

## ***NCER Assistance Agreement Final Report Executive Summary***

**Date of Final Report:** April 12, 2005

**EPA Agreement Number:** SU831 G4S20398

**Project Title:** Revitalization and Integrated Traffic Management Along a Multimodal Urban Arterial: A Plan for the San Pablo Corridor that Promotes Prosperity, Environmental Protection, and A Higher Quality of Life

**Faculty Advisor(s), Departments, and Institutions:** Elizabeth Deakin, Director, University of California Transportation Center and Professor, Dept. of City and Regional Planning, University of California, Berkeley, CA 94720-1782

**Student Team Members, Departments, and Institutions:** 21 graduate students and 79 undergraduate students at the University of California, Berkeley – various departments (SEE APPENDIX FOR LIST)

**Project Period:** Sept. 2004- May 2005

**Description and Objective of Research:** Urban revitalization and infill development along transit corridors are important smart growth strategies. This project is an urban transportation and land development study designed to support and promote urban revitalization of older, low and moderate income communities along a major urban arterial and transit corridor, San Pablo Avenue in Oakland, Emeryville, Berkeley, Albany, and El Cerrito, CA. The objective is twofold: 1) to establish and test an interdisciplinary approach for developing revitalization and traffic management strategies for complex urban corridors, and 2) for the case being studied, to develop realistic, feasible plans for improved traffic management and transit operations, pedestrian and bike facilities, land use planning and development incentives, and related policies and programs. The research performed in Phase I involved traffic operations and transit operations studies; surveys of transit users, bicyclists, and residents of the study area; interviews with developers, merchants, city officials, and other key stakeholders; analysis of census data; review and evaluation of land use plans and development regulations; urban design studies; and real estate analysis. From these studies we developed recommended transportation and land use changes for the corridor, working with elected officials and staff from the affected communities. The integration of these recommendations into an overall plan (or set of plans) for the corridor is an ongoing task.

**Summary of Findings:** The assessment of transportation and land use conditions along the corridor found auto-pedestrian conflicts, speeding, inadequate pedestrian lighting, underutilization of transit resources, marginal businesses and empty lots, uneven availability of neighborhood-serving retail, negative spillovers from corridor activities onto adjacent neighborhoods, safety concerns, and inadequate attention to landscaping, property upkeep, and the maintenance of public spaces. Key strategies for change identified for the study corridor include: redesign of portions of the street to include landscaped medians, providing aesthetic,

pedestrian safety, and traffic management benefits; adding street trees and other plantings along the length of the street to create a greener space in the city; repairing sidewalks and curb cuts; installing pedestrian-scale lighting throughout the corridor, starting at major development nodes; installing pedestrian bulbouts, zebra striped crossings, and extra lighting at uncontrolled intersections; increasing pedestrian crossing time at signalized intersections; retiming traffic signals using advanced coordination methods and transit-weighted signal timings; reducing speeds through street design and traffic control; providing alternative routes for bicyclists with connections to the avenue from side streets; installing bus queue jumpers to allow buses to bypass congestion; improving bus stops by adding shelters, seating, lighting, and transit information; protecting neighborhood streets from traffic incursions by installing traffic calming devices; focusing pedestrian and transit-oriented development at key intersections that also serve as major transit interchanges; providing incentives for mixed use development with first floor retail and offices and mixed income housing on upper stories at the nodes; extending programs for façade and signage improvements, earthquake retrofit, and other property enhancements to existing transit and pedestrian-oriented businesses; reducing the number of auto repair shops and other car-oriented uses along the avenue; encouraging cafes, neighborhood restaurants, entertainment, and related uses that create night-time activity along the corridor; reducing excessive parking requirements and requiring parking to be placed away from the street frontage; organizing merchants and businesses to support commute alternatives through deep discount transit passes and other programs; developing specific plans for key nodes that will integrate these recommended actions into a single document that has community support and will allow development and revitalization to proceed expeditiously.

**Conclusions:** In the first phase, in cooperation with the project advisory committee (elected officials and agency staff from the corridor jurisdictions); we developed and analyzed a variety of strategies for transportation and urban development along the study corridor. There is broad agreement among stakeholders that these strategies should be pursued. Their implementation would reduce auto dependence and allow growth and revitalization to proceed without a worsening of traffic impacts. Some of the recommended improvements (including sidewalk repairs and improvements, median installation plans, and landscaping) have been adopted by participating cities and are underway, as is street repaving. Discussions among the jurisdictions continue on 1) how to put together a final plan (or set of plans for the participating cities); building community support, requiring more analysis of parking and traffic issues associated with new development along the corridor; and finding funding to support the implementation of the plan(s).

**Proposed Phase II objectives and strategies:** In Phase II we propose to continue to work with the project advisory committee on ways to implement the proposals that emerged from Phase I. We propose to conduct six substantive tasks. 1) Study the auto ownership and use patterns of the occupants and customers of new developments along the corridor, especially those near transit and in pedestrian-friendly nodes, and recommend appropriate parking requirements. The traffic and parking implications of new development are a major issue in discussions about revitalization of the corridor, and new data and analysis are needed to inform the discussions. 2) Develop a strategy to encourage more transit use by residents and employees in the corridor, and in particular to improve the affordability of transit to low income residents and workers. Underutilization of transit resources may in part call for better regional connections to corridor

services. Transit pricing and funding strategies to keep services affordable are important equity and quality of life issues. 3) Work with local government on specific plans for nodes, incorporating and integrating the transportation and land use strategies recommended for the corridor. Specific plan development can be the basis for building community agreement that can allow development and revitalization to proceed more expeditiously. 4) Work with the advisory team to develop funding strategies for the proposed improvements. 5) Estimate the mode shifts toward walking and transit that can be expected from implementation of the proposed courses of action, and calculate implications for emissions, noise, and other key traffic impacts. 6) Organize workshops and focus groups on the findings of the study in cooperation with the advisory team, increasing public involvement in the process.

**Publications/Presentations:**

1. Greg Newmark and Elizabeth Deakin, Recasting a Road: The History of San Pablo Avenue as a Multi-Use Urban Arterial, conference paper, Transportation History Conference, University of Michigan, Dearborn, Michigan, October 2005.
2. E. Deakin, Managing the Multi-Purpose Arterial: San Pablo Avenue from Oakland to San Pablo, Conference Paper, Annual Meeting of the Association of Collegiate Schools of Planning, Portland, OR, October 2004
3. Luis Mejias and Elizabeth Deakin, Redevelopment and Revitalization Along Urban Arterials: A Case Study of San Pablo Avenue from the Developer Perspective, conference paper, Transportation Research Board Annual Meeting, Washington DC., January 2005.
4. Nathan Higgins, et al., Strategies for Traffic Management and Transit Priority Along an Urban Arterial: Case Study of San Pablo Avenue, forthcoming..
5. Jennie Day and Elizabeth Deakin, A Survey of Transit Users along San Pablo Avenue, forthcoming.
6. Carolyn McAndrews, Elizabeth Deakin, and Josefina Florez, with Students of CP114/CE154 (Spring 2005), Resident Views on Transportation and Land Development Issues Along San Pablo Avenue: Findings from A Survey and Focus Groups (forthcoming.)
7. Elihu Rubin: Signs of Change: San Pablo Avenue (film).
8. Students of CP218, Transportation Studio, Revitalizing San Pablo Avenue: Studio Report and Presentation to the Project Advisory Committee, December 2004.

**Supplemental Keywords:** transportation, infill development, transit corridors, urban revitalization, pedestrians, traffic management, modeling, simulation

**Relevant Web Sites:** [www.uctc.net/sanpablo](http://www.uctc.net/sanpablo)

## **Summary of Phase I**

### **1. Background and problem definition**

A growing body of research shows that infill development along transit corridors is a key way to maintain the health of existing urban and suburban areas and to reduce demand for greenfields development. [1] However, transit-oriented infill has proven to be hard to implement in many locales. High costs of land and construction in built up areas can deter developers. Tax flows and public costs can be an issue for local government. Existing zoning ordinances can bar higher density development that the market would support, or make it unduly expensive. Community opposition to density and to traffic increases – or perhaps simply to change – has derailed or diminished many infill proposals. [2]

Still, many cities and older suburbs are actively searching for ways to revitalize their older districts. Downtowns with strong transit systems have frequently succeeded, as have waterfront districts. However, one of the most common urban and suburban planning and design problems is the district centered on a multi-lane, multi-use arterial. In these districts, smart growth poses a particular challenge.

Multi-lane arterials in urban and older suburban settings frequently were primary roads before the Interstate system was developed. They were often Main Street (literally or figuratively) for the communities they crossed. They carried local and through traffic, trucks and trolleys. They were the market street for nearby residents, and in some cases the best residential address in town. Through trips and local trips shared the street space with pedestrians and bicyclists. Local business used curb lanes for parking, and center lanes were sometimes used for transit.

With the coming of the Interstates, shopping malls, mass-built suburban housing, and near-ubiquitous auto ownership, these multi-lane urban arterials underwent major changes. Businesses dependent on through traffic often faltered as portions of the traffic they had counted on shifted to the faster limited access highway. Household auto use increased, and local traffic on the arterials grew. Shopping, however, shifted to supermarkets and other large new stores, often located on the edge of town or in areas with larger lots and block sizes. In many areas transit use declined. Trolleys were replaced by buses, and their center lanes were claimed for road widening; the buses were relegated to the same lanes as the cars and trucks. Traffic engineering strategies commonly emphasized vehicular speed and flow; if needed, pedestrian crossings were restricted to maintain that flow. Frequently the result was a road that acted as a pedestrian barrier at the same time that it remained a shopping and residential street, somewhat down at the heels but persevering nevertheless.

Today, advocates of sustainable development and smart growth recognize that multi-lane, multi-purpose urban arterials need and deserve policy and planning attention. [3, 4] Typically much work remains to be done. Multi-lane, multi-purpose arterials often remain the shopping street for at least some of the trips of nearby residents, but successful businesses and housing may be lined up among obsolescent uses, vacant buildings and lots. Zoning may not have been revamped in years or in decades. On the street itself, transit agencies often run trunkline buses at reasonably high frequency, but the buses get caught in traffic. Conflicts between cars, trucks, and buses,

motor vehicles and foot traffic often make the streets less attractive, comfortable, and successful than they might be.

Hence the multi-lane, multi-purpose arterial is ripe for planning for smart growth and the 3Ps – people, prosperity, and the planet all could benefit from the development of a robust planning model for revitalizing these important streets.

This project has examined one such arterial as a prototype case. Aims of the project have been the following:

- Develop a planning process that integrates traffic management and transit planning with urban land use planning and zoning, drawing upon the skills and experience of multidisciplinary design teams; design the process so that it could be emulated in planning for other multi-lane arterials.
- For the specific case, identify needed and desired changes transportation facilities, services, and policies that would support an increase in walking and transit use and a reduction in auto dependence. Also identify needed and desired changes in land use that would help strengthen the local and regional economy and increase community quality of life.
- Study and help resolve existing institutional ‘bottlenecks’ that hinder the implementation of these strategies. Also identify new forms of institutional cooperation and collaboration that could be used to increase the probability of successful improvements in economic performance, equity, and environmental quality in the study area.
- Work with stakeholders to produce implementation strategies for agreed-upon improvements to street design and operation, and as well as land use changes.

The case for the project is **San Pablo Avenue**, a four lane state-owned urban / suburban arterial running through Oakland, Emeryville, Berkeley, Albany, El Cerrito, Richmond, San Pablo and Pinole in Alameda and Contra Costa Counties in the San Francisco, CA Bay Area. San Pablo Avenue traverses inner city neighborhoods, old streetcar suburbs, ‘40s and ‘50s wartime and post-war developments, and newer suburban growth areas. Nearby residents are of every racial and ethnic group in the region and range from low income to middle class. Some areas along the Avenue are fighting decline, others are gentrifying. Land uses are varied, with apartments and retail stores lining the sidewalk in some districts and big-box retail, auto sales, and parking lots along other stretches of the road. The street design also varies, with wide, tree-lined sidewalks and medians in some communities, barren expanses of asphalt in others. Figure 1 shows the San Pablo Avenue corridor study section.

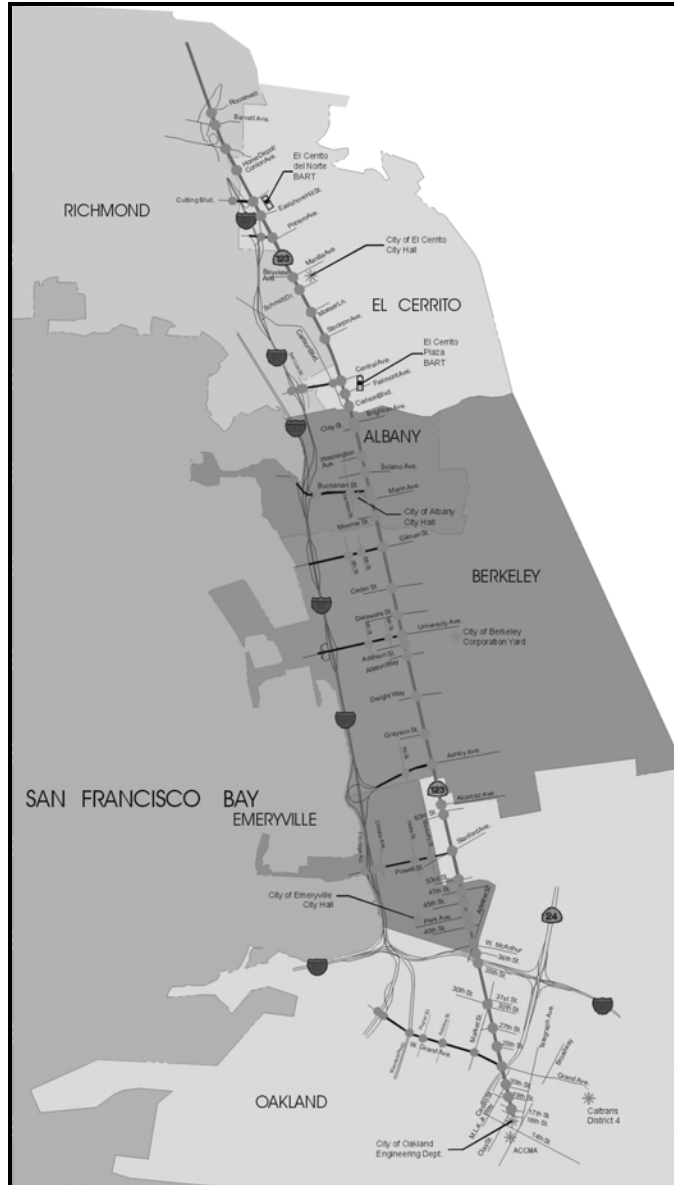


Figure 1. Study Section of San Pablo Avenue

Several transportation improvements had already been made to San Pablo Avenue before this project began. First, San Pablo Avenue is one of two primary corridors in the East Bay SMART Corridor program, under which traffic surveillance equipment (detectors and CCTV cameras) and traffic signal hardware upgrades (state of the art signals) were installed the length of San Pablo Avenue. The San Pablo Avenue project was a multi-jurisdictional cooperative effort involving the Alameda County Congestion Management Agency (CMA), the Contra Costa County Transportation Authority (CCTA), and twenty-four other local and regional agencies. As part of the project the participating agencies agreed to coordinate the traffic signals along the corridor, work to minimize the intrusion of freeway traffic onto the arterial and other local streets, improve transit on-time performance, reduce bus travel times, and provide accurate and timely bus arrival information. Second, building upon the transit priority treatment capabilities of

the new signals, AC Transit implemented a Bus Rapid Transit demonstration project, the 72 Rapid, along San Pablo Avenue, in 2003-4. The Rapid overlays local routes with a limited-stop, fast service that makes use of new stops installed at the far-side of the intersections, improved shelters and real-time “next bus” passenger information, and new low floor, multiple door buses. In addition, buses can be provided priority at traffic signals if they are running behind schedule.

Land use changes also had been made in some locations along the corridor. In Emeryville, for example, San Pablo Avenue passes through the city’s large redevelopment area, and several redevelopment projects including housing and retail opportunities had been implemented, along with street improvements including new landscaped medians, pedestrian lighting, and improved pedestrian crossings. In Berkeley, façade improvement and signage programs had greatly improved the aesthetics of commercial buildings at several nodes. In Albany, new market-rate apartments and condominiums had been installed on several formerly underutilized parcels.

Local officials and community members recognized the benefits of these changes, but also saw a need for additional, corridor-wide improvements in land use, transportation, and economic development. While some stretches of San Pablo Avenue had improved, many other stretches remained in need of revitalization. Signals had been upgraded and transit services improved, but it remained to be seen whether these improvements had in fact increased transit use and traffic conditions along the avenue. Crime remained a problem along some stretches. In addition, community members were concerned about the need to avoid displacement of low income residents as new development occurred; many also voiced concerns about protecting the mostly single-family residential neighborhoods just off the avenue.

In late spring 2004, the district’s state Assembly member, Loni Hancock, convened the mayors of the cities along the San Pablo corridor and their senior staff members to begin discussions on a coordinated effort to revitalize San Pablo Avenue. Representatives from the county congestion management agencies, Caltrans, the Metropolitan Transportation Commission, the Association of Bay Area Governments, the Bay Area Rapid Transit District (the rail operator), and AC Transit (the bus operator) also were asked to join the group. Our project team was invited to work with this group to provide technical support and to help develop data and ideas. Consequently, the working group members have served as the advisory committee for this project, sharing their views of opportunities and problems along the corridor, reviewing the project team’s work products, inviting team members to participate in presentations before the group, and attending mid-semester and end-of-semester presentations on the work.

### **-Relation to People, Prosperity and the Planet**

The project was designed to operate at two levels: to develop a robust planning model for revitalizing multi-use arterial streets, and to apply the model to a specific case which could then serve as an example for other areas wishing to work toward revitalizing urban arterials.

The need for a planning model for revitalizing urban arterials stems from the fact that such streets are found throughout the US and in many other countries, and are frequently in need of attention. Allowed to stagnate, these streets can become problem areas for the communities they traverse; revitalized, they can be community assets, hosting healthy shopping and commercial

districts as well as a mix of housing, and offering transportation facilities and services that encourage more biking, walking and transit use and less car dependence for residents, workers, and shoppers. Revitalization efforts thus can support people, prosperity, and the planet – creating attractive, sustainable communities and corridors. We anticipate that the approach we developed can serve as a model analysis procedure that would be useful in other cases.

At the project level, we considered P3 goals in several ways. We looked at existing conditions and possible future alternatives in terms of cost effectiveness, economic development potential, transit, walk, and biking mode shift potential. We carried out field studies, applied traffic simulation models, assessed level of service for pedestrians and bicycles, and conducted transit operations and demand analyses to evaluate the performance of the transportation systems in the study area and to develop and test possible improvements. We evaluated the economic feasibility, equity, and desirability of possible land use changes and infill development projects through surveys with developers, merchants, and residents and through design charrettes and project “pencil –out” evaluations. We conducted a survey of transit riders to determine how they used the bus services along the corridor and what improvements they needed. We interviewed merchants to learn about economic performance along the Avenue and to determine what policies, if any, they had regarding employee commute programs. We also conducted a survey of residents living along San Pablo Avenue to learn more about how they used the land uses and transportation systems in the corridor, and to evaluate the changes they would like to see along it. Finally, by working with elected officials, city and regional agency staff members, and other stakeholders, we were able to obtain regular feedback on the strategies we were considering and their ability to meet the communities’ economic, environmental, and quality of life goals. We were able to obtain buy-in for many of our proposals, and implementation is already underway on several elements of the recommended actions, including street design improvements and pedestrian improvements in several cities; sidewalk repairs and ADA access improvements are underway, and one of the cities are developing proposals to add medians and landscaping using our project work as the evidentiary basis for the changes.

### **-Relevance and Significance of the Work**

The project has made advances both in the design of transportation-land use planning and analysis processes and in the development of empirical evidence on a number of important transportation and land use issues.

The project team developed an innovative, multidisciplinary, integrated approach to planning for multi-purpose arterials, aimed at creating healthier economic development, increasing the use of environmentally friendly modes (walk, transit, bike) and managing auto traffic, and addressing community concerns about affordability and quality of life. This approach combined engineering, planning, urban design, economic analysis, and social science methods. Individual team members brought specific skills and expertise to the project: transit planning, traffic operations and signalization analysis, pedestrian planning, land use planning, real estate development assessment, safety analyses, survey research, urban design, and legal and political analysis. However, by working as a multidisciplinary team, the members learned a great deal from one another, built upon each other’s findings and insights, and as a result were able to carry out a complex planning and analysis process with substantial creativity.

The project team applied this interdisciplinary approach to take a comprehensive look at several issues that are of widespread interest in the land use and transportation planning and development community:

**--Transit Oriented Development and Fiscal Analyses for Bus Corridors:** Most TOD studies to date have looked at development around rail stations. Here, we examined development potential along a rapid bus corridor. We documented existing land uses and site conditions along San Pablo Avenue and analyzed possible land use changes. We interviewed merchants, businesses and property owners about economic conditions along the avenue, their customer bases, and changes that they would like to see. We interviewed local developers to determine their views on the avenue's assets and liabilities from a development perspective, including their views on zoning and other requirements for new development. We met with local officials in charge of transportation, land use planning, economic development, and urban revitalization to hear their views on problems and opportunities along the avenue. We also surveyed local residents to find out what activities they used along the avenue, what they saw as its strengths and weaknesses, and what changes they would like to see. We examined several possible development sites in detail through a series of design charrettes and economic evaluations of development alternatives. We used the information gained from these interviews and analyses in assessing zoning ordinances, including parking requirements, and other government programs and policies that would apply to the avenue.

**-- Arterial Traffic Management Strategies**

Success in mitigating roadway congestion depends upon tailoring a traffic management strategy to the operating environment it serves. We assessed traffic operations by conducting floating car studies, transit delay studies, and pedestrian counts and crossing observations. We used these data to develop alternative priority treatments and street designs, including longer pedestrian crossing times, transit-weighted signal timing, and addition of bus queue jumper lanes. We applied the signal timing program TRANSYT and the traffic operations analysis program PARAMICS to test these alternative traffic management approaches, for current and future traffic levels. We also looked at the effects of growth on the arterial under different assumptions about transit and pedestrian mode shares.

**-- Pedestrian and Bicyclist Safety Strategies and Designs**

Pedestrian and bicyclist comfort and safety along San Pablo Avenue have been major concerns in all of the communities along the arterial. We also assessed sidewalk conditions including paving, lighting, and handicapped access and inventoried pedestrian and transit user amenities (including benches, shelters, and landscaping.) We carried out pedestrian counts and measured pedestrian crossing times, delay, and likely conflicts to assess pedestrian level of service at key intersections along the avenue.

We calculated pedestrian level of service at all major intersections along the corridor and evaluated a number of improvement options, including 1) changing signal timing to allow longer pedestrian crossing times, 2) adding zebra striped crosswalks at unsignalized intersections, 3) widening sidewalks and crossings, 4) installing pedestrian refuges or full medians where they are absent, and 5) using signage and pedestrian lighting to draw motorist attention to pedestrian presence.

### **--Transit Performance and Customer Convenience Strategies**

While transit ridership has increased somewhat as a result of the implementation of AC Transit's RapidBus service, the increases have not been as substantial as hoped. Therefore, we conducted transit operations analyses, a transit rider survey, an investigation of employer commute programs along the corridor, and an analysis of strategies for improving bus operations and increasing ridership. The strategies we considered included transit-weighted signal timing strategies, alternative street designs that could improve transit performance and facilitate pedestrian access to transit, and employer-based incentives for transit use. To assess current performance of the transit lines operating along the study area, we conducted boarding and alighting studies, delay studies, and surveys of riders.

Again, these issues have significance beyond the specific case, since each of these issues is a key concern in transportation and land use planning both nationally and internationally.

### **- Implementation of P3 Concepts as an Educational Tool**

This project was carried out by both graduate and undergraduate students at the University of California, Berkeley. Twenty-one graduate students, drawn from City and Regional Planning, Civil and Environmental Engineering, Architecture, Public Policy, and Energy Resources, participated in a studio course (fall semester) and/or a special projects course (fall and spring semesters) that allowed them to carry out field work on land use and activities along San Pablo Avenue. In these courses they carried out traffic and transit operations data collection and analysis, traffic simulation, interviews with developers, transit user surveys, merchant interviews, and resident surveys and focus groups. Seventy-nine undergraduate students took part in a major field work assignment along San Pablo Avenue (spring semester) that involved documentation of field conditions, resident interviews, and the distribution and analysis of a survey of residents. The students were drawn from 14 departments, including City and Regional Planning, Civil and Environmental Engineering, Architecture, Urban Studies, Economics, Political Economy, Geography, and Operations Research, as well as several additional programs in engineering, the social sciences, and the humanities.

Students learned P3 concepts through background readings prepared for the courses as well as in lectures. More importantly, students learned about the concepts through hands-on experience. The graduate studio was a four unit course, and thus is a key part of the students' education. In addition, several of the studio participants have continued to work on the project for another 3 units as part of a special projects course, where they were joined by additional students who had chosen to make the project the professional report for their master's degree. For undergraduates, the field assignment on San Pablo Avenue accounted for about 1/3 of their 3 unit course.

The work was complemented by a grant from the University of California Transportation Center that helped support travel and related research expenses. We also built upon previous studies conducted by local, regional and state agencies, and the University. These include the PI's previous work investigating the institutional and legal arrangements within which California's transportation and land use policies are shaped, and the inducements and barriers to innovations that these arrangements create [5], [6], [7], and the PI's work on express bus options for the region, including strategies for better coordinating express buses on arterials with overall traffic

management [8] In addition, we built upon and extended a colleague's work on methods for managing signalized urban arterials and providing transit priority at traffic signals [9].

Because the project was carried out with active participation from community leaders, residents, merchants, developers, and other stakeholders, the students have been able to get a first hand understanding of how transportation and development issues are framed, analyzed, and debated. Students also have had the opportunity to use their creativity and training to come up with new approaches to a complex, multi-faceted problem. In addition, they have learned to work in teams, to present their work before the public as well as before peers, and to discuss its pros and cons.

## **2. Purpose, objectives, scope**

The purpose of the project has been to develop a plan for revitalizing a multi-lane, multi-purpose arterial, San Pablo Avenue, as a prototype case, and in so doing to develop and demonstrate a planning process that integrates traffic management and transit planning with urban land use planning and zoning, drawing upon the skills and experience of multidisciplinary design teams. The key objectives have been to identify needed and desired changes land uses and urban design and in transportation facilities, services, and policies that together will simultaneously 1) support an increase in walking and transit use and a reduction in auto dependence, 2) help strengthen the local and regional economy and 3) increase community quality of life for all residents in a mixed-income setting. To carry out these aims, we organized the project into ten tasks.

### **- Task 1: Establish a Project Advisory Committee**

A Project Advisory Committee was established at the outset of the study. Because we were invited to provide technical assistance to the San Pablo Avenue working group, that group became our advisory committee. It included Assemblywoman Hancock, mayors and staff members from the five cities in the study area, and representatives from the Alameda County Congestion Management Agency, AC Transit, BART, Caltrans, and the Metropolitan Transportation Commission. In addition, several faculty members from UC, including Professors Martin Wachs (CE and CRP), Alex Skabardonis (CE), Karen Chapple (CRP), and Elizabeth Macdonald (Urban Design, CRP) offered advice and assistance.

### **- Task 2. Establish the Study Corridor Boundaries and Project Scope for Studio**

While San Pablo Avenue extends for 20 miles between Oakland and the City of Hercules, the portion of the corridor that we studied in greatest detail, shown in Figure 1, runs through five cities, from downtown Oakland through Emeryville, Berkeley, Albany, and El Cerrito. We focused on these five cities because they include a variety of urban and suburban environments and traffic conditions, and because the cities were interested in cooperating on the study.

### **- Task 3. Review Assembled Data and Previous Studies; Collect Additional Data Needed**

We gathered together the General Plans and zoning ordinances for the study area as well as key project reports and studies, traffic counts, and Census data. For the data that were in electronic format, we created GIS maps and databases. We added detailed parcel level data for several cities where it was not previously available. We also obtained signal timing plans and traffic counts and gathered data on traffic speed by time of day, traffic growth rates, transit delays, and transit ridership profiles. We conducted field checks on all of the data. In addition, we conducted an initial round of interviews with key informants (local officials, neighborhood group representatives, merchant representatives, developer groups, outside observers) to obtain a range of perspectives on development and street design issues.

**- Task 4. Document and Evaluate Development Opportunities**

We documented sites that are vacant, underdeveloped, and/or deteriorated along the corridor. Through interviews, surveys, and meetings with developers, property owners, merchants, residents, and local officials, we examined the possibilities for “smart growth” redevelopment and revitalization considering market potential, development costs, developer and property owner interest, possible funding and other incentives. For particular parcels we developed prototype development proposals and evaluated development costs, developed values, developer cash flow, and tax consequences for the city.

**- Task 5. Evaluate Existing Zoning and Propose Needed Changes**

We reviewed the zoning ordinances and other development requirements and procedures for the properties along San Pablo Avenue and evaluated their effects on development potential. Where zoning (or other local regulation) was found to be a barrier, we identified possible changes that would improve development opportunities while responding to community concerns.

**- Task 6. Design and Study Corridor Transportation Improvements**

We designed traffic management strategies to improve the operating conditions across the corridor. We used simple demand forecasting methods as well as traffic operations models to evaluate the corridor’s ability to handle anticipated long-term traffic growth resulting from revitalization of the corridor as well as population growth. Additionally the micro-simulation models were used to assess the effects of proposed street design improvements, traffic operations improvements, and transit enhancements.

**- Task 7. Acceptability Analysis**

We evaluated the acceptability of the transportation and land use changes we proposed through a series of one-on-one meetings with developers, merchants, local officials and staff, and through a survey and small group meetings with residents of the communities along San Pablo Avenue.

**- Task 8. Develop Implementation Plan**

We developed recommendations on ways to implement the most promising strategies identified through earlier tasks. *This element of the work is still ongoing.*

**- Tasks 9 & 10. Draft Report & Presentation; Final Report/ Dissemination of the Results**

We prepared a draft report and presented it to an audience of over 50 elected officials, city staff members, developers, and merchants of the study area. We also held a series of small group meetings with residents in the five cities to discuss the issues and options identified and hear their views. *Additional presentations and meetings are being scheduled as the work of the Project Advisory Committee continues.*

Several papers and presentations have “spun off” from this work. A paper on the history of San Pablo Avenue was presented at the Transportation History Conference in Dearborn, Michigan, last fall [11], an overview of transportation and land development issues along the corridor was presented at the Association of Collegiate Schools of Planning meeting in Portland, Oregon in October [12], and a paper on developer perspectives on infill development along San Pablo Avenue was presented at the Transportation Research Board Annual Meeting in January 2005 [13]. We have proposed to present our transit survey [16] to the Association of Collegiate Schools of Planning this fall, and we plan to submit papers two papers to TRB this summer, one on balancing traffic, transit and pedestrian needs along San Pablo Avenue (an extension of the ACSP paper) [12] and the second on residential perspectives on transit-oriented development along a BRT line.[15]

### **3. Project Findings and Recommendations <sup>1</sup>**

San Pablo Avenue carries 20,000 to over 30,000 motor vehicles a day (varying by location) on its four traffic lanes. In the five city study area, San Pablo Avenue traverses inner city neighborhoods, redevelopment areas, old streetcar suburbs, '40s and '50s wartime and post-war developments, and newer suburban growth areas. Nearby residents are of every racial and ethnic group in the region and range from low income to upper middle class. They include both homeowners and renters and cover a range of age groups. Some areas along the Avenue are fighting decline, others are gentrifying. Land uses are varied, with apartments and retail stores lining the sidewalk in some districts and big-box retail, auto sales, and parking lots along other stretches of the road. Empty lots and run-down car repair shops are common in some areas. The street design also varies, with wide, tree-lined sidewalks and medians in some communities, barren expanses of asphalt in others. [11]

City officials and community members would like to see revitalization of San Pablo Avenue, but at the same time some are wary that changes could displace the lower income residents and price out small businesses. Residents would like to see more pedestrian-oriented activity on the avenue day and night; many would favor the development of groceries, produce and specialty food shops, neighborhood-serving cafes and restaurants, and recreation opportunities for both children and adults. Mixed use projects with ground floor retail and upper story offices or housing are favorably received by residents if well designed and planned, but many residents are concerned that the size and scale of such development not be out of scale with the single family homes in adjacent neighborhoods, not lead to worsening traffic along San Pablo Avenue, with attendant congestion, air pollution, and noise, and not result in spillover traffic and parking on nearby residential streets. Hence plans for revitalization must account for the varying prospects along different stretches of the avenue, must be combined with traffic management strategies, and must pay attention not only to economic growth but also to affordability and inclusion. [12]

Strategies to create a more walkable environment would be especially well received, and would support recent investments in improved transit stops and services, since nearly all transit riders walk to the bus stop. However, the relatively high level of traffic along the corridor, the high speeds (45+mph) along some stretches, and the lack of attractions for pedestrians on a number of blocks are all key issues that must be addressed before increased walking is likely. Increasing walking and transit use will take land use changes (toward more pedestrian-oriented uses such as local shopping, entertainment, and dining) as well as active traffic management. [12]

#### **Land Use & Development**

The development of San Pablo Avenue has been as a mostly continuous commercial strip, composed of a thin veneer of commercial uses, with low-density residential and industrial areas lying just beyond. Transportation has heavily shaped the development along San Pablo Avenue, from the streetcar era and the resultant nodes of commercial development at major transit stops to the automobile era, with repair shops, auto dealers and gas stations as the major land uses.

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<sup>1</sup> Please go to [www.uctc.net/san\\_pablo](http://www.uctc.net/san_pablo) for detailed data tables and analysis papers.

The historic nodes have evolved, and depending upon their location and neighborhood context have different market scale and focus; some are local serving while others have a more regional attraction. Berkeley has delimited nodes within its jurisdiction and developed specific overlay zoning to focus higher intensity use within them. Elsewhere along the corridor, access to Interstate 80 and the Bay Bridge are major drivers of auto-oriented development. For example in Emeryville, big-box retail and high-density residential and mixed-use development are the major land uses that have developed on redevelopment properties formerly used for heavy industry. In several other cities, multi-story housing and mixed use projects are beginning to appear as well.

The multi-story mixed use buildings on San Pablo Avenue, many of them 50-75 units an acre, contrast sharply with the lower density (8-15 units/acre) single-family residential homes on the streets immediately surrounding the avenue. In a few high-profile cases, proposals to add more high density buildings along and near the Avenue have led to intense community opposition. [13] Residents opposed the proposed developments as being out of scale with their own homes, blocking views and sunlight and intruding on the privacy of adjacent occupants when the larger buildings provide direct lines of sight into the back yards and upper story windows of the smaller homes. In a few cases opposition has led developers to walk away from proposed projects. In other cases developers have worked successfully with neighborhood groups to address their concerns, in most cases by scaling back the number of housing units and the size and height of buildings. Both developers and residents would prefer greater certainty about the development process, with agreed-upon zoning and design guidelines that protect existing neighborhoods and allow acceptable developments to proceed more expeditiously.

From a development perspective, high parking requirements appear to be the most critical zoning obstacle along San Pablo Avenue. [13] Every city along the corridor requires that at least one parking space be provided per dwelling unit; several require two or more spaces per unit. Additional parking requirements, at rates of 2-5 spaces per 1000 sq. ft., apply to commercial projects and the commercial component of mixed use developments. Since off-street parking typically costs \$20-\$35 thousand a space in the study area communities, high parking requirements can substantially increase the cost of housing and the rental rates for commercial space, making it less affordable for moderate income households and small businesses. A few developers and some city officials have proposed a lower parking requirement coupled with incentives for transit use, car sharing, and walk-bike access as alternatives to driving. The relatively high number of zero-car and one-car households in the area, along with good transit service, would seem to favor lower parking requirements. However, residents are skeptical, fearing that occupants of new housing will be wealthier, will be attracted to the area primarily by good freeway access, and will own multiple cars; current residents are concerned that lower parking requirements for new development would simply result in the use of their residential streets for car storage. Because multi-story housing units along San Pablo are relatively new, almost no data currently exist on auto ownership and use among their residents, and studies will be needed to help resolve this issue.

Nevertheless, residents agree with city officials that changes in land use along San Pablo Avenue are needed. Residents would like an increase in the number of neighborhood restaurants, cafes, and entertainment centers. In South Berkeley and in Oakland, neighborhood-scale grocery stores, produce and specialty food shops, and other convenience stores would be welcome. For most

residents, a well designed housing above the shops also would be acceptable.

Many residents have mixed reactions to the high number of auto uses along the avenue. On one hand, many of them use repair shops and gas stations along the avenue, and recognize the need for such facilities to be conveniently located for motorists. On the other hand, most residents feel that there are too many such shops along San Pablo Ave., many of them run down and attracting few customers. The tendency to have front-of-lot parking and storage creates a gap in the street frontage, and because the shops are closed at night, they create dead spaces in the evening streetscape, making walking less pleasant after dark. Most residents would like to see the number of gas stations and auto repair shops reduced. Many commented that more attractive painting, signage, and fencing, pedestrian lighting, and regular yard maintenance/upkeep would make the existing auto uses better neighbors. [15]

The deep setbacks and wide expanses of asphalt typical of the auto uses are found elsewhere along the avenue at fast food outlets, which are typically surrounded by parking and driveways, and on small lots where parking requirements have been accommodated by putting the spaces and driveway access at the front of the lot. This is in sharp contrast to the pre-1950s development style that presented a continuous building frontage along San Pablo Avenue, relying on metered on-street spaces for customer parking and using alley and side street parking for employees. Use of the front of the lot for parking and the variable setbacks that result produce a ragged edge that is less comfortable and interesting to pedestrians. Requirements that parking be placed at the back or the side of the building, and policies that allow small parcels to pay an in-lieu fee to support consolidated parking lots or garages, could go a long way toward improving the streetscape and making the pedestrian environment more inviting. Alternatively, zoning requirements or urban design plans could establish a build-to line to effectively form a consistent street wall; assistance with signage, façade improvements, window displays, fencing, and parking also could help improve the streetscape. [14]

Developers and real estate experts point out that there isn't a large enough market in the area to support new, mixed use, multistory development the length of the San Pablo Avenue study section.[13] Instead, strategically focusing development at key nodes can help create healthy shopping districts for each neighborhood. Rapid bus stops, which are frequently located at major intersections where multiple transit lines cross, would be prime candidates for the initial nodes of development. Elsewhere, façade and signage improvements, pedestrian lighting, and other upgrades of existing uses could make the stretches between nodes healthier and more attractive. [14]

## **Transit**

Transit is a key factor in encouraging infill development, and recent investments in transit along San Pablo Avenue provide a strong basis both for new development and for a shift in travel mode away from the automobile. However, studies of transit utilization and operations indicated that the existing services could be better utilized. On-board studies found that most buses along San Pablo, including the new Rapid buses, are only half full even during peak periods. [14] For this reason we examined the quality of the service for transit users along the avenue. We

inventoried conditions and amenities at bus stops, conducted field studies of transit delay, and surveyed transit riders (response rate 35%, n=269) to better understand patterns of demand. [16]

Conditions and amenities at the bus stops varied widely. Most Rapid stops had been upgraded to have new shelters, information systems, and lighting. Some, in addition, are located near cafes or convenience stores, and passengers often wait for the bus at the outdoor tables provided by these establishments. Other stops had no more than a bench (not always that). In many instances pedestrian access to the stops was poor, with broken sidewalk pavements, low lighting, and inadequate crossing times at intersections.

We found that boardings and alightings are concentrated at major intersections, where about 20% of the San Pablo bus users transfer to another bus line or to BART to complete their trips. [14] Most riders are going to and from work or school, although during the midday, shopping, medical, and personal business trips are also made on the bus. About a third of the riders cannot drive a car or do not have access to a car; another third had only one car per household. These numbers are somewhat higher than those reported in the 2000 Census for the tracts adjacent to San Pablo Ave. Also, two-thirds of the riders reported household incomes below the regional average; incomes were somewhat lower than those reported in the Census for the San Pablo Ave. tracts. [16]

Although most transit users reported that they were regular riders, 4+ days a week, only about 40% used discount fares. The rest paid full cash fares. The higher income riders (incomes over \$100,000, about 9% of the respondents) were far more likely to use discount instruments than were low income riders. Survey results indicated further that the higher income users were more than five times as likely as lower income users to receive an employer-paid or subsidized transit pass. Follow-up discussions during focus groups indicated that many low income transit users lack the resources to pay for a monthly pass; as a result they end up paying more in total, but less in any week, for daily fares. [16] Interviews with merchants and other employers along the avenue confirmed that virtually none provided any commute assistance to their employees. Clearly this is an equity issue that negatively impacts that welfare of the lower income residents of this area.[16]

Bus delay also remains an issue along San Pablo Avenue. Despite the installation of advanced traffic signals and equipment for bus priority treatment, buses are still getting caught at traffic signals; in our field studies, buses stopped at over half of the signalized intersections. In addition, at congested intersections cars often block buses from changing lanes, adding to delays. To address these problems, we used the signal timing program TRANSYT to analyze alternative signal timing plans, and we applied the operations analysis program PARAMICS to test the effects of queue jumper lanes at critical intersections along the arterial. Our analyses showed that more advanced signal timing methods could reduce delay for both buses and autos, or maintain delay at current levels while giving added time to pedestrians and giving greater priority to buses. Queue jumper lanes would help at some intersections but at others would be compromised by the high volume of automobiles likely to enter the lane to make turns.[17]

## **Traffic Management**

Traffic congestion, speeding, shortcutting on neighborhood streets, buses delayed in traffic, failure to yield to pedestrians, awkward and inadequate pedestrian crossings, danger for bicyclists: these are just some of the traffic woes that occur on San Pablo Avenue.

Traffic delay was concentrated at major intersections along San Pablo Avenue. However, only three locations experienced delays of over 30 seconds, or more than one signal cycle. While traffic was heavy in the more urban stretches of the avenue, it generally kept moving. In the northerly suburban stretches of the study area, speeding was common, with posted speed limits of 30-35 mph but floating car-measured actual speeds of 45 mph and higher. [14] Speeding was especially prevalent along the stretches of San Pablo Avenue that lacked a median and landscaping; in these stretches, long sight distances may act to create an environment where higher speeds seem “safe” to drivers. However, such high speeds create hazards for pedestrians, especially at unsignalized intersections.

In small group meetings and in survey responses, residents expressed concerns about speeding, traffic noise, shortcutting through neighborhoods during congested periods, and failure to yield to pedestrians. Residents felt that steps needed to be taken not only to moderate traffic along San Pablo Avenue but to keep it from spilling over onto parallel residential streets. [15]

Residents of Albany and Oakland, where medians were lacking, expressed strong support for adding them and installing trees and other landscaping both on the new median and along sidewalks. They were willing to accept somewhat more circuitous routes to some destinations along the avenue (since the medians would prevent mid-block left turns) in return for what they viewed as a safer, more aesthetic, and more pedestrian-friendly street design. [15]

## **Pedestrians and Bicycles**

Despite the auto-oriented nature of much of San Pablo Avenue, the roadway does have sidewalks, marked pedestrian crossings, curb cuts for disabled travelers, and, here and there, other pedestrian-friendly features. However, the quality and design vary significantly by city, node and even street corner. Furthermore, there are a large number of potential enhancements to the existing infrastructure that would improve the pedestrian experience by making it safer, more enjoyable, and more accessible.

Three pedestrian level-of-service (LOS) methodologies were utilized to develop a quantitative measure for assessing and scoring the quality, comfort and security of the pedestrian environment. Four factors were most important in determining the overall score: sidewalk width, lateral separation from travel lanes, on-street parking utilization, and vehicle speed and volume counts. The scores for pedestrian Levels of Service ranged from “C+” to “D” with a “C” average, indicating that the area is adequate for pedestrians, but not attractive. In general, the consistent strengths are wide sidewalks (typically 8 to 12 feet) and a large lateral separation (typically 13 to 18 feet). The over-riding weaknesses throughout the corridor are high vehicle

counts (often exceeding 3,000 vehicles per hour during the afternoon peak), and high vehicle speeds (over 30 miles per hour in some sections.) The many potential improvements at each node (better pavement quality, landscaping, etc.) could increase the average score from a “C” to a “B”, a safe and comfortable environment. But given the high traffic volumes, it is probably not possible to improve the pedestrian LOS to level “A.”[14]

Long crossing distances increase pedestrian exposure to vehicles and detract from the pedestrian experience. The typical curb-to-curb crossing distance along San Pablo Avenue varies considerably, from 40 feet to more than 150 feet in parts of West Oakland. The typical crossing distance across San Pablo Avenue is 74 feet; at signalized intersections, this results in pedestrian signal “walk” times (including flashing red) of 20 seconds and average “wait” times (one-half of the solid red time) of 30 to 35 seconds. The longer crossings distances have longer wait times. Research indicates that pedestrian impatience and risk-taking behavior increases after about 30 seconds of delay, so actions to reduce the crossing distances (through sidewalk widening, bulb-outs, etc.) could increase safety as well as convenience. [14]

Medians provide a refuge for pedestrians crossing the wide avenue; they also improve the overall aesthetics of the street when they are well-maintained. Most of the intersections south of Albany include medians; however in Oakland the median designs actually create a barrier to street crossing and obstruct the view of the opposite side of the street. Medians are absent in portions of El Cerrito and Albany, where painted center left turn lanes are common. In these areas, it is recommended that landscaped medians be installed wherever possible. [14]

Curb-cuts (also known as curb ramps) are essential for the safe travel of many disabled pedestrians, as well as the elderly. Most curb-cuts are properly located within marked crosswalks, with the glaring exception of Berkeley, where our inventory found that 71% of all marked crosswalks did not have a properly located curb-cut. (Berkeley did have curb cuts, but they were installed prior to the creation of ADA guidelines; based in part on our report these curb cuts are now being brought up to current standards.) [14]

Along the corridor, there is sporadic attention to providing the amenities necessary for creating an environment conducive to walking. Street trees vary significantly by community; where they do exist, they enhance overall aesthetics, strengthen the buffer zone between vehicles and pedestrians, and have a calming effect on traffic. Older, larger shade trees are prevalent in Berkeley and to a lesser degree in the Golden Gate district of Oakland, while new trees have been planted in El Cerrito, Albany and Emeryville. West Oakland and Downtown Oakland portions of San Pablo Avenue are noticeably deficient in tree coverage. [14]

Lighting, benches and shelters are amenities that enhance pedestrian safety and comfort. While the stretch of San Pablo Avenue in Emeryville includes pedestrian-scale lighting, it is not present anywhere else along the corridor. Most residents felt that improved lighting would be an important safety measure for after-dark pedestrians. Six of the twenty-two Rapid stops along San Pablo do not have a shelter, and some of the shelters are poorly placed on the sidewalk. Many of the local bus stops either do not have any amenities or have a poorly maintained bench located close to the street. [14]

Our survey of residents showed that about 10% walked to work and about 30% regularly walked to shopping and other activities in the vicinity of San Pablo Avenue. In small group meetings, most respondents commented that the walk environment needed to be improved. Residents wanted sidewalk pavement improvements, more trees and flowers, pedestrian lighting, longer pedestrian crossing times at signals, and street design and lighting improvements for pedestrians at unsignalized intersections, such as pedestrian bulb-outs (widening sidewalks at crossings into the parking lane, making pedestrians more visible to motorists and reducing crossing distances.) However, most residents also commented that land use changes would also have to be made before walking on San Pablo Avenue would significantly increase: they would walk more only when there were more places to visit along the avenue, such as restaurants, cafes, ice cream parlors, clubs, and exercise facilities. [15]

While pedestrian conditions along San Pablo Avenue are mixed, the avenue presents a very hostile environment to bicyclists. Results from our survey of residents in the vicinity of San Pablo Avenue showed that about 9 percent of adult respondents ride a bike to work and 40% bike to other destinations at least some of the time. However, most avoid biking on San Pablo Avenue itself. Those who do use the avenue for biking mostly have a trip origin or destination on it (68% of the respondents (n=40) in a small survey of bikers on the avenue); many of these cyclists actually ride on the sidewalks. [14] This is illegal in California, but the cyclists felt they were on the sidewalks out of “necessity”: they felt unsafe riding in the heavy and/or fast traffic along the street.

Bike lanes have occasionally been proposed for San Pablo Avenue, mostly because the street offers a continuous cross-town route through several cities. However, our examination of the street dimensions shows that there is little room for a conventional bike lane along the corridor; sidewalks, planting strips, on-street parking, the tree-studded medians, and traffic lanes take up the available right of way. Alternate routes paralleling San Pablo Avenue, with connections along side streets to popular destinations along the avenue, may be the safer alternative for bicyclists. [14] At small group meetings, residents commented that where parallel bike paths are available, they prefer to use them; however fewer than half of the cyclists were willing to go more than a block or two out of their way to use a parallel bike route or bike boulevard. A denser network of designated bike streets may be needed if the cities want to provide safe and effective alternative routes.[15]

Most bicyclists considered it easy to find parking for their bike, but many were locking up to parking meters (illegal in Berkeley) and street signs. The State Vehicle Code says that bicycles cannot be parked on the sidewalk such that they obstruct the path of pedestrians on the sidewalk; we observed that bikes locked to meters and street signs sometimes did this. Providing bike racks at key locations thus could improve pedestrian safety as well as bicycle security. Among the five cities in the study area, Berkeley has gone farthest toward providing bike parking at likely destinations; other cities have spotty provision of bike parking along the corridor. [14]

#### **4. Discussion, conclusions, and recommendations**

Revitalizing an urban arterial such as San Pablo Avenue requires an integrated approach to transportation and land use planning. To date, through a systematic, interdisciplinary approach,

we have identified and analyzed a number of key transportation and land use issues. We also have proposed a number of strategies for improving the economic vitality, the environmental performance, the social equity, and the quality of life of the area. In several instances participating organizations are implementing some of these strategies. They also are continuing to meet to further develop and build support for the planning concepts investigated here.

Three crucial elements in achieving success to date have been 1) the interdisciplinary approach we were able to take, combining skills from engineering, planning, architecture and urban design, real estate, and the social sciences, 2) our close working relationship with the advisory group members (elected officials and agency staff), who provided valuable insights and comments on our work and gave it an immediacy that stimulated creative responses, and 3) the willingness of residents of the area to participate in surveys and small group meetings to make their voices heard.

Key strategies for change identified for the study corridor include the following:

**-- Focus New Development at Nodes; Upgrade Existing Land Uses [12, 13, 14]**

- Concentrate pedestrian and transit-oriented development at key intersections that also serve as major transit interchanges.
- Reduce the number of auto-dependent uses (auto repair shops, fast food drive-ins) along the avenue; upgrade maintenance, lighting, fencing etc. at such uses.
- Encourage cafes, neighborhood restaurants, entertainment, and related uses that create night-time activity along the corridor.
- Extend programs for façade and signage improvements, earthquake retrofit, and other property enhancements to existing transit and pedestrian oriented businesses.
- Provide incentives for mixed use development with first floor retail and mixed income housing on upper stories at the nodes.
- Reduce excessive parking requirements to make development more affordable.
- Develop specific plans for key nodal areas to reflect the opportunities and needs of each node and to integrate neighborhood protection and improvement with Avenue traffic management and land development.
- Consider implementation of form-based codes (zoning) that establishes build-to lines for buildings, minimum heights, step-down requirements to protect views and privacy of neighboring parcels, etc.
- Reduce excessive parking requirements; allow shared parking, stacked parking, in-lieu fees, reductions in return for commute alternatives programs, etc.

**- Improve Transit Performance and Provide Incentives for Use [14, 16]**

- Implement transit-weighted signal timing plans, i.e., plans that give greater weight to a transit vehicle carrying 30-50 passengers than to a single occupant auto
- Where modeling shows them to be effective, install bus queue jump lanes to allow buses to bypass backups at intersections.
- Reduce boarding delay by increasing the number of touchless transit passes in use.

- Consider adopting a proof of payment fare system and allowing all-door boarding to reduce dwell time delays.
- Where sidewalk space at a bus stop is constrained, widen the sidewalk into the parking lane to create a bus “bulb-out”.
- Work with adjacent property owners to adapt awnings and other building features to provide shelter for bus patrons.
- Encourage cafes and other pedestrian-friendly land uses near bus stops to provide “eyes on the street” and create a more stimulating environment for waiting passengers.
- Improve all bus stops by adding shelters, seating, lighting, and transit information.
- Work with employers and businesses to develop deep discount transit pass programs for workers in the corridor.

### **Manage Traffic throughout the Study Area [14, 17]**

- Redesign portions of the street to include landscaped medians, providing aesthetic, pedestrian safety, and traffic management benefits.
- Add street trees and other plantings to create a greener space along the avenue.
- Retime traffic signals using advanced coordination methods, transit-weighted signal timings, and longer pedestrian crossing times.
- Reduce to 30 mph or less through street design and traffic control.
- Protect neighborhood streets from traffic incursions by installing traffic calming devices.

### **Improve Pedestrian Facilities [14]**

- Repair sidewalks and curb cuts for the disabled.
- Install pedestrian-scale lighting.
- Install pedestrian bulb-outs to reduce crossing distances; add zebra striped crossings and extra lighting at uncontrolled intersections.
- Increase pedestrian crossing time at signalized intersections.
- Require parking to be placed away from the street frontage to create a more attractive streetscape.
- Increase the number of pedestrian attractors along the avenue, such as cafes, neighborhood restaurants, and recreation facilities.

### **- Develop Safer Routes and Secure Parking for Cyclists [14]**

- Provide alternate bike routes within a block or two of San Pablo Avenue, with side street connections to San Pablo Ave. activities.
- Provide bike parking to reduce use of poles, meters, and other devices where parked bikes could interfere with pedestrian movements.
- Slow down motorized traffic by installing a landscaped median and moderating vehicle speeds to increase safety for the cyclists who venture onto the avenue.

More work remains to be done. Although we have proposed strategies for increasing transit use and walking, we have not yet quantified the mode shift nor calculated the likely environmental impacts (reduction in emissions, energy use, etc.) of these mode shifts. In part this is because there are knowledge gaps that need to be filled. In particular, we have identified the need to increase transit use and make it more affordable and effective; we have not yet fleshed out the details. We have identified a gap in knowledge about the demographics and travel behavior of residents of infill apartments and townhouses; that gap creates uncertainties about future mode shares and requires new research. We have noted that the most effective way to implement the recommended land use and transportation strategies would be through specific plans for subareas of the corridor; this appears to be a “next step” for the communities in which the project team could be a partner. We propose to address these outstanding issues in a second phase.

### **P3 Phase II Project Description**

#### **Definition of Project and Relation to Phase I**

In Phase II we propose to continue to work with the project advisory team (elected officials, staffs of affected agencies) on ways to implement the proposals that emerged from Phase I. In particular we propose to 1) Study the auto ownership and use patterns of the occupants and customers of new developments along the corridor, especially those near transit and in pedestrian-friendly nodes, and recommend appropriate parking requirements; 2) Develop a strategy to encourage more transit use by residents and employees in the corridor, and in particular to improve the affordability of transit to low income residents and workers; 3) Work with local government on specific plans for nodes, incorporating and integrating the transportation and land use strategies recommended for the corridor, 4) Work with the advisory team to develop financing strategies for the proposed improvements; 5) Estimate the resulting mode shifts toward walking and transit that can be expected from implementation of the proposed courses of action; and 6) Organize workshops and focus groups on the findings of the study in cooperation with the advisory team, to help build public support for the plan.

#### **Innovation and Technical Merit**

The overall project is designed to increase urban sustainability and promote smart growth by revitalizing older, low and moderate income commercial streets. The approach taken in Phase II will continue to emphasize an interdisciplinary approach drawing upon engineering, planning, design arts and social science methods to address the complex transportation and land use problems posed. The work on auto ownership, trip-making, and mode shares among residents of infill development will address a pressing issue that is a potential impediment to smart growth not only in this corridor but in cases all over the US. The work on transit promotion and transit affordability strategies has potential to serve as a model for other urban areas, as does the work on financing strategies for street redesign, traffic management, and urban revitalization.

#### **Sustainability and Measurable Results; Evaluation Method and Implementation Strategy**

Economic prosperity, equity, quality of life, and environmental quality are key components sustainable development, and all will be considered throughout the project. Equity is a major focus of the work on transit affordability and also is a key component of the assessment of the effects of new infill housing development. Economic development and increased prosperity are of course key goals of revitalization efforts. The focus on traffic management and increases in

walking and transit use is intended to improve both overall quality of life and environmental quality.

We intend to carry out specific analyses of likely mode shift potential and its emission and energy consequences as Task 5 of Phase II; this will be the major method for evaluating the benefits of a combined traffic management and land development plan.

Implementation of the proposals for revitalization is ultimately the responsibility of local and regional officials, developers, property owners, merchants and residents. Our partnership with local officials and staffers and our continuing work with other stakeholders are both intended to maximize the likelihood of implementation.

### **Implementation of P3 Concepts as an Educational Tool**

Phase II will again be implemented through a studio course and a projects course taught by the PI. Students will come from planning, engineering, public policy, energy and resources, and other groups. They will learn P3 concepts through background readings prepared for the course as well as in introductory lectures. More importantly, students will learn about the concepts through hands-on experience on the project. By implementing the project as a studio (a four unit course), the work will be an integral part of the students' education. By working with community leaders, residents, merchants, developers, and other stakeholders, students will get a first hand understanding of how transportation and development issues are framed, analyzed, and debated. They will learn to apply advanced analytical tools – models, GIS systems, etc.- as well as to use their creativity and training to come up with new approaches. They will learn to present their work before the public as well as before peers and to discuss its pros and cons.

### **Project Schedule**

The project schedule is shown in Table 2. Meetings with stakeholders and the project advisory committee will be held periodically throughout the study, to guide the work and to help develop findings and conclusions.

### **Partnerships**

We propose to continue the already established partnership with the San Pablo Corridor elected officials/staff stakeholders group, for which the project team will continue to serve as a technical support group. The stakeholders will provide advice and feedback throughout the study. We also propose to continue to utilize our ongoing partnerships with local public agencies and private nonprofits, who will share data and offer advice and support.

### **Budget and Budget Justification**

Table 3 shows the proposed budget for Phase II. We seek funds to support workshops, focus groups, and report preparation and dissemination, as well as local travel to meetings and miscellaneous office expenses associated with the project.

| <b>Table 2. Tasks and Schedule</b>  |           |            |
|---|-----------|------------|
| 1) Study the auto ownership and use patterns of the occupants and customers of new developments along the corridor, especially those near transit and in pedestrian-friendly nodes, and recommend appropriate parking requirements. | 9/1/2005  | 10/31/2005 |
| 2) Develop a strategy to encourage more transit use by residents and employees in the corridor, and in particular to improve the affordability of transit to low income residents and workers                                       | 9/1/2005  | 10/31/2005 |
| 3) Work with local government on specific plans for nodes, incorporating and integrating the transportation and land use strategies recommended for the corridor.   | 9/1/2005  | 11/30/2005 |
| 4) Work with the advisory team to develop financing strategies for the proposed improvements.   | 9/1/2005  | 11/30/2005 |
| 5) Estimate the resulting mode shifts toward walking and transit that can be expected from implementation of the proposed courses of action; analyze their environmental impacts.   | 11/1/2005 | 11/30/2005 |
| 6) Draft Report on Results; Presentation  | 12/1/2005 | 12/21/2005 |
| 7) Organize workshops and focus groups on the findings of the study in cooperation with the advisory team, to help build public support.  | Spring 06 | Spring 06  |
| 8) Final Report and Dissemination of Results  | Spring 06 | Spring 06  |

| <b>Table 3. Budget</b>                                      |   |                    |
|---|---|--------------------|
| <b>University of California, Berkeley - EPA P3 Phase II</b> |   |                    |
|   |   | <b>Amounts</b>     |
| <b>1) Focus Groups</b>                                      | Honoraria@ \$40/person*15/group *2/city* 5 cities (150 people)            | \$6,000.00         |
|   | Refreshments for focus groups, \$6/person                                 | \$900.00           |
| <b>2) Workshops</b>   | Materials for workshop (displays etc), \$300/workshop*10 workshops        | \$3,000.00         |
|   | Refreshments for workshops, \$4/person*50 per workshop*10 workshops       | \$2,000.00         |
| <b>3) Reports</b>   | 100 pp. including color graphics, \$30/copy*10 per city*5 cities          | \$1,500.00         |
| <b>4) Local Travel</b>                                      | To meetings, field work - transit, auto + parking costs, est. 200/mo*6mo. | \$1,200.00         |
| <b>5) Miscellaneous Expenses</b>                            | Office supplies, copies, postage and shipping                             | \$400.00           |
| <b>6) Total Direct Costs</b>                                |   | <b>\$15,000.00</b> |
| <b>7) Indirect Costs</b>                                    | 52% of total direct costs   | \$7,800.00         |
| <b>8) Total Project Costs</b>                               |   | <b>\$22,800.00</b> |

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**Elizabeth Deakin**

Professor, Department of City and Regional Planning (50% time)  
Director, University of California Transportation Center (50% time)  
2614 Dwight Way, 2d Floor MC 1782 -1782  
University of California, Berkeley, CA 94720  
edeakin@uclink.berkeley.edu  
tel. 510 642 4749

**i) Education**

S.B. (Political Science) MIT, 1971  
S.M. (Civil Engineering, Transportation Systems), MIT, 1972  
J.D. Boston College Law School 1976

**ii) Courses Taught**

CP213/CE290, Transportation and Land Use; CP217,/CE250 Transportation Policy; CP 218, Transportation Studio; CP290 Special Topics: Readings in Urban Theory; previous years Land Use and Environmental Law, Land Use Planning, Special Topics in Land Use, Special Topics in Transportation

**iii) Selected Publications Last Five Years (2001-present)****-- Books and Monographs; Book Chapters**

E. Deakin et al., "Surface Transportation Environmental Research: A Long Term Strategy", Special Report 268, National Academy of Sciences Press, Washington DC, 2002.

E. Deakin, "The Changing Importance of Central Cities", Veröffentlichungen aus dem Institut für Strassen und Verkehrswesen, Universität Stuttgart, in Zusammenarbeit mit der Al;atal SEL Stiftung, August 2002, 94 pp. (in German and English)

E. Deakin, Mainstreaming Intelligent Transportation Systems, in D. Gillen and D. Levinson, eds. Intelligent Transportation Systems, Spon, 2004.

**-- Recent Articles in Journals and Proceedings**

E. Deakin, Managing the Multi-Purpose Arterial: San Pablo Avenue from Oakland to San Pablo, Conference Paper, Annual Meeting of the Association of Collegiate Schools of Planning, Portland, OR, October 2004.

E. Deakin, Integrated Land Use and Transport Planning – Finding a Green-Gold Path, Symposium Paper, Networks for Mobility 2004, University of Stuttgart (Germany), Sept. 2004

Greg Newmark and Elizabeth Deakin, Recasting a Road: The History of San Pablo Avenue as a Multi-Use Urban Arterial, conference paper, Transportation History Conference paper, University of Michigan, Dearborn, Michigan, October 2005.

Chris Cherry, Eric Tang, Elizabeth Deakin, and Alex Skabardonis, Analysis of Freeway Improvements for Express Bus Service, conference paper, Transportation Research Record, Washington DC., forthcoming 2005

Luis Mejias and E. Deakin, Redevelopment and Revitalization Along Urban Arterials: A Case Study of San Pablo Avenue from the Developer Perspective, c Transportation Research Record, Washington DC., forthcoming 2005

Manish Shirgaokar and E. Deakin, A Study of Park and Ride Facilities and Their Use in the San Francisco Bay Area Transportation Research Record, Washington DC., forthcoming 2005

E. Deakin, Shuttles for the First and Last Mile, Editorial, Access, Fall 2004.

E. Deakin. et al., "Parking Management and Downtown Land Development: The Case of Downtown Berkeley, CA," Transportation Research Record, Washington DC. 2004.

E. Deakin et al., "Development of the BART System Expansion Criteria and Process ", Transportation Research Record, Washington, DC, 2004.

McDonald, N., S. Librera, and E. Deakin, 'Free transit for low-income youth: Experience in the San Francisco Bay Area' Transportation Research Record, Washington, DC, 2004.

E. Deakin, "Mainstreaming Intelligent Transportation Systems.", Transportation Research Record, 2004

E. Deakin, Trends and Policy Choices: A Research Agenda, Access 23, University of California, Berkeley, Fall 2003, pp. 26-31.

E. Deakin et al., "Policies and Practices For Cost-Effective Transit Investments: Recent Experiences in the United States", Transportation Research Record 1799, pp.1-9, 2002.

E. Deakin et al., "Sustainable Transportation: Findings from an International Scanning Review", Transportation Research Record 1722, pp 1-11, 2002.

E. Deakin, "Transportation in California: The Coming Challenges" in California Policy Issues Annual, California's Future in the Balance: Transportation, Housing/Land Use, Public Higher Education, and Water Four Decades Beyond the Pat Brown Era, Pat Brown Institute of Public Affairs, Los Angeles, CA, 2002

E. Deakin, "Land Use for Sustainable Urban Transport: An Assessment of Problems and Options", Keynote Address and Paper, Workshop on Land Use for Sustainable Urban Transport, Linz, Austria, Proceedings, European Council of Ministers of Transport and Organization for Economic Cooperation and Development, Paris, 2001,  
<http://www1.oecd.org/cem/UrbTrav/Workshops/LandUse/Deakin.pdf>

**Appendix - Student Participants in UC Berkeley P3 Project, 2004-2005**

|                                      | <b>DEPT.</b> | <b>DEGREE OBJECTIVE</b> |
|--------------------------------------|--------------|-------------------------|
| <b>21 GRADUATE PARTICIPANTS</b>      |              |                         |
| STAGI, JAMES                         | CRP          | MCP                     |
| CAVANAGH, ELLEN RUTH                 | CRP          | MCP                     |
| KANG, JUNHEE                         | CRP          | MCP                     |
| MCANDREWS, CAROLYN ANN               | CRP          | MCP                     |
| MEJIAS, LUIS                         | CRP          | MCP                     |
| SHIN, KYOUNG MUN                     | CRP          | MCP                     |
| WEBB, MARCUS MENSAH                  | CRP          | MCP                     |
| <b>8 WICKLAND, JOHN LAURENCE</b>     | CRP          | MCP                     |
| CHEN, JUSTIN K                       | CE           | MS                      |
| DYER, SCOTT KAPLAN                   | CE           | MS                      |
| HANNAY, ROBERT LEWIS                 | CE           | MS                      |
| HIGGINS, NATHAN                      | CE           | MS                      |
| MAHESEWARI, GEETIKA                  | CE           | MS                      |
| MARTIN, ELLIOT WILLIAM               | CE           | MS                      |
| <b>7 VALENTIN, THOMAS GABRIEL</b>    | CE           | MS                      |
| <b>1 RUBIN, ELIHU JAMES</b>          | ARCH         | PHD                     |
| <b>1 CHERRY, CHRISTOPHER ROBIN</b>   | CE           | PHD                     |
| DAY, JENNIFER                        | CRP          | PHD                     |
| NEWMARK, GREG                        | CRP          | PHD                     |
| <b>3 RUBIN, JAMES</b>                | CRP          | PHD                     |
| <b>1 VALENCIA, ADRIANA MARIA</b>     | ERG          | PHD                     |
| <b>79 UNDERGRADUATE PARTICIPANTS</b> | <b>DEPT.</b> |                         |
| APPLEMAN, SARAH AVRAM                | ARCH         |                         |
| AQUINO, EDDIE VILLANUEVA             | ARCH         |                         |
| BROVKO, ALEXANDRA                    | ARCH         |                         |
| BRUNTSCH, OLIVIA TASCHA              | ARCH         |                         |
| CARRUTHERS, KIMBERLY RENEE           | ARCH         |                         |
| CHA, KYUNGHO                         | ARCH         |                         |
| CHAN, NGA WING ARIANA                | ARCH         |                         |
| CHEN, HUI-WEN                        | ARCH         |                         |
| CHOI, DANBEE                         | ARCH         |                         |
| CHOW, MAN HUM                        | ARCH         |                         |
| DAB, JACLYN MICHELLE                 | ARCH         |                         |
| DIMAL, ANTHONY CHARLES               | ARCH         |                         |
| HENNING, MARIA LYNNE                 | ARCH         |                         |
| HUNG, SHING YAN                      | ARCH         |                         |
| JENG, ANGELA                         | ARCH         |                         |
| KONG, MAN HIN                        | ARCH         |                         |
| KONG, MYRON HOK                      | ARCH         |                         |
| KWAN, JOSE KEI YUEN                  | ARCH         |                         |
| LEE, MONICA SEUN YUNG                | ARCH         |                         |
| MA, YIU CHUNG ALVAN                  | ARCH         |                         |
| MOK, DOUGLAS LEE                     | ARCH         |                         |
| OSAWA, MIZUKI                        | ARCH         |                         |

|    |                             |                  |
|----|-----------------------------|------------------|
|    | PARK,CINDY SOOJOO           | ARCH             |
|    | SAPONE,SARAH MARIENEOLA     | ARCH             |
|    | SEASTROM,JEFFREY JOHN       | ARCH             |
|    | SOARES,JOSEPH GEORGE        | ARCH             |
|    | SONG,CHRISTINA WEI          | ARCH             |
|    | TO,BENNY HON                | ARCH             |
|    | TRUONG,KIM VAN THI          | ARCH             |
|    | TSANG,CARRIE Y              | ARCH             |
|    | WU,CHRISTINE JEAN           | ARCH             |
|    | YANG,CHUN HIN CHARLIES      | ARCH             |
| 33 | ZHANG,LIWEN                 | ARCH             |
| 1  | WALLIN,MELISSA BENET        | ART              |
|    | LAU,JORDAN G                | ASIAN-AM STUDIES |
| 2  | TONG,KARMIN                 | ASIAN-AM STUDIES |
|    | BURLINGHAM,KEVIN MICHAEL    | CE               |
|    | CHEN,JUSTIN SHINE           | CE               |
|    | CHEN,RUN                    | CE               |
|    | DORIA,ZYLAH YLANA GARLITOS  | CE               |
|    | GORDIN,EUGENE               | CE               |
|    | HINDHARTO,DWITO KUSJA       | CE               |
|    | HUYNH,LOAN KIM              | CE               |
|    | LEE,ELTON C                 | CE               |
|    | LEUNG,JAMIE                 | CE               |
|    | NGUYEN,HONGVAN THI          | CE               |
|    | POPE,JUSTIN JAMES           | CE               |
|    | POSVISTAK,JARED PARKER      | CE               |
|    | RADELL,RACHEL ANNE          | CE               |
|    | ROBERTS,EDWARD JOHN         | CE               |
|    | SNOW,ERIC JOSEPH            | CE               |
|    | TADDESSE,NEBIYU DAWIT       | CE               |
|    | THARP,CARL A                | CE               |
| 18 | WAHL,DOUGLAS AARON JAMES    | CE               |
| 1  | PRODAN,ALEKSANDR            | COMP. SCI        |
|    | AGUIAR,MATTHEW CHRISTOPHER  | ECON             |
|    | LATIF,JASSIM                | ECON             |
| 3  | ZHAO,CHRISTINA VERONICA     | ECON             |
| 1  | SHOOK,THOMAS SYDNEY         | ENG              |
| 1  | STEWART,ALEXANDER RUPP      | GEOG             |
|    | HOLMES,TRACY M              | IEOR             |
|    | MEYER,RAPHAEL GABRIEL       | IEOR             |
| 3  | YORDE,JONATHAN DAVID        | IEOR             |
| 1  | DUONG,KATHY KIM             | LANDSCAPE ARCH   |
| 1  | ANJOS,CHRISTINE             | LEGAL STUDIES    |
| 1  | DE LEON,MIGUEL CARLO        | LINGUISTICS      |
|    | BURCH,DAVID BRIAN           | POLITICAL ECON.  |
| 2  | POW,STEFANIE                | POLITICAL ECON.  |
| 1  | ESTRADA,ELADIO ALEJANDRO JR | RELIGION         |
| 1  | MAI,MECHING                 | SPANISH          |
|    | BERGER,PIETER MATTHEW       | UNDECLARED       |
|    | KAM,YIU TING                | UNDECLARED       |

|   |                        |               |
|---|------------------------|---------------|
|   | LEUNG,WAYNE            | UNDECLARED    |
|   | LI,BETTY               | UNDECLARED    |
|   | NG,BENJAMIN KAIEN      | UNDECLARED    |
| 6 | PARSONS,ALAN DOUGLAS   | UNDECLARED    |
|   | ADAMO,HAILA            | URBAN STUDIES |
|   | DAVIS,DYLAN PHANTUSAN  | URBAN STUDIES |
| 3 | HAVSTAD,ELIZABETH ERIN | URBAN STUDIES |