of Telegraph Avenue. Those thousands of new residents are either going to start driving cars or they're going to use transit. If we make the transit good enough, then we won't be exacerbating our traffic congestion problems. I think if any one of us, whether we're an elected official or a transit agency officer, could come up with a way to cut down traffic by five percent, we could probably be elected governor. It's one of the things people gripe about all the time. With the success rate on San Pablo, I think we're going to have the other streets begging us to do on their streets what we've done on San Pablo.

**Therese McMillan:**

Well, one of the things we heard in those responses was the introduction of land use. What do you believe is the best way to induce land use changes within the BRT corridor that would support, not only the use of the corridor, but necessary transit connections in that corridor; connections either to the local system, or to other regional networks, be they express bus connections at major transit nodes, or connections to BART? The Fruitvale area, I think, has been an example of that. Jon or Jim, do you want to comment?

**James Cunradi:**

For planning purposes, we had to figure out where to put BRT stations, so we did it several ways. Wherever we could make a quick connection to BART, we would do it. Wherever we crossed a cross-town bus route, we would put a station. Then we looked at employment-specific generators, like the university, courts, and downtowns, and we located stations there. We looked at employment and residential density—something that isn't always so obvious when you're on the street, but if you look at the census data, you can pinpoint some of this—and we located stations in the centers of those high density areas. Finally, we went to the cities and we asked them: where are you doing major projects? When you think of transit-oriented development, you ask: what can we put on a rail station parking lot? With BRT, it's more like tell us what you've got and we'll put a station there. So, we bring a station to the development instead of bringing development to the station. We added stations, for instance, in San Leandro at 143rd Avenue and East 14th Street where their south redevelopment plan was proposing a major residential and commercial development.

**Jon Twichell:**

One of the things that happened in parallel while we were putting in the rapid bus on San Pablo Avenue was that five different apartment buildings got built along the route during 18 months. That's one of the things that we're very interested in.

Rex and I were at the California Transit Association meetings earlier in November (2004). One of the interesting panels there was on bus-oriented development. You think about development and you think about the BART parking lot and building something. But there is a great need for urban infill and there's a great need for multi-unit housing. We like apartment people because they like buses, so the more we can do to encourage that kind of multi-unit urban infill development, the better it is. We're in the process of trying to sort out how AC Transit, as an agency that doesn't own land, can facilitate more of this suburban, multi-unit, infill housing, because we think it's one of those things good for everybody.

**Therese McMillan:**

The issue of synergistic effects relates to another question that we have. I think in the best of circumstances, when we talk about transit-oriented development or TOD, you're going to face some level of NIMBY (Not In My Backyard)-ism. One of the particular challenges with BRT

is there are already some concerns with the local traffic impact, simply based on lane diversion. On top of that, we're bringing potential local traffic impact because of increased residential and/or employment densities in the corridor. We might be facing a particular education challenge. Given that everyone, I think, is committed to the concept of TOD, is there a natural coalition between local jurisdictions and the transit providers that can be pulled together to discuss and overcome these issues, or is it something that needs to be nurtured now because it is not quite there? Maybe we could hear from Peggy and Kriss on that, and then maybe from the staff's experience with dialog that you've already had with neighborhoods and how you've managed that.

**Kriss Worthington:**

Well, I have a lot of experience living in the city of Berkeley and dealing with this. I think what's most important to understand about dealing with that is just because somebody puts an organization after their name, doesn't mean that they represent all of the people who live in that neighborhood. A lot of people show up and say: "My neighborhood's against this and we had a unanimous vote of all five members of our organization and we're all against it." If every single one of those people opposed me in my elections, but I win by a 2-to-1 margin in that same neighborhood, do those five people represent that neighborhood? If they do, why do two-thirds keep voting for me, because I don't agree with them?

I think it's really important to know that while there are certain people who will activate and motivate and get themselves out on the extremes, it's really critical to get business people, neighborhood people, and average residents to really understand what the costs and benefits are. I believe the average person in Berkeley, Oakland, and San Leandro will think that this is more beneficial. If it's just left to the most extreme environmentalists, who are gung-ho, versus the most extreme opponents, then who knows where the political decisions will be made? We have to get to the middle, to people who are sort of mildly environmentally inclined. They have to understand that this is good for them and good for the cities. If we get that information out there, the overwhelming majority of people will support these ideas.

**Jon Twichell:**

Can I add just one little piece to that—two little pieces? Assemblywoman Lonnie Hancock has been working the last six or eight months on putting together a San Pablo corridor committee that's more focused on development, street beautification, and other things of that nature.

That group is wrestling with how they do something to beautify and improve the corridor as a whole. The second thing is: we would welcome some help from MTC on this notion of bus-oriented development. How do we as agencies facilitate that? What can we do to encourage that in dialogue with the local cities? That's something where we could really use some assistance at this point.

**Therese McMillan:**

I will definitely take that into account, because as Steve Heminger mentioned, MTC is really beginning to get our arms around an approach for transit-oriented development and support within the region. One of our key interests in this forum is being able to see where the potential for BRT development can be in that milieu.

Let me approach our guest from the south, Mr. Rex Gephart, for his perspective on working with neighborhoods in L.A, which may or may not be easier than working with neighborhoods in the Bay Area.

**Rex Gephart:**

In Los Angeles, transit is a new concept. We like our cars, and bus-oriented development is a new issue in Los Angeles. As far as that goes, bus TOD is new to the United States; we just don't have a lot. There are very few good examples. Transit-oriented development is usually associated with rail around stations where the land is owned by the rail agency, and its often confused with joint development, which is a totally different issue. In Los Angeles, bus transit-oriented development is viewed more as a corridor issue, not a station issue. We have a lot of businesses, residential and commercial along some corridors that want better bus service, that want more public transit service. It's along an entire 10-, 12-, 15-mile corridor, it's not just at a bus stop. In Los Angeles, bus-oriented development is a corridor issue, not a stop issue. That's how we address it with BRT. When we layout BRT, it's a corridor concept, it's a corridor plan. It's everything moving along together on that corridor, it's not only the local buses, but the rapid buses as well as the traffic. We work very closely with the traffic engineers in turning movements and everything else to create a corridor concept in Los Angeles.

**Dr. Peggy Thomsen:**

May I just say that it's a corridor concept along San Pablo Avenue as well. I'm along that corridor all the time and I think it's working. It's exactly the same concept, so it's not just in L.A.

**Therese McMillan:**

Well, it's good to see we have common ground between north and south, which is always a nice thing to have. With that I guess one of the benefits of being a moderator is being able to call a break. When we reconvene, we'll hear from Rex Gephart.

## CAPSTONE SESSION

### Therese McMillan:

I would now like to again offer a fine welcome for our guest from Southern California, Rex Gephart, who is the Director of the Regional Transit Planning Department with the L.A. County MTA. We're eager to hear his experiences and we'll take some questions when he's done.

### LOS ANGELES METRO PROGRAMS

#### Rex Gephart:

When Jim Swofford called me from the Mineta Institute to see if I could come to this workshop, I got a little worried. It wasn't because of the issue and it wasn't because of the audience, but he said he wanted me to be the capstone speaker and I didn't know what the heck the capstone speaker was. Anyway here I am. It's also surprising that someone from Los Angeles is here in the San Francisco Bay Area talking to you about transit. You know if we can do it in L.A., you can easily do it here.



Figure 14 Rex Gephart

I thought we could talk about two things. First is the program that we have in Los Angeles. We've heard a little bit about it already and I thought I'd give you some details and results. Second, there are four programs that we did a major investment study on. Two of them turned out to be BRT instead of LRT (light rail transit) and two of them turned out to be LRT instead of BRT. I will tell you why.



So let's talk a little bit about the Metro Rapid in Los Angeles. First of all, whether we call it BRT or Metro Rapid, it's the same thing. That's the nice thing about BRT, it has a flexible title and it is flexible in its concept.

We interviewed a couple thousand of our patrons and other people in Los Angeles and their number one issue was slow transit service and it wasn't just L.A. We have sixteen or seventeen municipal operators in Los Angeles, and everyone was upset about the slow speeds of everybody's bus service. So we did a study and I was actually surprised that our bus speeds had declined by 12 percent since the mid-1980s. That meant we had

A presentation slide titled "Why BRT in Los Angeles" in yellow text on a dark blue background. The slide lists four bullet points in white text: "Public dissatisfied with slow bus service", "MTA average bus speeds have declined by 12% since mid-1980s", "LADOT found that 50% of the time a bus is in service it is stopped", and "MTA and City of Los Angeles formed Metro Rapid Program". At the bottom left, it says "Metro Rapid Program" in red text, and at the bottom right, it says "Page 2" in yellow text.

- Public dissatisfied with slow bus service
- MTA average bus speeds have declined by 12% since mid-1980s
- LADOT found that 50% of the time a bus is in service it is stopped
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Metro Rapid Program Page 2

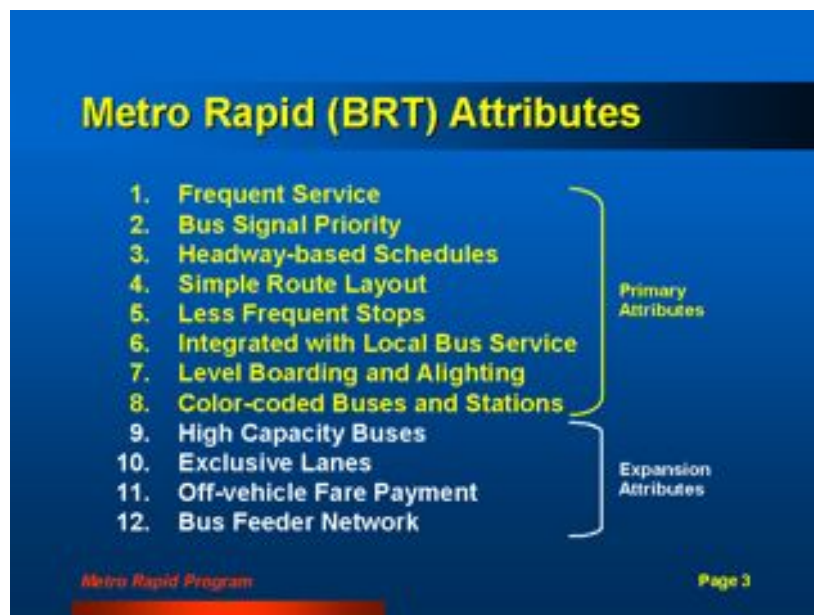
added 250 buses to the MTA just to keep the same number of seats out there—250 buses is a huge capital expense, a huge operating expense—so we decided to do something about it.

The L.A. Department of Transportation rode our bus service and found that half the time the buses are in service, they are stopped. They're stopped at a bus stop or they are stopped at a red light. So the two agencies decided to work together to get these buses moving faster. It was a huge expense, and everybody was losing, including the bus traffic. That's why the MTA and L.A. city decided to form this Metro Rapid Program.



The first thing that many people did was to fly to Curitiba, Brazil. I suppose some people here have heard about Curitiba, Brazil. Well, everybody except the people who really had to work on this project went to Curitiba, Brazil; the mayor, all the politicians, people who had money went to Curitiba, Brazil because the entire city was designed around bus transit. There was no rail transit, there is now, but there wasn't then. It was a really nice planning concept and the folks came back with the idea that the BRT attributes from Curitiba worked.

By the way, we implemented the first eight in Los Angeles; we did not implement the last four yet.



Metro Rapid is defined as "frequent service," meaning 10 minute headways or less in the peak periods, and 12 minutes or less in the off-peak hours. We always have bus signal priority, and we'll talk a little bit about that later. We always have the headway-based schedules, which means the buses can go as fast as the traffic can go.

Most everyone here is probably used to schedules that say the bus is going to be there at 6:10 in the morning, or 6:15 in the morning. Schedules are always written for Monday through Friday and it's the same schedule for every day. If the traffic is moving fast, that's tough, that bus is still going to be there at 6:10 or 6:15, even though it could have been there earlier and gotten you to your destination quicker. Generally speaking, what headway-based schedules means is that we got rid of those things called time points and we let the buses go as quickly as they can from one end of the route to the other.

We made the routes really simple, either there's a rapid bus or there's a local bus, there's no other choice. So you know where that rapid bus is going to stop every single day. We reduced the number of stops. We integrated with the local buses out there so we always have local bus service.

Our rapid buses are the only red buses in Los Angeles. They're all fueled by compressed natural gas, they're all 40 seats, and they're all low floor.



Curitiba has the completely level boarding and alighting. They have stations that you walk into at their bus stops where you prepay and then you walk onto these five-door double-articulated buses that are designed to hold 275 people each. Everybody boards and alights just like a rail system.

In L.A., of course, we couldn't do that, so we put low-floor buses on all of our lines. We color-coded the buses in the station, so that the buses always look different and the stations always look different, very similar to what Jon Twichell has done here in AC Transit. What we don't have are our high-capacity buses, but they're on order. We don't have exclusive lanes, but we

now have a demonstration of one in our heaviest traveled corridor and we're experimenting with off-vehicle fare payment and a bus feeder network.

We opened up two new corridors to begin with, because our Board of Directors came back from Curitiba, Brazil, and said this is a really neat idea in Curitiba, let's see if we can do it in Los Angeles. What they failed to remember was that Curitiba, Brazil is like a dictatorship. If they want a corridor going one way, they tell you to move your house, thank you very much, and that's exactly how they do it. Jaime Lerner was the mayor there and he wanted things done a certain way and he built a terrific city built around transportation, but there were no such things as environmental issues or community meetings; they just weren't in the agenda.

Our stations looked like this on our first two demonstration corridors. I'll show you what they look like now, but the idea was that we wanted a station that looks similar to this at every single stop so if you're at that station, you'll know there's going to be a red bus pulling up there.

## Metro Rapid Stations

- Branded stations
- Expedite boarding/alighting
- Real-time "next-trip" displays
- Information kiosk/ad panel pays for maintenance
- Provides overhead protection without blocking sidewalks or adjacent properties

Metro Rapid Program



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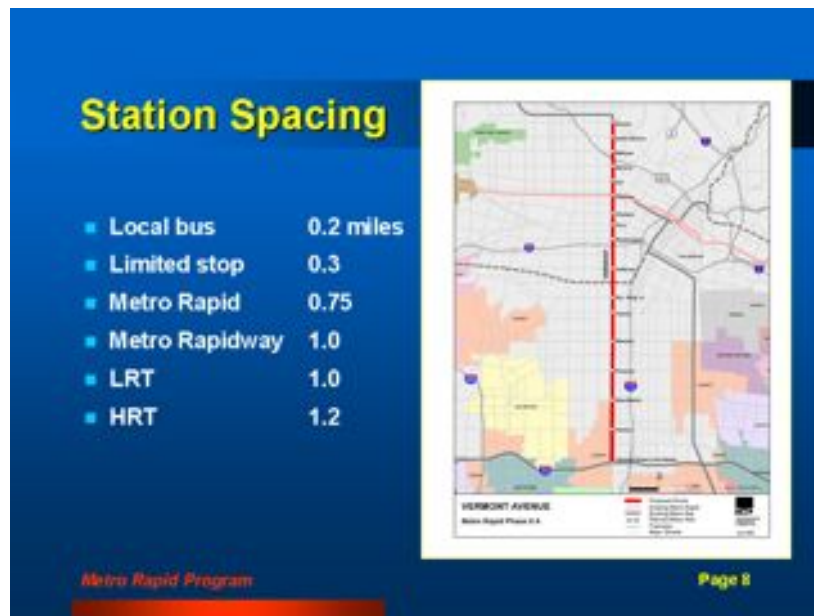


Our displays are not made by NextBus. We developed the hardware and software in Los Angeles that tells you when the next bus is arriving, just like your NextBus system does here.

Our stations now look like this. We lowered the canopy and changed the roof angle. Because the first two corridors were demonstration corridors, we took the things that we liked and threw out the rest. For example, since some stations didn't provide enough protection, we redesigned them to provide twice the shade than the ones have today, but they still look similar. We provided little seats on these lean bars, which we didn't have before. You'll

notice there are no benches here. The idea is if it's frequent enough service, you don't really need a bench. The service should be fast enough so that you really don't need to sleep before the bus comes.





Station spacing for our local buses, and this is probably pretty true for most agencies, are stops about every 2/10ths of a mile. Our limited-stop service is about every 3/10ths of a mile. Now, limited stop should mean fewer stops and wider station spacing. But, over time, limited stop service tends to add more stops. It's just the way the system works. You go to community meetings and a person says I really want another stop over here, and after five years, your limited-stop service becomes local-stop service. That's about what you see in Los Angeles; it has been compromised to death.

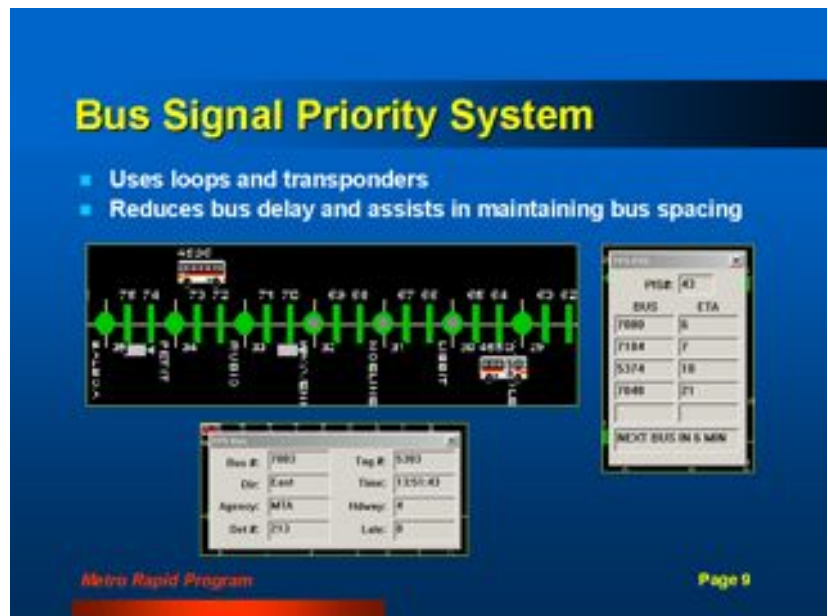
When we moved in with Metro Rapid we replaced the limited stops. We now have the Local and the Rapid. There are two distinct services for two distinct markets. People who want to go long distances get on the Rapid. If you want to go a short distance, you get on the Local. They're both the same price, it doesn't make any difference, but we do provide two separate services.

The Rapid is closely approaching our LRT in terms of station spacing. Metro Rapid is an official BRT system that, in terms of space, is a mile between stops. Light rail is typically a mile and our heavy rail is about 1.2 miles, so the BRT is approaching the LRT concept in terms of station spacing.



We have signal priority. This allows buses, as they approach intersections, to hold the green a little bit longer or turn the red to green a little bit earlier, up to 10 seconds on either end. This happens at every signalized intersection along a corridor; there are no exceptions.

We have monitors that show these buses moving across the stops or moving across the corridors. We monitor where the buses are and we can click on little bus stops that we can see on the screen in downtown Los Angeles to know that the next bus at that stop is going to be there in six minutes, the one after that in seven, the one after that in ten, and the one after that in twenty-one. At the stop, the next bus display is saying to the patrons, the next bus is in six minutes.



We can also click on the bus to see that it's running a four-minute headway and it's zero minutes late, or whatever it is. If we find that there are two or three buses bunched together, we can call up the operators and ask, what are you doing, or say to pass one another. We try to help manage the system. The idea is that we have people managing people, as opposed to schedules managing people.

If the traffic is moving fast, and the operators can move quickly, they get a longer layover at the end of the line. The unions just love this concept, and the operators love the concept. In fact, I don't think anybody doesn't like this concept. Everybody wins here. You get more service out there for the same operating expense, and the operators like it and the public likes it.

## On-Bus Transponder



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Our signal priority system is simple. It has a little transponder that looks like a hockey puck underneath the front of the buses. They're really inexpensive to put on; we put them on lots of buses.

## Loop Detector



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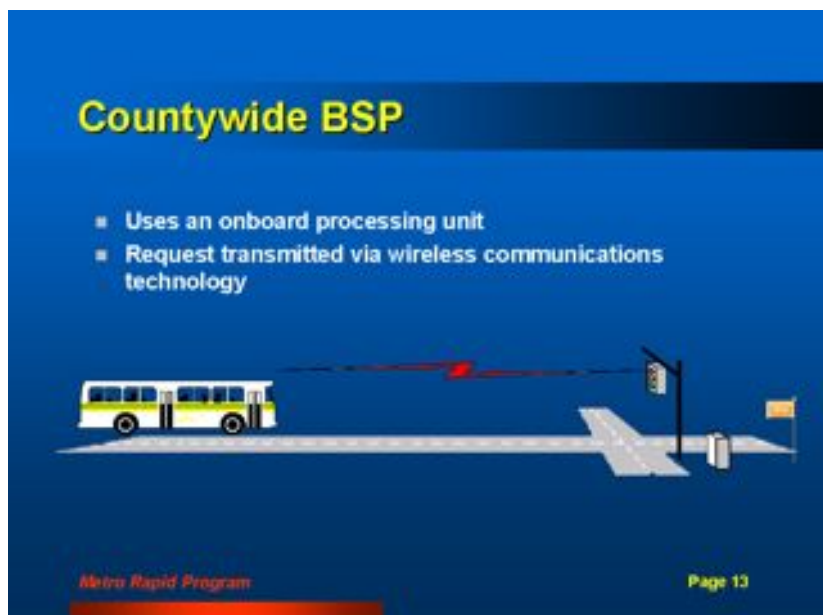
Then we have antenna loops in the street that detect the buses going over the antennae. The loops are six feet apart. The transmitters are beeping every so often, so we know that it is a bus and not something else. We can tell which bus and the speed of that bus and everything else.



We monitor with screens in downtown Los Angeles.



We have another signal priority system that we've developed as well that is, I believe, similar to the one you're using here in AC Transit. Essentially it's on the bus; as the bus approaches the intersection, it communicates to the traffic signal that it would like priority, then it either gets priority or it doesn't.



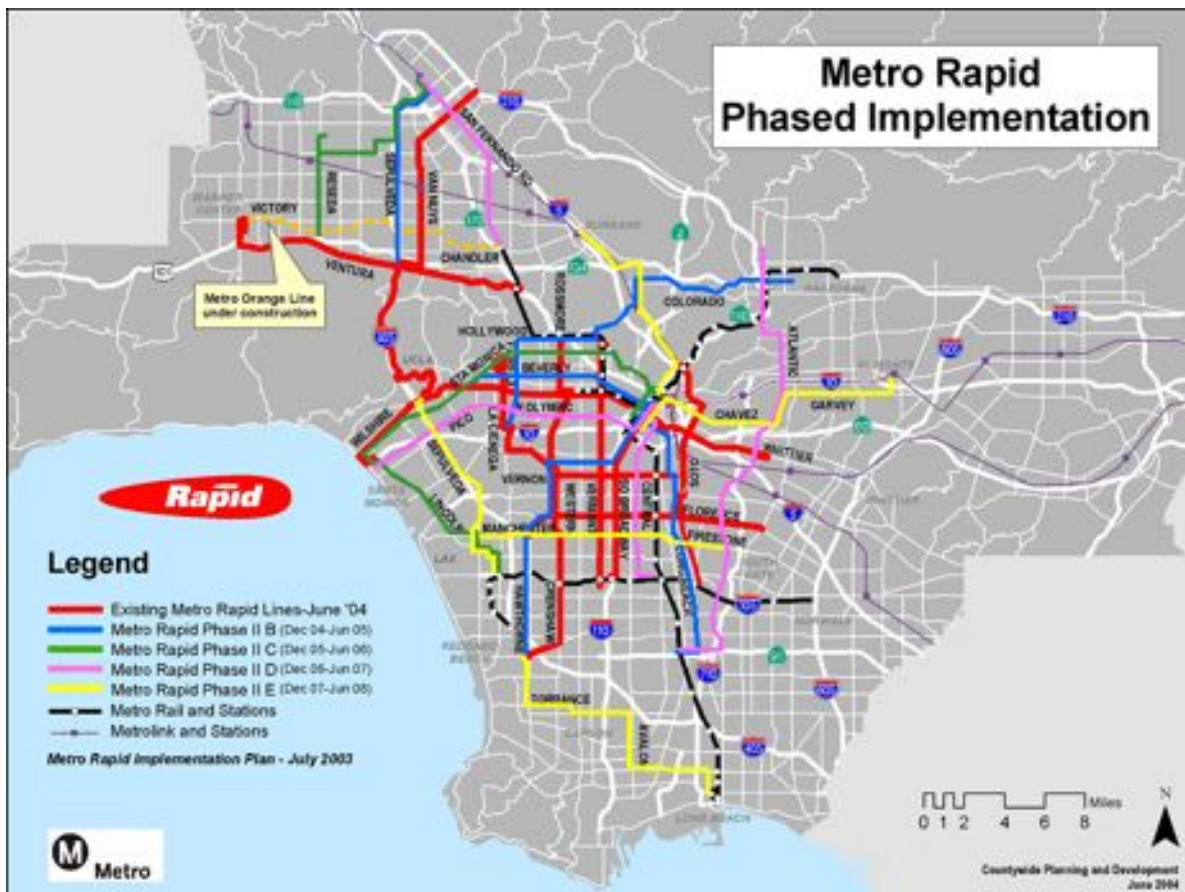
In the system that I was talking about before, the entire city of Los Angeles is connected to a signal. If the bus asks for priority at an intersection and it would like six seconds, but let's say that it really can't take six seconds, we'll take three seconds from the next intersection after that and three seconds from the third intersection after that. That way we can pick where we want to take those seconds so we don't disrupt automobile cross traffic. One of the tests of this program was: if we put signal priority in, will it have a negative impact on the automobile traffic? We asked the traffic engineers in Los Angeles to evaluate that and their response was it had no impact on the automobile cross traffic in Los Angeles.

One of our lines, Wilshire Boulevard, is a huge line. It crosses a lot of other very big lines and streets in Los Angeles. Yet there was no significant impact on the automobile cross-traffic caused by the Wilshire Metro Rapid System. That's all in writing, which the federal government liked, and that's actually one of the system's selling points.

The traffic engineers in the city and the transit agency are working together on this issue, because no transit agency can put this system together on their own, and no city can either. The transit agency doesn't own the street or the sidewalk, and the city doesn't own the bus system. You've got to have partnerships to create this system and then it really works well.

Each of those buses has a computer on it, which is just a PC to tell you the request of priority as it's approaching the intersection.





In Los Angeles, we currently have nine bus lines and about 150 miles of Metro Rapid Service. We're going to be adding different phases; by 2008 we'll have 28 corridors and about 450 miles all connected to one another and all connected to rail service. The idea is to provide fast bus service to the rail service, and if you want to take a local service, it's still there as well. To get around L.A., we've got to have some really fast bus and rail service working together, and not just rail.

The program has been a success. Passenger travel times are as much as 29 percent faster, and ridership has increased anywhere between five to 40 percent, depending on the corridor. A third of the ridership increases are new to public transit, according to an independent survey by Caltrans. Actually, the question was: what did you ride before Metro Rapid, and a third of them answered they rode in automobiles. The federal government was very happy to hear this.



Speed improvements for our first seven corridors are up to 29 percent, and they're all above 20 percent which was our goal. Van Nuys was less than that, but that's because the signal priority didn't open up until recently. What this means is, if you've got your service operating 20 percent faster, you've got 20 percent more seats for no increase in operating expense; they're free seats. You've got more capacity without spending any more of your operating dollars.





One of the big problems with the transit agencies isn't the capital issue, it's the operating expense. Nobody can afford to add more service, but they could afford to do something like this, where you build it, and then when you operate it, it doesn't cost anymore, you just provide more service, provide more seats. That's one of the good things to come from this; you're providing more capacity for no increase in operating expense. If you happen to get more ridership, that's great as well, and you can see we got a lot more ridership. In L.A. it was anywhere between 5 and 40 percent, depending on the corridor.

BRT works on two fronts: more capacity for no increase in operating expense, and an increase in ridership. Our increases in ridership vary five to 49 percent from June 2002 to June 2004. A couple of the corridors have been open only six months. Our total system ridership is down, but all Metro Rapid corridors are up. That was really important, because we found that we were still gaining bus ridership even though the whole system was losing some ridership.



## What's Next ?

### Expand Metro Rapid network

### Introduce additional attributes

- High capacity buses
- Smart Card all-door fare collection
- Exclusive bus lanes
- Feeder network to Metro Rapid



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## Metro Rapid Buses – High Capacity

- CNG powered
- Low-floor with 3 doors and 60 seats
- Current purchase of 200 buses first step in High Capacity Vehicle Program



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So what's next? We're going to expand the Metro Rapid network to 28 corridors and introduce some additional attributes that Curitiba has, such as some CNG-powered, single-articulated, low-floor buses.

Also, we have exclusive lanes that we've been testing for six months on Wilshire Boulevard, the biggest corridor in Los Angeles. The ridership in that corridor is 90,000 a day, and headways are about a minute-and-a-half apart on the Rapid Bus. The traffic engineers had some problems with taking a lane there because there are a lot of cars there too. We suggested to the traffic engineers that we try taking one mile during the peaks only, not all day. This happened to be a parking lane. We also did left hand turning movements—now we'll see what happens to the businesses and if we make any improvement in the bus speeds.



Frankly, I was a bit doubtful about whether bus-only lanes would work with our concept, because with bus-only lanes, there are a couple of issues. First, if the traffic is moving fast already, you don't need a bus-only lane; you need one where the traffic is really slow or stopped. Second, mixing the service types in a bus-only lane gets a little complicated. If you put Rapid out there, with few stops, and Local, with a lot of stops, the Rapid has to stop at all the Local stops because it's following the Local Bus. All the buses will only go as fast as the slowest bus. There were some tests to be done.

I was skeptical that the rapid bus would go faster, but in fact it did. Not only has it gone faster, but the other traffic has gone faster and the traffic engineers have liked that as well. The reason is the buses are not weaving in and out of the traffic and slowing it down. Now we have two traffic lanes dedicated to cars, one to buses, and everyone's going faster. So far that has been a win-win situation.



We're looking at all-door boarding. We're going to do some testing on this. The major issue with all-door boarding is: how much do we cut on the dwell time; how fast can we get people on and off the buses? The benefit to getting people on and off the buses as fast as possible is a cut in operating expenses. On the other hand, when you do something like this, it's going to increase your operating expenses because you're going

to need security, you're going to need some way of validating whether a person paid their fare or didn't pay their fare. It's a cost-versus-benefit question. We're going to test that and see whether that really is a benefit in Los Angeles.



An issue I thought I'd touch on is transit corridor studies. I mentioned that we did a major investment study on four corridors. For the first two we decided to go with the BRT; for the second two we decided to go with LRT. You might ask: why?



**Wilshire Corridor BRT**

- **Statistics**
  - 13 miles, 15 stations, 3-4 minute headways
  - Project construction/vehicle cost = \$182 million (\$14 mil/mile)
- **Issues**
  - At grade corridor in 3 jurisdictions; many major street crossings
  - Very high arterial traffic with bottlenecks
  - Existing Metro Rapid arterial BRT
  - Potential future extension of Red Line (HRT)
- **BRT selected over LRT**
  - Existing BRT-light successful; only need to add exclusive lanes
  - Avoid mode complexity and unnecessary transfers
  - Minimizes short term investment until Red Line extended

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The Wilshire corridor was selected for BRT. It is a 13-mile corridor with 15 stations. The project cost, including vehicles, was \$182 million. That's about \$14 million per mile. It was an at-grade corridor. It went through quite a few jurisdictions. It had very high arterial traffic

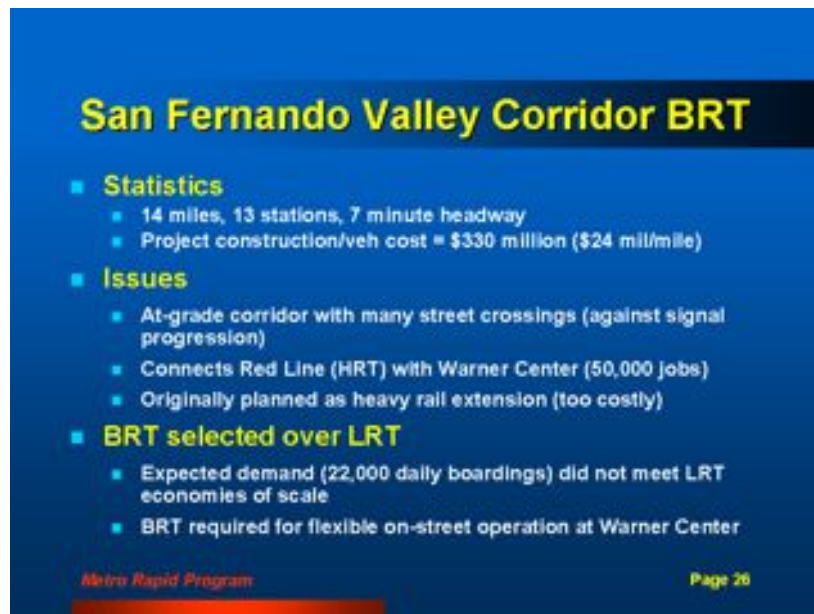
with bottlenecks all the way. It did have the existing Metro Rapid Service on Wilshire Boulevard, just not in dedicated lanes. There was the potential for future extension of the Red Line light rail system.

Why did we select BRT? We did that because the existing BRT—we call it BRT light or Metro Rapid—was very successful. It had a 40 percent increase in ridership and only needed additional exclusive lanes to make it even better. It avoided mode complexity and unnecessary movement of people transferring from rail to bus. If we keep it all bus, but make it even faster bus, we avoid that transfer issue, which is something you want to avoid. People don't like transfers, especially two transfers.

It also minimized our short-term investment. We decided to put BRT out there until we get the okay to go ahead with a rail line. In fact, the Feds are saying the only way to get the okay for a rail line is if you can prove with your BRT that you really have the demand. Put high-capacity buses out there going as fast as they can in some dedicated lanes and prove that the demand is there. If you don't have the demand for BRT, you're not going to get funded for heavy rail.

I think the Feds are tired of everybody writing reports they've seen for 40 years saying that with rail, ridership is going up and the costs will go down. They now want something that produces some results and has costs that they can understand. They're asking people to prove it with BRT.

Our Wilshire corridor would potentially have median as well as curbside BRT.

A presentation slide with a blue background and yellow text. The title is "San Fernando Valley Corridor BRT". Below the title are three sections: "Statistics", "Issues", and "BRT selected over LRT", each with bullet points. At the bottom left is "Metro Rapid Program" and at the bottom right is "Page 26".

## San Fernando Valley Corridor BRT

- **Statistics**
  - 14 miles, 13 stations, 7 minute headway
  - Project construction/veh cost = \$330 million (\$24 mil/mile)
- **Issues**
  - At-grade corridor with many street crossings (against signal progression)
  - Connects Red Line (HRT) with Warner Center (50,000 jobs)
  - Originally planned as heavy rail extension (too costly)
- **BRT selected over LRT**
  - Expected demand (22,000 daily boardings) did not meet LRT economies of scale
  - BRT required for flexible on-street operation at Warner Center

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The second corridor, San Fernando Valley, is a higher cost per mile. The first one I said is \$14 million a mile, now this is \$24 million per mile. These are all progressively more expensive. This corridor is in the San Fernando Valley. It is a dedicated railroad right-of-way, as opposed to the other one being arterial. We own the railroad right-of-way, 14 miles of it connected to the heavy rail system. We can make it look like LRT or BRT with LRT stations and everything else that goes along with that: prepaid fares, TVMs (ticket vending machines), you name it.

It is an at-grade corridor with many street crossings and against-signal progression. Let me take just a minute to talk about this. Signal priority doesn't always work. If you've got a corridor that's going east-west and all your signal progression is north-south, you're not going to get as good a priority. That's exactly what was going on in the San Fernando Valley. We were cutting across the grain of the signal progression, most of the cars were going north-south, not east-west, but we were trying to get the buses to go faster east-west. We were trying to cross the north-south grain, where 60 percent of the time is allotted to north-south traffic and 40 percent is for east-west. We're trying to take seconds away from the 40 percent, not seconds away from the 60 percent. This gives us less opportunity for the buses to go as fast, so that is an important issue here.

The corridor will connect with our heavy rail system and to 50,000 jobs out at the end of the line at Warner Center. It was originally planned as a heavy rail extension, but it was way too expensive.

Why did we select BRT? Because the expected demand was pretty low—22,000 daily boardings did not meet our LRT economies of scale—and at that other end, where those 50,000 jobs are, the buses had to get off the dedicated right of way and get onto arterials to get to those buildings. We knew LRT couldn't do that, so this was a great option for BRT and that's what's being built.



It's actually under construction, with 4,000 trees, by the way, which is \$100 million of that cost. It's going to be a beautiful corridor. I don't know how fast it's going to be, but it's going to be beautiful.



The Expo, or Exposition, corridor is also railroad right-of-way. Now we're up to \$45 million a mile. It is an exclusive railroad right-of-way with street crossings and alignment options that include grade separations, which make it expensive. There are two or three grade separations in that cost. We have the opportunity to connect with another light rail system and the corridor serves several jurisdictions.

Why did we choose LRT? The expected demand is close to 50,000, which provides LRT economies of scale. It allows the shared use of our other LRT infrastructure, the blue line LRT tracks and a tunnel in downtown Los Angeles. So, we're going to combine an LRT with another LRT, and again, get rid of those transfers. It made sense to choose LRT in this situation.


The Expo LRT is not yet being built, but it is being engineered. This is just a nice picture.

## Exposition Corridor LRT

- **Statistics**
  - 9.4 miles (7.9 new/1.5 shared), 10-12 stations, 7.5 minute headway
  - Project construction/vehicle cost = \$426 million (\$45 mil/mile)
- **Issues**
  - Exclusive railroad right-of-way with street crossings
  - Alignment options include grade separations
  - Opportunity to connect with existing Blue Line LRT
  - Serves several jurisdictions
- **LRT selected over BRT**
  - Expected demand (43,600 daily boardings) provides LRT economies of scale
  - LRT allows shared use of Blue Line LRT tracks & LACBD tunnel

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## Exposition Corridor LRT



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East L.A., the last corridor, is up to a \$150 million a mile. Costs jumped quickly here and this is not the least expensive. When you get into heavy rail, you're talking \$300 to \$400 million a mile. I have been talking about \$14 million, \$24 million, \$42 million, and now \$150 million per mile. The Metro Rapid is \$200,000 a mile, so there's a huge difference between the rapid bus program and any of these BRT and LRT programs. Some of them can get expensive pretty quickly. That, by the way, is what Jon Twichell was saying, \$800 million a mile compared to less than a million a mile for some of the Bay Area programs.

Why did we choose LRT for East L.A.? Initially it was a heavy rail extension, but we also wanted to link it to an existing LRT which was just completed from Los Angeles to

Pasadena. We are connecting the Pasadena north-south line with this east-west line so there will be one LRT line together. We get through service for the existing Gold Line (that's the one I mentioned) and we connect with another LRT Gold Line for East L.A.



**East Los Angeles Corridor LRT**

- **Statistics**
  - 6 miles (1.8 miles in tunnel), 8 new + 1 existing station, 7.5 min hdwy
  - Project construction/vehicle cost = \$898 million (\$150 mil/mile)
- **Issues**
  - Initially HRT extension (too costly)
  - Desire to link with regional hub (Union Station) and existing LRT
  - Station locations not on continuous street or right-of-way
  - Surface streets narrow (built in 1900s); active community street life
  - Surface operation requires numerous turns across traffic
- **LRT selected over BRT**
  - Minimize community impacts (mix of tunnel and surface ops)
  - Through service w/ existing Gold Line LRT at Union Station

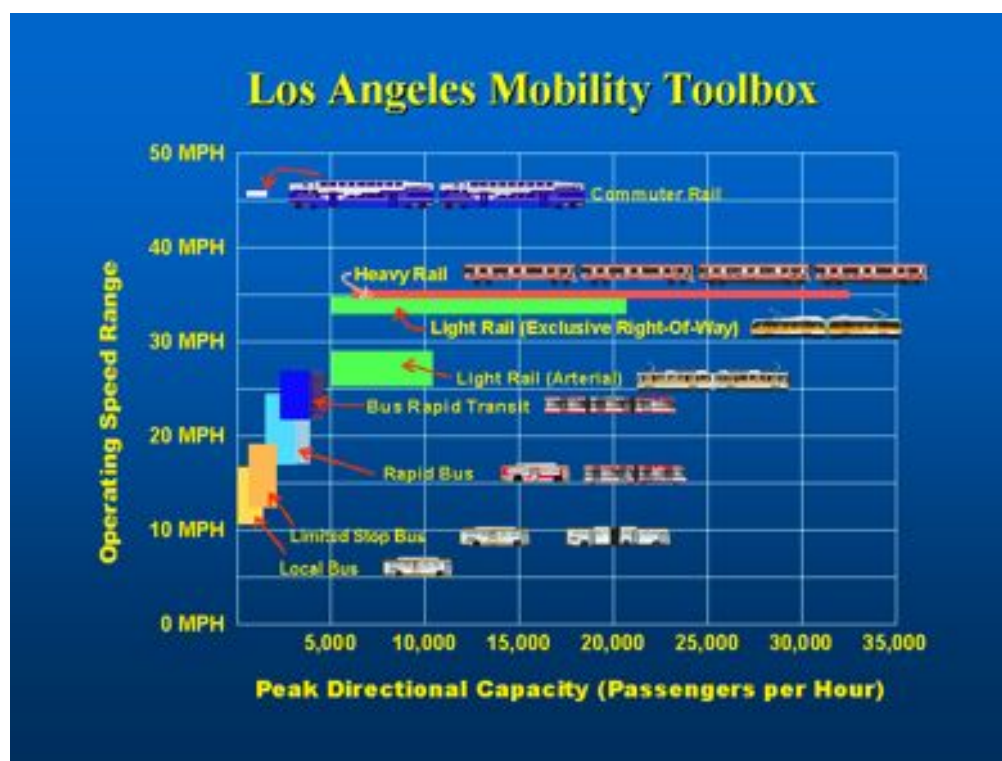
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There were issues with this line. Station locations are not on contiguous streets or right-of-way. The surface streets are very narrow, built in the 1800s. Service operations would require numerous turns across traffic. The BRT wasn't going to work, so we selected LRT because it minimized the community impacts.

A big part of the cost is almost two miles of tunnel—actually 1.8 miles. In a six-mile corridor, about a third of it is tunnel. We're still calling it LRT, but it got as expensive as heavy rail in this section because we had to go underground. We weren't going to do that for BRT.



We developed a Los Angeles mobility toolbox. On the bottom of the graph, the horizontal, is capacity; the vertical is speed. Local buses in Los Angeles have about that capacity and that speed. Limited-stop buses have a little bit more capacity and a bit more speed, but not a lot more. The rapid bus stepped in with quite a bit more speed. Except for one case, it was always 20 to 29 percent faster with a bit more capacity because of increased frequency, not size of bus.

Our BRT system that we're building in the San Fernando Valley, at \$24 million a mile on the dedicated railroad right-of-way, is going to boost capacity and speed as well.

Our light rail system that's in existence today, the Blue Line, has a lot more capacity, but frankly it's not a lot faster than the BRT because it's arterial. In fact, it uses the same signal priority system that our BRT systems use, so it's not going to be a lot faster; it can't be.

We have our light rail moving down the middle of the freeway. That is going to be a lot faster—there's no ridership, but it's down the middle of the freeway. Then we have our heavy rail, which has great ridership, great capacity, and is very fast. It's also on dedicated right-of-way, underground. The light rail exclusive right-of-way is above ground, but they're both on dedicated right-of-ways so they're very fast.

The commuter rail has very little capacity. It's very fast, but it's just commuter rail; not to belittle it, it has its purpose. It's very fast with no capacity, because people get on it at one end and off at the other end.



I will conclude with a challenge. That challenge is: keep it simple. That will be the hardest thing you'll ever do. Keeping it simple is not easy. There are a lot of outside influences that

will try to pull you in directions that only make things more complicated. Politicians get involved, no offense to anybody, but if you can keep it simple, inexpensive, that's what the public is looking for, a simple transit system. They'd like to know which bus to get on and where to get off, and that's all they're looking for. So dare to be simple: simple fares, simple colors, simple schedules.

**Therese McMillan:**

That was a great presentation; in fact, it was so great it answered about 15 of the written questions.

## CAPSTONE SESSION QUESTIONS AND ANSWERS



Figure 15 Rex Gephart, Trixie Johnson and Therese McMillan

**Q: Therese McMillan:**

Let me take a couple of questions that we didn't handle before. You can't be in the Bay Area and talk about any transportation technology without talking about bicycles. What about bicycles in the corridors that we're talking about? There's been a lot of discussion about lane capacity and whether you would take it or supplement it for purposes of autos. What about bicycle accommodation alongside BRT routes, has that been an issue? Also, are bicyclists able to put their bikes on the buses and take them with them, have you addressed that?

**A: Rex Gephart:**

In Los Angeles, we have bike racks on the front of all of our Metro Rapid Buses; they hold two bikes. If you have really good ridership, it won't matter because by the time the people get the bikes in the racks, they're still going to have to wait in line because there should be good demand. Bicycles haven't impacted our speeds at all.

**A: James Cunradi:**

One of the biggest issues for us in the East Bay is a proposed bike lane on Telegraph Avenue where everybody is competing for the same narrow piece of real estate. Our

engineers have taken a look at it, and we think we can actually fit in as much bike lane as Oakland is proposing for their area. It's slightly different in some locations because of transitions, left turns, and BRT stations; but mile per mile it's pretty much exactly what Oakland was proposing. We're also looking into having the ability to carry bikes on buses. We're proposing using 60-foot articulated buses and we're looking at ways to have an indoor hook or something like they use in the Santa Clara light rail system, but do it on the buses.

**A: Cyrus Minoofar:**

Just something quickly that's unrelated to rapid bus—CMA, in cooperation with Caltrans, implemented a \$2 million video protection project along El Camino Real and one or two locations in Berkeley. We also have made a grant application to MTC and we're hoping to get some more funding to do bicycle video detection along the International/Telegraph route.

**A: Rex Gephart:**

Jim, just for your information, we ordered articulated buses that have an area for bicycles to be stored on the bus. You might want to see what we've already ordered. On the articulated buses, we couldn't put the racks in the front, so we put them inside the bus.

**Q: Therese McMillan:**

One of the questions that I think we can address both to Rex from the L.A. experience and back to our panel here is about impact on business. Outside of the obvious concern about taking away parking that was in front of retail businesses, what were some of the other responses from retail and businesses along their corridors? Did there seem to be any economic benefit to those businesses once the Rapid got going?

**A: Rex Gephart:**

We only have that one mile stretch in Los Angeles where we've taken parking away for the one-mile lane on Wilshire. Before we did that, of course, we did a lot of research and found that actually there was quite a bit of parking behind the buildings and on the side streets. It wasn't going to impact any of the neighborhoods. So we did all our research first, then went to the politicians and talked to them, had some public meetings where we mentioned

it to everybody, and then when we took the lane everyone was aware of it. All the politicians and everybody had approved it. There is a negative impact from taking parking away from the businesses, but other than that there have been no other issues, positive or negative, with the folks that live along the corridor.

**Q: Therese McMillan:**

Here's a question for Rex. Does the Metro Rapid, as it exists on a major local corridor, help resolve equity issues regarding services in the core area versus those favoring rich suburbs?

**A: Rex Gephart:**

If you look at that map showing the nine corridors, you see that they're all over L.A. County. They were not our top corridors in terms of the criteria I mentioned earlier: highest demand, slowest speeds, and longest average trip distances. Those would have all been the top five or six lines, parallel to one another in West L.A. The other 75 percent of the county would have received nothing. We didn't do that because we wanted to build a network to begin with. We wanted to get people moving east-west and north-south, so we built corridors all over L.A. County, knowing that we didn't build them in order of preference. We built them in the order of an attempt to create a network and that has satisfied everybody in L.A. County. Metro Rapid goes through the poorest neighborhoods as well as the richest neighborhood. We're trying to attract more people onto the service regardless of income.

**Q: Therese McMillan:**

What information is provided in the kiosk at the stops and how often does it get changed?

**A: Rex Gephart:**

The kiosks are another important thing. Transit agencies don't want to be strapped with any operating expenses. These kiosks have an advertisement on one side. That advertising money goes to the city and the city maintains the bus shelters. We at the MTA have no obligation to maintain or clean these shelters. So there's an advertisement on one side—some of them are four-foot-by-six-foot advertisements—and on the other side is a map of the entire L.A. County bus system with all 17 operators and all their lines and all their line numbers. It doesn't matter where you are in L.A. County, you can figure out where you

want to go. It might take you a day to get there, but you can figure it out on this map. We've had a lot of comments that this is the first time that there's ever been a map in L.A. County that showed how a person could go from someplace to someplace else, as opposed to this system's map and then that system's map. We combine them all on one county map.

**Q: Therese McMillan:**

I'm going to direct this question to both camps, because I think it's an important one that comes not just from rapid transit per se, but any of the at-grade developments. It has to do with pedestrian safety. I believe that one of the considerations that was talked about in terms of a near-side versus far-side bus stops specifically had to do with improving pedestrian safety. How are pedestrian safety issues being incorporated into your BRT thinking? Does any of the signal preemption timing create pedestrian crossing issues that need to be dealt with?

**A: Cyrus Minoofar:**

Pedestrian issues for CMA are just part of the SMART corridor. They are somewhat remote from the rapid bus project, so we do have that taken into account because of the safety. We have adequate response to all local needs. We don't have any problem in that area. In terms of why the bus stops are located on the far-side, it was because of the technology we have chosen. We don't have the buses stop at the red light and then, as soon as the light turns green, have it go to the far-side of the intersection.

**A: Jon Twichell:**

We went through a long process with a traffic engineering committee within CMA to design the software parameters for the signal priority. One thing is, we don't take anything out of the pedestrian portion of the signal, which is a specific answer to the question. The other thing is, Ped (pedestrian) Buttons, in general, are very good for us. When you're working on a signal progression and there are no cars on a loop in the side street, or nobody's using the Ped Button, then you can maintain your green longer on the main corridor. When someone calls for a light change or a pedestrian movement, then it gets taken care of. In that way the equipment actually is a help to us.



**A: Rex Gephart:**

In Los Angeles, there are two issues. One, we never take time away from the pedestrian crossing; that's just the rule. If it was 20 seconds before Metro Rapid, it's 20 seconds or more after Metro Rapid; we never take that time away. The only time we take away is from the cross-traffic, so it's never an issue. We did run into a problem with the far-side/near side issue. Initially with Metro Rapid, we put all Rapid stops far-side and left the Local stops near-side.

Far-side/near-side means that as the bus is going down the street and it approaches an intersection, the side before it gets into the intersection is the near-side and the side after it goes through the intersection is far-side.

When we put Metro Rapid out there, we wanted the Rapid stops far-side and the Local stops near-side for two reasons. First, we wanted to have the rapid bus get through the intersection because the signal priority can get it through the intersection so it can stop far-side. Second, we never wanted to have the Rapid and the Local bus sharing a stop. If the Local bus is sitting there stopped picking up people when the Rapid pulls up, the rapid bus has to wait. So we always split them. That turned out to not be the best idea as part of the demonstration because that meant, in some cases, if a person saw the Rapid coming down the street, and they were at a near-side Local stop, they'd run across the street to the far-side rapid bus stop. We never had an accident, but there were a lot of people who didn't ride the bus system who thought this was an issue, so we changed the policy. Our policy now is to put both the Rapid and the Local stops on the far-side, and separated. The problem with that is it takes a lot of red curb to do that. You've got to be working with your city, your traffic engineers, and other folks to have them be with you when those decisions are made.

**A: James Cunradi:**

Can I finish off with the effect of the dedicated lanes on pedestrian access? We generally designed the BRT as a walk-to system—pedestrian-oriented transit instead of auto-oriented transit. Pedestrian access is very important. We're learning from both San Pablo and Los Angeles. We're also looking at ways to put in pedestrian refuges as part of the BRT right of way—using stations as pedestrian refuges—and putting in bike lanes. We're working with the City of Oakland on ways to put in mid-block crosswalks for pedestrians,

which we didn't think of originally, but Oakland has stepped in and they've got some ideas that they want us to try.

**A: Dr. Peggy Thomsen:**

May I just say, that from the political side, that was one of my real concerns all along when we were having meetings. I said, what about the pedestrians? I have to say that they have done a great job. I see no problems all along the avenue.

**Q: Therese McMillan:**

Kudos all around on that one, it sounds like.

I'm glad I get to ask this question of Rex, because being from L.A. myself and having grown up there, I know that Wilshire Boulevard is just a wee bit wider arterial than Telegraph Avenue in Berkeley. So, I'm not sure if this question is hypothetical or true, and the question is: has MTA foreseen or projected that, at any point in the future, their arterial capacity will be exceeded by auto demand so much in the rapid BRT bus corridors that it degrades the benefits of the speeds and service in the corridor?

**A: Rex Gephart:**

Absolutely, and the Wilshire corridor is a good example. The Wilshire corridor is two lanes in each direction plus parking in each direction. I don't know how that compares to Telegraph, but that's what it is.

If you pick corridors where you really have demand, you're going to have a lot of cars there and you're going to have a lot of people there and eventually it's going to slow down. Then, you're eventually going to get to the decision point that the BRT mode doesn't work because it's not capable of hauling enough people quickly enough. I think that's the point where you choose the next mode.

If you're at a point, your buses are just going too slow and you can't do anything about it because even the dedicated lane is getting held up. You can't provide any more capacity because you've got articulated buses out there and you've got the headways down so low that you can't get signal priority. It's a complex answer here, but in Los Angeles, if your headways are less than three minutes some of those buses are not getting signal priority. At

three minutes and above, they're all getting signal priority whenever they ask for it, three minutes or less they're not. So you run out of capacity after awhile and you can't do anything about it except experiment with parallel streets and one way couplets, or getting cars off of that main corridor and having only buses on the corridor. That leads to the next option of another mode like light rail or heavy rail, and I believe that's what the Feds are thinking as well.

**Q: Therese McMillan:**

I think some of the particular challenges that the Bay Area faces, given the number of transit operators, are integrated fare systems and mechanisms to help in transferring from system to system. The question here is: are there any additional costs, and I would add, are there any particular mechanisms that assist passengers in transferring from the BRT to your other light rail or heavy rail systems? What are the cost and fare structure?

**A: Rex Gephart:**

In Los Angeles, the BRT doesn't cost any more. The fare is exactly the same as the local bus; there's no difference. It's not a special fare, even though people have said, why don't you charge a higher fare because of the premium service? Well my answer is: it's really not a premium service; it's just what people were supposed to be getting to begin with. The other service shouldn't be there. Metro Rapid is just what people are paying for.

Now, 10 to 20 percent of our fleet has this thing called universal fare systems, which means that it understands the fares of all the operators. If you get on an MTA bus and have a pass from the Santa Monica bus line, it knows that it's a Santa Monica pass and it deducts a certain amount of fare. So we have a universal fare system on each bus that understands everybody's costs and transfers. Anybody can transfer between buses; it's very easy.

**Q: Therese McMillan:**

That's good. Okay, we are down to our last question. The question is the BRT in Bogotá, Columbia carries 45,000 passengers per peak hour per direction on its heaviest travel segment; do you see a North American BRT ever achieving this huge level of ridership?

**A: Rex Gephart:**

No, I don't. New York is fantastic. Manhattan has a great system for transit. In Bogotá you can't drive a car; you don't want to own a car. You can't drive it anyway if you did own it. Sao Paulo, Brazil is the same way. In those cities, you just can't move in a car; it's like Manhattan. There's no point in driving a car; it's too expensive to pay for, and you've got a great transit system that takes you everywhere anyway. Those systems are way beyond where we are in the United States in terms of ridership, transit-oriented development, and corridor development. I mentioned Curitiba earlier. Sao Paulo and Bogotá all have the double-articulated buses. They're actually coming up with a triple-articulated bus now, and the capacity is 275 people on those buses. People just swarm onto those systems to get around those cities, and they need to.

The United States is a car culture.

**Q: Therese McMillan:**

Comments from anyone else?

**A: Jon Twichell:**

The kinds of responses you get in other cities and other cultures naturally reflect population density and capacity for car ownership. All of the other systems there are really designed to be a substitute for rail. The colonial era is over and Britain is not going to go around the world and build rail systems anymore.

A lot of Central American and South American countries have implemented BRT lately. One of the more interesting ones is a town in Mexico called Leone. They had lots of jitneys zooming around the streets there competing for passengers and it was just a mess. The government put in stations and lanes, forced the jitney people to form consortiums, bought buses for them and said: okay, you're on your own, go out and do it. Within six months, they had taken a completely chaotic system and made it into one that worked very well. When you have a certain level of dictatorship, you can do that. It's not going to happen around here.

I think, realistically, a lot of cities around this country can benefit from at least the basic level of BRT. Everyone has trunk lines, and if you can improve service on your trunk lines,

you are going to get something out of it. Our corridors run between 15-25,000 boardings for the big ones. Wilshire Boulevard is a true anomaly because there are hordes of people on the buses all day long there. But every city has something they can do in terms of improving their service.

**Therese McMillan:**

We're at the end. I think the one thing I would like to say is MTC is thrilled to have been a participant. I think we've learned a lot, and if there's one key theme, I think one of the most positive things that we've heard here today is about choices and coordination— coordination between modes, coordination between communities, coordination among jurisdictions to try and make things better. With that, I think we are going to see some advances in this area and I for one thank the audience for great questions and thank our wonderful panel.

**Trixie Johnson:**

On behalf of the Mineta Transportation Institute, I want to thank you for taking a Friday afternoon with us to look at BRT and the potential for what it can do in this part of the East Bay, to find out what L.A. has been doing, and perhaps what we can do in other parts of the Bay Area to get people around a whole lot better. Thank you for coming.



## APPENDIX A: ADDITIONAL QUESTIONS & ANSWERS

There were more written questions submitted than there was time to answer them within the limits of the forum. Some of those questions were either technical in nature or were addressed to corridor-specific topics, and the moderator chose to not use them during the event. In the interest of maximum possible disclosure, the panelists provided written responses to those questions afterward. Those questions and their answers are presented here.

**Q: Irwin Dawid, Sierra Club:**

Rather than projecting traffic levels and congestion, I would like to see the same, or greater, level of detail paid to “modal shift” from single car to all alternatives. How do the alternatives effect walking and biking and BART usage?

**A: James Cunradi:**

The models we use measure the shift from single-occupant vehicles, carpools to transit, and the shift between transit modes. Any new riders to transit that do not come from these modes can be presumed to come from walking or biking. Improved transit does tend to attract some short trips formerly made on foot or by bicycle.

**Q: Norman Rolfe:**

Please give us the formula for calculating cost per new rider. Why not use cost per rider using total number of riders? If a proposal resulted in carrying the same number of passengers, but at a lower cost, how would it be evaluated?

**A: James Cunradi:**

The formula we use is this:

$$\frac{(\text{annual operating cost} + \text{annualized capital costs})}{(\text{annual new riders to transit})}$$

We also use cost per total riders when we measure the annual subsidies required. The only way to achieve what you have described would be one where the investment lowers operating expenses by the same amount as the annual capital costs.



**Q: Eva Alexis, League of Women Voters of the Bay Area:**

Will AC Transit be there to testify for more intensive development along BRT routes and to advocate wider sidewalks for pedestrian access?

**A: James Cunradi:**

Yes. We review all development projects in the corridor as well as proposed changes in zoning or land use. We vigorously support projects that have mixed uses, medium to high density, and are located close to our facilities.

**Q: Michael Sarabiz:**

Bus-only lanes. Will you let cars pay for using lanes?

**A: James Cunradi:**

No. The lanes will be reserved for buses and for emergency vehicles. In a limited number of locations drivers will be permitted to use the lanes to make right turns, and to access parking or loading areas.

**Q: John Gonsalves, Parsons Brinckerhoff; BRT Project Manager, Eugene, Oregon:**

Have you considered a single reversible BRT lane through urban constraints?

**A: James Cunradi:**

There are several locations along the corridor where this might be possible. The key determinants are 1) close spacing between adjacent BRT stations and 2) a physically constrained right-of-way. We are working with the Partners for Advanced Transit and Highways at UC Berkeley to investigate the potential of an electronic guidance and tracking system that could work much like a switching system of a railroad.

**Q: Ross Maxwell, Parsons Brinckerhoff:**

Does the Metro Rapid on major local corridors help resolve the equity problem of service, factoring richer suburbs?

**A: Rex Gephart:**

Yes, to some extent. Metro Rapid corridors are defined by high employment density, high population density, and transit dependency and, thus, serve many low income neighborhoods.

**Q: Roy Nakadegawa, PE:**

When does the bus design and procurement start relative to the design/construction of a corridor? What is the average cost ratio between bus purchase and design/construction of a corridor?

**A: James Cunradi:**

One needs to know the bus length, floor height and width before BRT stations are designed. Procurement can take place any time before the service begins. The portion of total project costs used for buses varies by project.

**Q: Bruce DeBenedictis:**

What is the effect of rapid bus/BRT on the parallel local service? (Is it faster? More/less ridership?)

**A: James Cunradi:**

Where walking distances are similar between parallel lines, a rapid bus would attract some riders away from the slower or less frequent local service on the other street.

**Q: Ted Yurek, SamTrans:**

Can you talk about the lawsuit stopping construction of the Orange Line? (Now restarted?)

**A: Rex Gephart:**

The law suit is over and construction has started again. We plan to open the Orange Line in late August of 2005.

**Q: Margaret Okuzumi, Bay Rail Alliance:**

Why does faster speed facilitate reduced headways? What happens when there are simply reduced headways without faster speed? How does faster speed help (other than helping to attract more riders)?

**A: James Cunradi:**

The faster speed means each bus trip from terminus to terminus takes less time. In turn, for the same cost, buses can be run more frequently. Just increasing the frequency of buses without increasing the speed is expensive and does not attract a significant numbers of riders. An added problem is that high frequency in congested traffic conditions almost always results in buses traveling in bunches. The combination of bus lanes and signal priority also serves to maintain schedule reliability.

**Q: Chris Peeples, AC Transit:**

What does the agency give up in terms of the next five to eight priority corridors by spending what it takes to bring one corridor up to full dedicated-lane BRT?

**A: James Cunradi:**

The agency doesn't give up anything, quite the contrary. The agency actually gains by successfully completing a large-scale project—each success creates a track record that helps secure funding for the next major corridor project. Failure in one corridor affects the ability to secure funding in others. Furthermore, the funding for the Telegraph/International/E. 14th Street corridor is dedicated to this specific corridor and cannot be spent elsewhere. Thus each new corridor would need to be studied and a plan developed. Finally, nothing is lost in the current corridor development by advocating for study funding in the other priority corridors.

Our board has actually discussed these strategies and has affirmed focusing resources on a single corridor and then moving on to other corridors as outlined in our Strategic Vision and Short Range Transit Plan. AC Transit has been quite successful using this approach.

**Q: Michael Diehl, Building Opportunities for Self Sufficiency:**

Do rapid buses have bike racks in front like other buses to facilitate people using bikes rather than cars?

**A: Jon Twichell:**

Yes, all AC Transit buses have bike racks.

**Q: Lars Sandstrom, SamTrans:**

You mentioned the length and location of the BRT lanes not being contiguous. Using the 14-mile segment of rapid bus, approximately how many miles of BRT lanes would be used if it was BRT? Only approximate to bus stops?

**A: James Cunradi:**

We don't know yet. The traffic and ridership studies and financial evaluation will tell us where dedicated bus lanes can be done, how effective they would be, and how many miles we can build.

**Q: Brett Clavio:**

Will the buses use diesel (fuel)? If so, can they be modified for bio-diesel, saving petroleum and re-using other fuels?

**A: James Cunradi:**

AC Transit's first generation of BRT buses will be diesel. We are testing hydrogen fuel cell buses and may purchase diesel-electric hybrids in the near future.

**Q: Joyce Roy:**

If AC Transit continues to use buses with awkward seating configuration that riders hate, how will that affect AC Transit's ability to attract riders that are not transit dependent?

**A: James Cunradi:**

Buses should be comfortable to attract more of the discretionary bus riders.

**Q: Quam, SOC:**

What is the risk of unauthorized users (taxis, private parties) gaining access to the transit signaling priority devices for their own benefit?

**A: James Cunradi:**

This would activate the system too frequently. Cross traffic would suffer as would buses using the same corridor.

**Q: David Schonbrunn, TRANSDEF:**

It sounds like AC is committed to the notion of dedicated bus lanes. Why? Is it reasonable to commit a lane to serve one bus every 5 minutes?

**A: James Cunradi:**

Bus lanes are very cost-effective in creating fast and reliable transit now and into the future. Many large transit agencies are investigating the efficacy of bus lanes and many agencies already have them.

**Q: David Uniman:**

How does the funding invested in BRT vs. other services, compare to the system wide percent of ridership provided by it?

**A: James Cunradi:**

The current routes in the BRT corridor account for 15 percent of our total ridership. After BRT, the route will account for 20 to 25 percent of our total ridership. Other than the cost of buses, there is no capital (roadway, signal) investment in most of the 100+ routes we operate, so there is no real way to make a comparison between high investment and no investment.

**Q: Roger M. Bazeley:**

What is the cost-benefit formula that can be applied to a fixed median (BRT) system (electrified) along a major commercial eight-lane boulevard for convincing or building community support for such a system upgrade?

**A: James Cunradi:**

We are not proposing an electrified system. We do not have many eight-lane boulevards in our service area. Where we do, the transit ridership tends to be very low.

**Q: Rex Gephart:**

Los Angeles does not have experience with BRT systems on fixed routes, although we are planning several for future implementation. In all cases, we will use the parking lanes instead of the median because of the difficult turning movements and limited flexibility for passing, vehicle door configurations, etc. Nevertheless, taking lanes on arterials, regardless of the lane, requires a package solution that involves the parallel arterials and limits the impacts on automobile traffic, parking, and sidewalk environment.

**Q: Linda Lazzeretti, Oakland Chamber of Commerce:**

Uptown Project, Oakland—what are the plans for Telegraph from 17th to 20th, and any planning yet for theatre district public transit options (i.e., shuttle service from parking/transit hubs to congested/limited parking areas)?

**A: Jon Twichell:**

At this point, the city of Oakland has requested that transit service be diverted off Inner Telegraph (20th to 15th) onto Broadway. So the Telegraph Rapid, as well as local service, would proceed up Broadway, turn left onto 20th Street, then right onto Telegraph.

**Q: Roy Nakadegawa:**

Problem of BRT nomenclature—FTA defines BRT to include all forms of increasing speed and conveniences of buses. AC Transit uses BRT as Busway, whereas FTA defines it as including Enhanced Bus, rapid bus, as well as Busway, with the most significant form of Busway being the Guided Busway.

**A: James Cunradi:**

True enough. The nomenclature has evolved over time. The current definition promoted by FTA is the most flexible and covers the complete range of bus improvement options.

**A: Jon Twichell:**

“Rapid” bus is Level 1 BRT, as defined by FTA. Our BRT project on Telegraph Avenue/International Boulevard/East 14th Street would include other BRT items such as stations and possible exclusive lanes.

**Q: Lars Sandstrom, SamTrans:**

Rail-to-rapid-bus passengers—any correlation between distance between parallel corridors and converted passengers; that is, more conversion wherein origination/destination corridors are closest and less so where furthest?

**A: Jon Twichell:**

No correlation. Our San Pablo Rapid gained 13 percent of its ridership from former BART passengers.

**Q: Michael F. Sarabia:**

Will BRT bus have (bring your own laptop) access to the Internet? Many/most commuters may be allowed to “Sign-In” by logging into the office via the Internet and working. Some might be allowed to do the same on return. These commuters may save two-plus hours daily.



**A: James Cunradi:**

Not on BRT. However, AC Transit's Transbay express buses are designed for long commutes and have laptop power outlets.

**A: Jon Twichell:**

AC Transit is looking at creating Wi-Fi connections on its Transbay buses.

**Q: Bob Piper, Sierra Club:**

What are the relative numbers of buses in service during peaks before and after rapid bus? Is there a dispatch program to prevent bunching?

**A: Jon Twichell:**

Formerly the 72L ran a 20-minute schedule with nine buses; the 72R runs a 12-minute schedule with 11 buses. As for bunching, reality intervenes—we have a headway-based schedule with buses leaving the ends of the lines every 12 minutes and moving to the other end as quickly and safely as possible. Bunching will occur from time to time, no matter what.

**Q: Kate Ming:**

How is the infrastructure of CMA set up to be an effective liaison between agencies involved in the SMART corridors program?

**A: Cyrus Minoofar:**

Congestion is reported through the use of microwave vehicle detectors which provide information every 30 seconds on a 24/7 basis (lane-by-lane and by direction). The congestion and incidents could be verified by the use of video streams from CCTV (closed-circuit television) cameras. The CCTV cameras could also be used to proactively monitor the intersections as the public agency system (private network) also includes information from 220 traffic signals along the corridors. The traffic signal module is not open to the public Website (<http://www.smartcorridors.com>). The traffic

signal module is used to ensure coordinated and seamless operations across the 15 systems/agencies.

**Q: David Schonbrunn, Transdef:**

To avoid the controversy about take-a-lane, why not make the lane HOV-only, rather than bus-only, to encourage mode-shift from SOV (single-occupant vehicle) to carpool, and have more activity in the lane?

**A: James Cunradi:**

The lanes and BRT stations are part of a single transit system; allowing cars, even HOVs, compromises the intent of the design.

**Q: Roy Nakadegawa:**

Porto Alegre platoons the buses to increase capacity on their Busways. Vancouver, B.C. has set criteria so that when their ridership reaches a certain point they will take away a parking lane for a Busway. Leeds, U.K. built guided Busways to by-pass the congestion. Does MTA have similar criteria?

**A: Rex Gephart:**

No, not yet. However, we may soon establish criteria based on the number of buses per hour that use a lane. It is our contention that in order to justify the exclusive use of arterial lanes for buses, we must be able to show that buses move the same number or more people as automobiles three years from the lane's inception. While the headway threshold would differ by corridor, it seems likely that the minimum threshold would be five minutes or less.

**Q: Jim DeHart, SamTrans:**

When the Wilshire Corridor becomes heavy rail, will you retain rapid bus? If so, why or why not? Competition?

**A: Rex Gephart:**

No, we would not operate Metro Rapid Bus service if the Metro Red Line rail service is extended westward. Our preference, in general, is to not duplicate rail service when possible in order to minimize operating expenses.



**ABBREVIATIONS AND ACRONYMS**

|            |  |
|------------|--|
| ACCMA      | Alameda County Congestion Management Agency              |
| AC Transit | Alameda-Contra Costa Transit Agency                      |
| BART       | Bay Area Rapid Transit                                   |
| BRT        | Bus Rapid Transit  |
| BSP        | Bus Signal Priority                                      |
| Caltrans   | California Department of Transportation                  |
| CCTV       | Closed-Circuit Television                                |
| CHP        | California Highway Patrol                                |
| CMA        | Congestion Management Agency                             |
| CNG        | Compressed natural gas                                   |
| EVP        | Emergency vehicle preemption                             |
| FTA        | Federal Transportation Administration                    |
| HOT        | High-occupancy toll                                      |
| HOV        | High-occupancy vehicle                                   |
| HRT        | Heavy Rail Transit                                       |
| ITS        | Intelligent Transportation System                        |
| JPA        | Joint Powers Authority                                   |
| LRT        | Light Rail Transit                                       |
| MTA        | Metropolitan Transportation Authority (Los Angeles area) |
| MTC        | Metropolitan Transit Commission (S.F. Bay Area)          |
| MTI        | Mineta Transportation Institute                          |
| NIMBY      | "Not in my backyard"                                     |
| Ped        | pedestrian   |
| SAMTrans   | San Mateo County Transit                                 |
| SOV        | Single-Occupancy Vehicle                                 |

|          |   |
|----------|---|
| Transdef | Transportation Solutions Defense and Education Fund |
| TOD      | Transit-Oriented Development                        |
| TSP      | Traffic Signal Priority                             |
| TVM      | Ticket vending machine                              |
| VMS      | Variable message sign                               |
| Wi-Fi    | Wireless Fidelity                                   |