EXECUTIVE SUMMARY

A Note about this Document

While this Public *Review Draft of the El Camino Real Master Schematic Design Plan* does not provide images as part of the Executive Summary, the Final Draft will.

In addition to what is provided here, the *Final Draft of the El Camino Real Master Schematic Design Plan* will include *Acknowledgements* of all participants in the planning process, such as members of the Advisory Group and the TAC, City staff, City Boards and Commissions, as well as the City Council. And finally, another chapter will be added, which reflects on the *Lessons Learned* from this project.

The Final Draft will have a separate companion document as *"Appendix"*. This document will contain the following:

- full text of the "Existing Conditions Assessment",
- full text of the two tree reports,
- final text of the Memorandum of Understanding (MOU) between Caltrans and the City of Palo Alto,
- full Goals and Objectives document,
- Caltrans Director's Policy, and
- other documents.

Executive Summary

The *El Camino Real Master Schematic Design Plan* is ground breaking in many of its aspects, particularly as it applies concepts of Context Sensitive Design (CSD) and multi-modal transportation planning to a California State Highway (Highway 82) consisting of 6-lanes carrying high levels of traffic during peak travel times. Setting out to make a street like El Camino Real multi-modal is a unique proposition, especially since the City of Palo Alto does not intend to take over ownership of the roadway from Caltrans. In the past, this drastic step was the only option available to communities that wanted to achieve the flexibility in design necessary to construct pedestrian-, bicycle-, and transit-friendly design elements that are needed to make major streets a true community asset. The City of Palo Alto's long-time intent to achieve such goals and objectives without taking over ownership of the street significantly gained momentum when the City was able to secure a grant from the newly created Caltrans Office for Community Planning (OCP), which helped fund the preparation of the *El Camino Real Master Schematic Design Plan*. The OCP's and Caltrans' goal in funding this study was to learn from this process, and to better understand what Caltrans can do to better achieve context-sensitive design for the many miles of urban arterial state highways that exist throughout the State of California. The City selected a consultant team led by an urban design firm, Community Design + Architecture (CD+A), with a transportation and planning firm, Fehr and Peers Associates (FPA) taking a major role in the master planning effort.[1] The multidisciplinary nature of the consultant team was fundamental to the successful design and analysis that has resulted in the *El Camino Real Master Schematic Design Plan*

The following is a summary of the planning and design development process as well as the proposed corridor design concepts and improvements created as part of this study.

1. INTRODUCTION

Successive generations of Palo Alto citizens, community leaders, city planners and transportation engineers have wrestled with the various safety, aesthetic, and operational issues presented by El Camino Real as it passes through the center of town. In the 1960's, El Camino Real was widened, and in some cases re-aligned, into its present state as an auto-oriented major arterial street. When the new Caltrans Office

for Community Planning instituted a Demonstration Grant Program available to communities with planning projects that would address more "context-sensitive design" for in-town highways, Palo Alto saw an opportunity to address a wide range of long-standing issues involving El Camino Real. The resulting Master Schematic Design Plan will be used to apply for federal, state, and other funding sources for incremental construction of the project, allowing the city to be proactive in taking advantage of construction funding as it becomes available.

Why Change El Camino?

A planning process typically begins with a definition of the problem or issue that triggers the need for intervention, so Why Change El Camino? The answer to this question is that presently no one particular user group – including drivers – is satisfied with how El Camino in Palo Alto accommodates their needs. A look at the experiences of different users of the street and an analysis of roadway design elements reveals a strong imbalance in how the finite resource of right-of-way width is allocated between different users of the street.

While vehicular traffic occupies approximately 83% of the available public right-of-way, the **Pedestrian Experience** is largely characterized by long crossing distances and narrow sidewalks (8 feet), that are not conducive to pedestrian travel along the street, nor supportive of a positive environment for typical pedestrian activities such shopping and strolling. Many of the crossings are perceived to be unsafe for school children, the elderly, or in some cases active adults.

The **Bicycle Experience** is characterized by traveling with high volume – and at times speeding– traffic, and a minimum accommodation within the 20 to 21 foot wide outside lane, shared with traveling and parked cars.

Transit Experience is defined by poor bus stop conditions for waiting and boarding passengers; and minimal pedestrian access afforded by narrow sidewalks and long crossing distances.

The **Merchants' Experience** is defined by the negative aesthetics of El Camino and narrow sidewalk widths that reduce pedestrian access and do not allow business related activities, such as a sidewalk café.

The **Neighborhood Residents' Experience** is characterized by the perception of El Camino as a barrier between neighborhoods and other parts of town in general and for school children in particular. Traffic and other conditions on El Camino also contribute to a sense of perceived poor community character and concerns about cut-through traffic.

Even the **Driver Experience** on El Camino is dissatisfying as inconsistent vehicle speeds result in abrupt stops and starts, which on one hand can contribute to accidents at key intersections and, on the other, create a feeling of frustration for drivers, as they perceive high levels of congestion throughout the Corridor. In reality what they are experiencing is inefficient progression down the Corridor as a result of drivers rushing at high speeds between major intersections and then coming to abrupt and at times prolonged stops at the major intersections.

Although it is a goal of the Master Plan to support El Camino's role as a regional north/south arterial on the Peninsula, it has to be concluded that by today's standards of increased attention to and acceptance of Context Sensitive Design concepts (see below), the conditions on there is an imbalance between the accommodation of vehicular traffic and that of all other modes of transportation and other functions of the street.

Palo Alto's Comprehensive Plan includes policies that recognize the short-comings of El Camino Real. However for many years the community has felt that effective changes to the street were beyond their reach given the high levels of traffic and the perceived inflexibility of Caltrans' design standards.

This has changed vis-a-vis the arrival of federally sponsored concepts like Context Sensitive Design (CSD) and flexibility in Highway Design: "Both flexible design and Context Sensitive Design call for less rigid application of design standards to highway projects. Flexible design involves utilizing the flexibility inherent in the current design process and in current national guidelines and state standards. CSD implies tailoring designs to adjacent land uses with sensitivity to community values." [2] The translation of these concepts into federal and Caltrans initiatives, such as the inception of the *CalTrans Office of Community Planning* have given rise to the opportunity for a future redesign of El Camino Real, that will transformation the street into one that benefits adjacent neighborhoods and meets the needs of pedestrians, bicyclists, public transit users, drivers, neighborhood residents, and business owners alike.

2. PLANNING PROCESS AND COMMUNITY PARTICIPATION

The critical component in the public participation process for this project's was the Project Advisory Group. Its members were recruited by the City and proved to be highly committed to a consensus process focused on achieving a successful new future for the street. They were also a very knowledgeable resource for information on existing local conditions. The group represented a broad base of interests in the community, including: the bicycling community, tree advocates, neighborhood associations of the different neighborhoods that adjoin El Camino, business owners, Stanford University (the largest land owner on the Corridor), and others.

The work of the Advisory Group was complemented by two widely advertised Public Workshops and individual meetings with particular stakeholders such as Neighborhood Associations, the "Trees for El Camino" and "Canopy" groups, the "Safe Routes to Schools" group, and Palo Alto High School. Both workshops were well attended and generated critical feedback needed to inform the issues assessment, and the goal setting and design concepts stages of the project.

The technical aspects of the planning process were aided by a Technical Advisory Group (TAC), that included representatives from City Departments and outside agencies, including Caltrans, VTA, and Stanford University. This group was provided information with respect to the technical aspects of the El Camino redesign and was critical to assessing the feasibility of a given design proposal. In light of the importance of Caltrans' as the agency in control of the right-of-way and its operational aspects, several focused meetings were held with Caltrans representatives separate from the TAC. These meetings involve key decision-makers from the operations and design divisions of both District 4 and Caltrans Headquarters in Sacramento. This cooperative process was key to the successful development of the Master Plan's recommendations for improving El Camino Real.

3. SETTING GOALS AND OBJECTIVES

The Design Plan process was built on a strong foundation of goals established in Palo Alto's Comprehensive Plan, which identifies El Camino Real as a Corridor vital to its adjoining neighborhoods but also as deficient in its current configuration to achieve goals supporting walking, biking and transit uses. It was a critical step to complement the goals of the Comprehensive Plan with goals rooted in neighborhood support for changes of the street, and stakeholder interest in the realization of multi-modal goals for El Camino. The Advisory Group, with input from the public workshops, worked to broaden these base goals to a set of goals and objectives that were used as a 'touchstone' throughout the master planning effort.

These are the key goals:

> The overall goals of the future design are to change the character of El Camino Real from a highway designed primarily for motor vehicle mobility to:

- A fully multi-modal urban thoroughfare that maintains mobility and improves safety for transit, trucks, and autos, while improving safety and convenience for pedestrians and bicyclists;
- A center of community activity rather than a barrier between activities on either side of the street; and,
- An aesthetically attractive corridor that projects a positive image of Palo Alto.

Additional goals include:

- Improve quality of life along El Camino Real while protecting its adjacent neighborhoods and districts;
- Create economic benefits for both businesses and property owners along El Camino Real and for the City of Palo Alto; and,
- Make positive change soon with full development occurring incrementally over time.

The importance of having a broad base of community support, including active support from local elected officials, also became clear in discussions with Caltrans. The agency was clearly more inclined to consider flexibility in their interpretation of applicable standards if the desired changes had been based on a broad-based and informed decision-making process.

CD+A and FPA worked with the Advisory Group and the Technical Group to develop an evaluation matrix that defined specific strategies for achieving the project goals and objectives and then listed a variety of performance and design criteria that could be used to evaluate the success of proposed design alternatives.

Caltrans Project Goals

What set the stage for the success of this planning effort is the maturation of a set of goals and policies at Caltrans that relate to the need for transportation projects to be imbedded in a community planning process and a recognition of the need for a context-sensitive design approach for State Highways that also serve as community "main streets."

Following is the Caltrans' Director's introduction to ***Main Streets: Flexibility in Design and Operations Booklet***, published in the July 2002:

"Caltrans remains committed to the notion that people live, work and play in the communities through which our facilities pass. It is our duty, by recognizing the needs of both non-motorized and motorized modes of transportation, to assure that living space is good space in which to live. We are committed to full cooperation with the citizens and elected officials of those communities to find transportation solutions that meet both our duty to protect the lives and mobility of travelers, as well as making main streets a good place to be."

4. ASSESSING EXISTING AND PROJECTED FUTURE CONDITIONS

The assessment of the existing context along El Camino Real included a comprehensive review of physical and transportation conditions. In addition, the assessment considered projected future conditions as represented by public policies and sound transportation growth projections.

Assess Urban Form and Landscape Character

The existing conditions assessment established a clear link between travel speed, roadway function, and ultimately transportation design solutions on one hand and existing and planned future urban form and landscape character of land uses along the Corridor on the other hand. A key finding of the Land Use and Urban Design Assessment was the fact that the El Camino Corridor is not uniform from beginning to end but rather consists of two distinct segments:

'Stanford Frontage' Segment - between Northern City Limit and Stanford Avenue

This area is dominated by large-scale properties, such as the Stanford Shopping Center, the Palo Alto Medical Foundation, the Town & Country Shopping Center, the Stanford Campus, and the Palo Alto High School. Building footprints on these properties are respectively large and most structures are set back from the street. The latter when combined with existing landscape conditions gives the area an almost rural character.

'Urban' Segment - between Stanford Avenue and Adobe Creek

This segment includes the most urban portions of El Camino Real in Palo Alto. In general the area is characterized by commercial buildings fronting directly onto the street. Parcels in this segment tend to be smaller than along the 'Stanford Frontage' segment. The landscape character of the 'Urban' Segment is variable, but mostly characterized by street tree plantings in medians and along sidewalks.

In addition, some 'nodes' along El Camino were identified as standing out for their more intense pedestrian and bicycle activity and present or planned concentration of commercial/retail activity. These include:

- University Avenue/Palm Drive/Caltrain Stop;
- Embarcadero Road/Town and Country/Palo Alto High School;
- California Avenue Area; and,
- the El Camino Way Triangle Area.

The segmenting of the Corridor by function and urban context allowed for different approaches to achieve similar goals at different locations along the Corridor, while the visual and physical transitions of the roadway design from one segment to the next and the horizontal roadway shifts associated with such transitions can contribute to traffic speed management.

Trees in Sidewalks and Medians

An important portion of the existing conditions assessment was a study of the condition of existing street trees along the Corridor. Landscaping can be a key element in the definition of urban form and character of street. Many highly valued, grand boulevards are typified by their street trees with buildings providing a backdrop and detailed human character. While this is the hope for the redesign of El Camino Real, the existing conditions along the street do not fulfill their potential. Investigations indicate that while a significant number of trees have been planted along the Corridor in major portions of the 'Urban' segment of the Corridor sidewalk trees have been stunted in their growth. This stunting has occurred because of the soils conditions in which the trees are planted. The Master Plan includes a set of recommendations for improving this situation for many existing trees, and how to avoid the situation in future plantings.

The Public Right-of-Way

A key finding of the corridor-wide analysis of cross sectional dimensions of the roadway is the relative consistency of the dimensions of key elements throughout the corridor such as sidewalks, parking lanes, travel lanes, turn lanes, and medians. This occurs regardless of differences in local land use conditions and roadway utilization. A case in point is the presence of the right shoulder. Throughout the Corridor this 8-foot-wide space is sometimes used as a parking lane but it persists where parking is not allowed or necessary. This occurs because of the Caltrans requirement for a 'break down lane.' This is a pertinent example for how the application of highway design standards to urban arterials leads to a design that does not reflect roadway function or context.

Other key findings of the urban design analysis include the absence of unifying design elements such as street furnishings and the lack of lighting scaled to the needs of pedestrians with regard to fixture height and fixture spacing.

Transportation Assessment

To support the development of the design alternatives, the Consultant Team collected a variety of transportation data including accident history, travel speeds, and corridor signalization. This data proved instrumental in developing alternatives.

Existing Conditions

Safety and Accidents: While the overall accident rate along El Camino Real is average for similar facilities throughout the state, analysis of accident data revealed locations where the accident rate exceeded the expected level. Analysis indicated that several locations had high percentages of rear-end accidents with speeding cited as a cause. Therefore, it can be inferred that excessive travel speeds are contributing to accidents in these locations. While data indicates that pedestrian and bicycle accidents are not unusually high for this type of highway, it is clear from public input that there are concerns and a perception that El Camino Real is not a safe place to ride a bicycle along or to cross as a bicyclist or pedestrian.

Travel Time Study: Travel time along El Camino Real was studied in comparison with parallel routes. Travel time was an important evaluation criteria for the future condition of the Corridor, because if a relatively high quality of travel time can be maintained on El Camino, drivers will be less likely to divert to parallel routes and otherwise 'cut-through' adjacent neighborhoods. The travel time studies also indicate that speeding is an issue in the Corridor with traffic exceeding the speed limit in some segments of the Corridor even during the rush hour.

Corridor Signalization: The timing of signals along a street like El Camino has a great effect on the quality of the driving experience along the Corridor and on the ability of pedestrians to safely cross the street. Analysis indicated that signals are not well coordinated for traffic moving along El Camino Real which contributes to the 'peaks and valleys' in vehicle speeds that were evidenced in the travel time studies. Also, analysis showed that pedestrian signals do not provide enough time to satisfy Caltrans or Palo Alto standards at several intersections.

Pedestrian and Bicycle Conditions: As mentioned earlier, sidewalks along the Corridor are too narrow for comfortable pedestrian use of the street. Also, the frequency of pedestrian crossings is inconveniently long in much of the Corridor, and as mentioned above signal timing often does not allow the desired amount of time for pedestrians to cross the street. The speed of traffic and the lack of a marked bicycle lane, particularly where cars are parked along the street makes many bicyclists uncomfortable with riding along the street. The street is used by a substantial number of bicyclists, particularly by people commuting to work (which was observed many times during the study).

Transit Conditions: Several existing bus routes run along or across El Camino Real with the VTA's 22 and 300 lines having about 5,000 daily boardings in Palo Alto.

Project Future Conditions and Programs

Traffic Growth Rates: Sound prediction of traffic growth is important for effective evaluation of future traffic conditions resulting from different roadway design options. Over the period from 1992 to 2002, El Camino Real experienced and average traffic growth (combining accelerated growth periods with more static or stable periods) of between 1 and 1.5 percent per year. Extending this trend over the next twenty years, the projected growth in Corridor traffic is expected to be nearly 25%.

For comparison purposes, this growth rate was compared to the future growth rate shown in Palo Alto's Comprehensive Plan. The growth rate shown in the Comprehensive Plan for various intersections along El Camino average 1 to 1.5 percent. Therefore, this historical growth rate is consistent with the growth rate shown in the comprehensive plan.

Planned Transit Improvements: To support increased transit ridership, VTA is planning to provide Bus Rapid Transit service resulting in a higher level of transit access along the Corridor. BRT improves the level of service with stops that are designed as transit stations, more convenient loading of low floor buses, and more predictable frequency of service though signal priority systems and other technologies.

5. CREATING CORRIDOR CONCEPT DESIGN ALTERNATIVES

Context-sensitive design requires a different approach to the creation of alternative design solutions. The solutions must be more comprehensive and take into account their interrelated impacts on all modes of transportation and the quality of the physical context.

Summary of Design Approach and Alternatives Evaluations

Using the community's goals for El Camino Real as a guide and the analysis of existing conditions to highlight deficiencies in the Corridor, the Consultant Team created a range of options for the future design of El Camino Real. These design concepts were reviewed and refined with the advisory groups. At the same time work began with Caltrans to identify where a flexible interpretation of standards, or exceptions from standards, would be warranted to achieve the design concepts. The process with Caltrans involved identifying the individual design elements that required a variation from existing interpretations of Caltrans guidelines and standards (e.g.; lane width, shoulder width, curb extensions, etc.).

The approach to establishing a design concept applicable to the entire Corridor consisted of the following key steps:

- Identification of desired improvements and design elements based on the evaluation of existing deficiencies , functional requirements (such as continued use as a truck route and major transit corridor), and projected 20-year growth in Corridor traffic, and on preliminary community goals;
- Preparation of a broad range of alternative, illustrative corridor concepts and cross section designs;
- Evaluation of design alternatives based on feasibility relative to right-of-way constraints and Caltrans standards, effectiveness in handling traffic and multi-modal travel demand, as well as performance relative to evolving community goals and selected tradeoffs;
- Selection of two alternative corridor design concepts and associated cross section and intersection designs that reflect two approaches to balancing corridor operations and community goals;
- Comparative transportation and urban design analysis of selected alternatives;
- Refinement of alternative corridor design concept(s) and associated cross section and intersection designs.

The following design elements were identified by the community as desirable for El Camino Real:

- 2 or 3 travel lanes for each direction;
- left-turn lanes where needed and appropriate;
- sufficient traffic capacity to accommodate growth related to the Comprehensive Plan without reducing El Camino's travel efficiency (travel time) relative to parallel streets;
- adequate accommodation of transit vehicles (VTA and other busses) and truck traffic where these are designated to occur;
- safe bicycle accommodation throughout the Corridor either in form of a bike lane or in wider travel lane;
- on-street parking where needed for businesses and other uses along the street;
- wider sidewalks for pedestrian and business activity;
- corner curb extensions (bulb-outs) and other design features to create safer crosswalks throughout the Corridor;
- longer "WALK" times on traffic signals to meet City of Palo Alto crossing-time standards
- median refuges for slower paced pedestrians and bicyclists, and to provide for the planting of large trees;
- raised medians, lined by trees including the narrow medians along turn lanes; and,
- large canopy trees, that shade the roadway, beautify the street and provide additional environmental benefits.

The assessment of the corridor concepts resulted in two key conclusions regarding future traffic operations in the Corridor, and these shaped the final recommendations of the Design Plan:

Capacity must be maintained at major intersections for queuing and storage. This storage requirement averaged approximately 600 feet at the four major intersections within the Corridor: Alma / Sand Hill Road, Embarcadero, Page Mill Road, and Charleston / Arastadero.

Signal timing and coordination adjustments can be used to meter traffic flow along El Camino distributing delays more evenly, reducing stopping-and-starting, and controlling queue lengths and delays at the most critical intersections while **allowing for reduction in the number of lanes at key locations**.

Street Cross Section Designs

(For cross section Diagrams see chapter 5.3)

The constraints imposed by the finite width of available right-of-way became apparent when the optimum dimensions for all community-desired design elements were summed in an "Ideal Cross Section" and then compared to the actual width of the existing El Camino right-of-way. The example of the "Ideal Cross Section" emphasized the need for tradeoffs and compromises relative to desired optimums championed by proponents of a given mode of transportation or particular design element.

Based on Caltrans' willingness to explore and exercise flexibility in the application of highway design standards, Caltrans, the Consultant Team, City staff and the Advisory Group worked through an iterative process of reviewing street cross section designs that favored different functions of the roadway and working to the consensus street cross sections illustrated here:

'Urban' 6-Lane: This cross section is the typical 6-lane configuration for the 'Urban' portion of the Corridor. This cross section is characterized by many design elements being accommodated at the minimum end of their range, such as the 10-foot wide sidewalks.

'Stanford' 6-Lane: This is the typical 6-lane cross section for the 'Stanford' area. The cross section reflects the character of the adjacent uses and landscape. Trees are accommodated in planting strips and planted in a more informal arrangement.

'Urban' 4-Lane: Defining feature of this cross section is the 17-foot wide sidewalk, 19-foot wide medians and the short crossing distances afforded by the reduction to two lanes in each direction. The wide sidewalks can accommodate a variety of sidewalk uses such as sidewalk cafés, transit facilities and public art.

'Stanford' 4-Lane: This cross section is primarily defined by its generous landscape character, created by a 22-foot wide median and the 13-foot wide planting strips.

5-Lane Cross Sections: In certain locations because of differing

traffic demands in a north or south direction, a 5-Lane cross section is necessary. A 5-Lane cross section can be implemented in two ways. By putting one half of a 4-Lane section and a 6-Lane section together, which results in uneven sidewalk treatments, or by redistributing the non-roadway portions of the street section to the median and equal sidewalk areas.

Recommended Corridor Concepts

The Master Schematic Design Plan recommends three overall Corridor Concepts that apply the street cross sections to different segments of the Corridor *(see Chapter 5.3 forConcept Plans)*. The Corridor Concepts and cross sections underwent an iterative and increasingly detailed process of development and refinement with input from the Advisory Group, the TAC, Caltrans, and the public. Throughout this process, FPA subjected preliminary versions of concept plans to traffic flow Level of Service tests in the CORSIM model, a step that strongly informed the development of the final design options.

Six-Lane Throughout Option

The 6-Lane Throughout Option is the most conservative approach to the redefinition of El Camino Real. In this option, the current configuration of El Camino with three travel lanes in each direction is fully maintained. However, the redesigned cross sections for this option do provide an increased sidewalk width (10 feet), the introduction of a 5-foot bicycle lane, and a basic set of crosswalk improvements, such as 8-foot wide median refuges and curb extensions to reduce the crossing distance. This approach limits the extent to which some of the multimodal and other goals can be accommodated. Many of the desired design elements are included at the minimum of their dimensional ranges.

Six/Four-Lane Hybrid Configurations A and B

These options are based on detailed analysis using the CORSIM simulation tool. The options were developed through a process of repeated refinement with respect to length and location of segments with a reduced number of lanes. At the beginning of the process, lane reductions were made to the areas that would benefit most from a reduction in number of travel lanes. Included were street segments where commercial and pedestrian activities are strong today or are expected to increase in the future based on city policies and zoning, and where a higher number of school-route crossings occur. Several of the preliminary options therefore attempted to stretch out the use of 4-lane cross sections throughout these segments. However, the CORSIM analysis quickly demonstrated that there were limits to how long 4-lane segments could be extended and where they could occur.

In testing the options and balancing community-supported context sensitive concepts with traffic performance, the Consultant Team and city transportation staff developed two variations of the 6/4-Lane Hybrid Option (Configuration A and B), which primarily differ in the length of their proposed 4-Lane and particularly their 5-lane segments. The relative traffic performance of these alternative concepts was tested using the CORSIM tool.

6/4-Lane Hybrid Option-Configuration A: The following are the key intersection crossings for pedestrians, bicyclists and school children that would benefit from teh proposed reduction by one or two lanes are: Stanford Avenue (4 lanes), California Avenue (5 lanes), Los Robles (4 lanes) and Maybell Avenue (5 lanes).

6/4-Lane Hybrid Option-Configuration B: The chief difference between Configuration A and B is the increased number of intersection crossings for pedestrians, bicyclists and school children that would benefit from the reductions by one or two lanes. and the increased length of widened sidewalk.

Transition between 4 and 6 lane Segments: Lane additions and lane drops would each occur twice in each direction of travel under Hybrid Configuration A and under Hybrid Configuration B. Lane drops need to be carefully designed to ensure that cars merge safely into the adjacent lane. This condition was discussed extensively with Caltrans to ensure a safe design concept.

Design Characteristics of Typical Crosswalk Improvements

A number of prototypical crosswalk improvements are recommended for use throughout the Corridor. Key intersection improvements for six, five, or five-lane roadways are:

- 6-foot corner bulb-outs (curb extensions) to shorten crossing distances;
- Ladder-type striping of pedestrian crossings for added visibility (at unsignalized, marked crosswalks);
- Special paving material such as (colored) concrete brick pavers for crosswalks with higher pedestrian crossing volumes; and,
- 8-foot pedestrian refuge protected by the median and an 8-foot by 4-foot wide concrete curb on the opposite side.

Comparative Analysis Between 4-6 Lane Improvements

Travel times will increase over the next 17 years regardless of change to the street. However, relative small differences exist between the three corridor concept alternatives for a redesign of El Camino. Compared with the future baseline ("Future without any Improvements"), the increases in travel time for the entire length of the Corridor are only about 3% to 4% for Option A, and 3% to 11% for Option B. All proposed alternatives improve the multi-modal experience of the Corridor, with the 6/4-Lane Hybrid options producing relatively higher benefits for pedestrians, bicyclists, and transit users.

Using the CORSIM Model to Refine the Configurations: A major reason why reducing the number of lanes in selected segments along El Camino Real does not significantly increase the travel time is the preservation of capacity at the major intersections. All of the proposed alternatives retain the necessary turn lanes and length of lanes carrying traffic into the intersection (i.e.; 'queuing distance') at the four major intersections(Alma/Sand Hill Road, Embarcadero Road, Page Mill Road, and West Charleston/Avashadero). Lane reductions to the 4 or 5-lane cross sections only occur at minor side streets where there is good intersection performance (LOS C or better) and excess capacity.

Street Tree Concept Plan and Recommendations for Successful Tree Planting

Large canopy street trees are a prominent feature along many grand boulevards throughout the world, and they can also be a very cost effective tool and bring a short-term significant change to the character of the El Camino Corridor, and over time make for a dramatic transformation of a streetscape. Large canopy trees also provide a variety of environmental benefits including improving air quality, shading pavements, and reducing peak storm water flows.

The approach to the tree concept plan acknowledges and builds on the significant difference between the 'Stanford' segment which has almost rural appearance and dominated by deep building setbacks and generous landscaping, while and the 'Urban' segment which is characterized by buildings that come up to the property line and the more urban landscape character of street trees in sidewalks and median.

For the **'Stanford' area**, the landscape treatment reflects the 'looseness' of the adjacent existing landscaping. The proposed tree species of Valley and Cork Oak blend in with existing oak trees on both sides of the street. New trees should be planted with offsets from the centerline of side planting strips or the median, and 'on-center' distances should vary to give the trees a clustered appearance more reminiscent of an Oak-Woodland landscape character. For the medians a combined use of London Plane trees and Valley Oaks is recommended. While the predominant London Plane trees lend continuity to the visual appearance of the overall Corridor, where this species is the dominant street tree, the occasional occurrence of clusters of Valley Oaks will provide a visual and horticultural 'bridge' across El Camino and connect the landscaped areas on either side of the street.

Planting strips and the center median in this area should both be

landscaped with grasses and native shrubs to match the oak woodland character of the selected trees and adjacent portions of the Stanford University campus.

Throughout the **'Urban' area** the street tree concept plan proposes the use of London Plane trees in sidewalks and medians. However, this approach is modified and varied by the intention to emphasize the importance of two areas commercial and pedestrian activity. The plan recommends that either Red Maples or American Elms be planted in the medians between Leland and Grant Avenues and between Curtner Avenue and West Charleston Road. Either species would provide a strong color in the fall while they are otherwise very compatible with the London Plane trees of the sidewalks.

Tree Planting Practices: The Master Plan includes recommendations for both the planting of new trees and remedial improvements that can be made for existing trees soil conditions to improve tree growth. Approaches vary depending upon specific soils conditions, but in general, to large canopy trees, sidewalk trees should be planted in wells with a minimum dimension of 4 feet by 6 feet with a 3 foot depth back filled with soils and provided with other treatments to ensure proper drainage.

6. IMPLEMENTATION AND PHASING

The first step toward the transformation of El Camino Real into a street that better serves the goals expressed by Palo Alto is the preparation of this *Master Schematic Design Plan*. This step will conclude with Caltrans and the City signing a Memorandum of Understanding (MOU) about key design elements of the future street and how to proceed with the implementation of improvements to El Camino Real.

The completion of the Master Schematic Design Plan and the signing of the MOU will allow the implementation to move forward as funds become available. As demonstrated by the comparative analysis of the benefits associated between six and four-lane improvements, the effectiveness of the future El Camino Real in meeting the community's goals and objectives is increased where 4/5-Lane improvements are implemented. The transportation analysis has shown that traffic is predicted to function well while pedestrians, bicyclists and transit modes will reap benefits in accessibility and safety.

Implementation and phasing recommendations follow a clear 'decision tree' that provides a flexible path for incrementally building-out the Master Schematic Design Plan. It allows the first steps to be taken very soon and does not include lane reductions in the initial improvements. The basic steps are:

Phase 1: Initial Improvements – Retime the signals in the Corridor and restripe the roadway to approximate the recommended 6 Lane redesign, including narrower lanes and addition of bicycle lanes. This will allow near-term benefits for transportation in the Corridor. Also, tree plantings can move forward in many of the medians along the street.

Phase 2: Field Test – Select a segment or segments of 4/5 Lane improvements and "field test" them as temporary improvements. Construct permanent adjacent segments of 6 Lane improvements and evaluate the effectiveness of the 4/5 Lane field tests.

Phase 3 and beyond: Further Field Testing or Incremental Build-Out of Corridor-wide Improvements – Make decision either to do more field testing, begin building final improvements of one of the 4/5 Lane Hybrid Options, or abandon the concept of the 4/5 Lane sections and begin building the 6 Lane Option.

At any point during the process a decision could be made to move forward with Corridor-wide 6 Lane improvements.

Additional Studies

As the implementation of the Design Plan moves forward several additional studies will need to be undertaken:

A. Design-level Exceptions

Caltrans requires 'Design Exceptions' for all roadway design elements that deviate from standard dimensions or characteristics (or ranges) as described in the Highway Design Manual. Two levels of design exceptions can be granted at the planning or detail design level, with the latter being the more common of the two. Planning-level design exceptions will be granted as part of the MOU process.

All key design elements proposed for El Camino that need a design exception have been discussed and coordinated with Caltrans as part of this project. However, the level of planning, design, and analysis undertaken in the study did not allow for every one of these elements to be taken through the design exceptions process. It is therefore recommended that the City of Palo Alto continue working with Caltrans on all needed design exceptions that can be granted at the planning-level. A *'Design Exceptions Matrix'* will be included with in the Final Master Schematic Design Plan appendix, which lists all key design elements and indicates whether a planning or detail design-level exception is needed.

B. Environmental Review

Environmental review will be a required step for the implementation of each phase of the El Camino improvements project. City staff and/or the designer of the street improvements would prepare an environmental checklist and depending upon the outcome of this either prepare a negative declaration of no significant environmental impact mitigated negative declaration or move forward to prepare an environmental impact report (EIR per CEQA standards), and if federal funds are used an environmental impact statement (EIS per NEPA standards).

C. Parking Utilization Studies

One area requiring further analysis on-street parking along portions of El Camino. Field visits have indicated that on-street parking is heavily utilized in certain areas, such as the commercial areas adjacent to California Avenue, and not highly utilized in others. It is therefore recommended that parking utilization surveys be conducted for segments of the street as they enter the detailed design process.

A focused parking study will also provide opportunities for discussions with property owners and businesses that are adjacent to the areas being studied, as well as meetings with residents of the neighborhoods adjacent to El Camino Real.

D. Neighborhood Traffic Studies

Another additional study would be an analysis of any possible location-specific traffic diversion into adjacent neighborhoods that might result from changes on El Camino Real. These focused neighborhood traffic studies could be conducted as detailed designs are prepared for segments or concurrently with field-testing that would occur on El Camino Real.

7. COST ESTIMATES

The level-of-magnitude cost estimates created for the proposed design alternatives indicate that no significant cost difference exists between the three key corridor concept options: 6-Lane Throughout Option, and the 6/4-Lane Hybrid Options–Configuration A and B. The following table shows that highest (Hybrid Option-B) and lowest estimated cost (6-Lane Throughout Option) differ by only about $1 million.

It is also important to note that Initial Improvements can be made at a relatively low cost, approximately $1.5 million. Such initial improvements would allow for the Corridor to be prepared for the field testing of potential 4/5-Lane segments, and include the following:

- Initial survey and aerial;
- Signal Coordination Study and Implementation of Signal Re-timing;
- Limited Parking Utilization Study;
- Design and construction drawings for re-striping and model crosswalk improvements at one intersection;
- Construction of model crosswalk improvements at one intersection; and
- Re-striping of the entire Corridor and scraping off the old markings from the roadway surface (resulting in a cost at the lower end of the range given above); or
- Re-striping of the entire Corridor and covering of old markings by applying a thin layer of asphalt across the entire roadway surface (resulting in a cost at the higher end of the range given above).

Alternative Options: 6-Lane Throughout or 6/4-Lane Hybrid Options

All figures include a 30% contingency on capital cost items (excluding any "soft" costs such as design and engineering). Using this relatively high contingency is justified by the built up nature of this urban corridor, where potential complicating factors can result during detailed design and final Caltrans review, and where currently unknown conditions including, r.o.w. encroachments, or conditions can complicate the engineering and construction stages. It should also be noted that the overall cost figures for the alternative options include a significant amount for the construction of a completely new lighting system (roadway and pedestrian) throughout the Corridor.

All presently anticipated "soft" cost items, such as surveying, a signal timing study and its implementation, a parking utilization study, and design and engineering were accounted for after the 30% contingency was applied to the subtotal of all capital improvement costs.

	OVERALL COST FOR ALTERNATIVE OPTIONS		
	6-Lane Throughout Option (w/o Segment North of University Avenue)	6/4-Lane Hybrid Option Configuration A (w/o Segment North of University Avenue)	6/4-Lane Hybrid Option Configuration B (w/o Segment North of University Avenue)
Total of Capital Cost Items	$ 29,950,000	$ 30,350,000	$ 30,800,000
Total of "Soft" Costs Items	$ 2,350,000	$ 2,500,000	$ 2,450,000
Subtotal	***$ 32,300,000***	***$ 32,850,000***	***$ 33,250,000***
30% Contingency on Capital Cost Items	$ 8,985,000	$ 9,105,000	$ 9,240,000
Rounded Total	**$ 41,300,000**	**$ 42,000,00**	**$ 42,500,000**

Each of the estimates includes the following key items:

- Additional Survey of Detail Features;
- 2nd Signal Timing Study and Implementation of Re-timing;
- Parking Utilization Study;
- Design and Construction Drawings for fully improved Option;
- Utility Add-on for the relocation of some existing utilities between Maybell and Adobe Creek.
- Construction of fully improved 6-Lane Throughout or 6/4-Lane Hybrid Option, with comlpete replacement of lighting system (roadway and pedestrian).