

## **Re-Engineering an Urban Arterial Street**

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### **Abstract**

The Charleston Road and Arastradro Road form a 2.2 mile-long arterial street corridor in Palo Alto, California, home to Stanford University and some of the nation's leading technology firms. Charleston Road and Arastradero Road provide access to eleven public and private schools, two public parks, a public library and community center, senior citizen housing, a neighborhood shopping center, and several residential neighborhoods. Planned development along the Corridor will increase the residential and school population as well as add a regional community center and a senior citizen housing complex. Average weekday motor vehicle volumes on the Corridor range from between 15,600 and 21,700 depending on location. The posted speed limit all along the Corridor is 25 mph.

Concerned parents and other residents requested that the City of Palo Alto enhance the bicycling and walking environment for children and other Corridor users. As a result of this community concern, the Palo Alto City Council adopted a multi-modal Charleston-Arastradero Corridor Plan to significantly improve cycling and walking conditions on, as well as the visual amenity of, the Corridor, primarily through conversion of approximately one-half of its reach from four through lanes to two through lanes with a raised center median with left turn pockets. Notably, this street re-design is to be accompanied by improvements to the Corridor's traffic signal system. The signal improvements, along with new left turn pockets are expected to compensate for the loss of travel lanes. Corridor Plan Performance Measures adopted by the Palo Alto City Council set forth quantitative thresholds to be met regarding pedestrian and bicycling conditions, motor vehicle travel times, and travel safety.

## Introduction and Corridor Plan Context

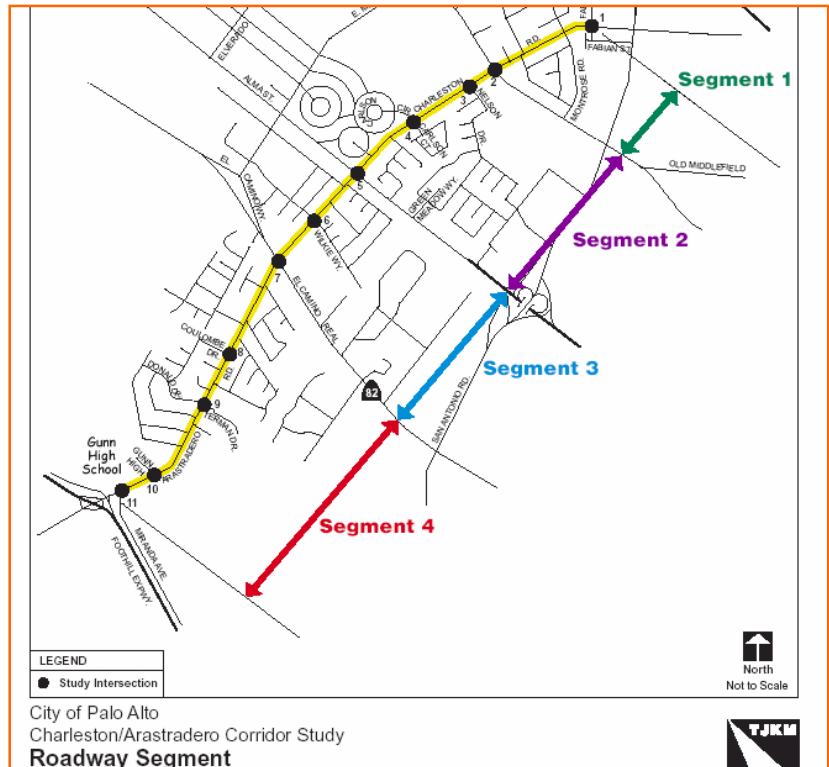
Charleston Road and Arastradero Road are linked arterial streets in the southern part of Palo Alto, California, home to Stanford University and some of the nation's leading technology firms. The Charleston-Arastradero Corridor provides access to eleven public and private school, as well as two parks, a community and library, a neighborhood shopping center, senior citizen housing, and several residential neighborhoods. Planned development along the

Corridor will increase the resident and school population as well as add a regional community center and a senior citizen housing complex. Motor vehicle volumes on the Corridor range from between 15,600 and 21,700 and 85<sup>th</sup> percentile vehicle speeds vary from 30 mph to 37 mph, depending on location. The posted speed limit all along the Corridor is 25 mph.

Existing peak directional

motor vehicle volumes range from approximately 400 vehicles per hour to about 1,150. Peak directional volumes on the eastern section of the Corridor, on Charleston Road from Fabian Way to Alma, are generally below 900 vehicles per hour. Existing 2007 peak hour directional volumes on Arastradero Road vary between 700 and 1,250 vehicles. The upper end of this range is reached during the AM peak hour in the vicinity of the public high school on Arastradero.

Projected peak directional 2015 volumes do not show significant growth on Arastradero Road, Charleston Road peak directional volumes are expected to nearly match those on Arastradero Road. This is due to the concentration of foreseen development expected on the eastern section of Charleston Road, the part of this street that is the furthest from Arastradero Road.



## **Bike Lanes**

While bicycle lanes are present in both directions of the Charleston-Arastradero Corridor, there are major discontinuities: bicycle lanes are dropped for one approximately one block on each Corridor approach to the El Camino Real intersection and all of Charleston Road from Middlefield east lacks any bicycle lanes. Several sections of the Corridor have gaps of more than 1,000 feet between controlled pedestrian crossings.



Existing traffic conditions and proposed new development along the Corridor prompted concerned Parents and other residents to request that the City of Palo Alto enhance the bicycling and walking environment for children and other Corridor users. As a result of this community concern, the Palo Alto City Council directed Palo Alto Transportation Division staff to prepare a plan to enhance bicycle and pedestrian conditions on the Charleston Road – Arastradero Road Corridor and more efficiently manage current and future motor vehicle traffic.

## **Corridor Plan Performance Measures**

The City Council subsequently adopted a set of ten demanding Performance Measures for use in evaluating the Corridor Plan. Some of these Corridor Plan Performance Measures are as follows:

1. No increase in peak or off-peak motor vehicle travel time on any of the four major sections of the Charleston-Arastradero Corridor.
2. No increase in either average or critical movement motor vehicle delay on any Corridor signalized intersection.



3. Reduce off-peak 85<sup>th</sup> percentile motor vehicle speeds by at least 20 percent on all of the four major sections of the Charleston-Arastradero Corridor by 2010.
4. Reduce crash rates (accidents/million entering vehicles) by at least 25% on all of the four major sections of the Charleston-Arastradero Corridor by 2010.
5. Increase pedestrian crossing volumes at all signalized intersections by at least 20% by 2010 and by 40% by 2020.
6. Increase bicycle volumes at all signalized intersections by at least 20% by 2010 and by 40% by 2020.
7. Increase average daily public transit boardings by at least 50% during the school year by 2010.

### **Public Process**

Palo Alto is well known for resident engagement in public policy. Initially the City conducted two rounds of meetings with the general public during development of the Corridor Plan, held a bicycling “mobile workshop” along the Corridor with a pre-set timetable stops for discussions with residents, and made presentations to the Palo Alto Bicycle Advisory

Committee and the Palo Alto PTA Traffic Safety Committee, a joint study session with the Palo Alto City Council and the Palo Alto Planning and Transportation Commission, as well as at three public hearings before the Council and two before the Commission. The first round of two general public meetings focused on listening to concerns and suggestions from a broad array of Corridor users. The second round of two general public meetings comprised presentation of a range of Corridor Plan options for review and discussion. The “mobile workshop” was conducted by the City staff (Joe Kott, former Chief Transportation Official) who rode on bicycle along the Corridor to meet with groups of residents at pre-determined times and places to discuss specific Corridor sites. Public interest in the Corridor Plan was comparatively high, based on attendance of from 50 to 100 people at each of the four general public meetings and equal numbers of attendees at the Planning and Transportation Commission public hearings. Palo Alto staff and consultants worked with an informal stakeholders group, called the “Wise Counselors”, comprised of representatives of neighborhood associations along the Corridor, Corridor development interests, affordable housing advocates, the Palo Alto Bicycle Advisory Committee, the Palo Alto Chamber of Commerce, and the Palo Alto Unified School District.

### **Corridor Plan Alternatives**

On January 27, 2003, the Palo Alto City Council adopted a recommended Charleston-Arastradero Corridor Plan that included four- to three- lane conversion on approximately one half of the Corridor’s extent, traffic adaptive signal operation, provision of landscaped center medians and roadside frontages, continuous and tinted or painted bicycle lanes on both sides of the Corridor, a variety of pedestrian crosswalk improvements, and other Corridor Plan elements described previously. Council authorized a one-year trial of the Corridor Plan, after which City staff was directed to return with findings and recommendations for any Corridor Plan modifications prior to permanent installation of the Plan elements.

A variety of four and three-lane configurations was prepared for review and evaluation during development of the Corridor Plan. These were refined to the following options:

**(I) Fabian Way to Alma (East Charleston Road)** - re-design from two lanes in each direction to one lane in each direction with raised center median (16’ wide) interspersed with

left turn pockets (10' wide). Four travel lanes retained in vicinity of major signalized intersections (Middlefield and Alma) to provide vehicle storage during red signal indicator. Add an uncontrolled crosswalk between signalized intersections, including provision of in-pavement crosswalk lighting and raised center-median pedestrian refuges.

This segment was restriped in 2006 and TJKM is currently processing the data to evaluate the after conversion performance measures. The data would be presented during the conference.

**(II) Alma to El Camino Real (West Charleston)** – retain four lane cross-section, but add small (6') intermittent raised and landscaped center medians.

**(III) El Camino Real to Gunn High School (Arastradero Road Option #1)** - re-design from two lanes in each direction to one lane in each direction with raised center medians (16' wide) interspersed with left turn pockets (10' wide). Four travel lanes are retained in the vicinity of major signalized intersections (El Camino Real and Foothill Expressway) to provide vehicle storage during the red signal indicator. Add two uncontrolled crosswalks between signalized intersections, including provision of in-pavement crosswalk lighting and raised center-median pedestrian refuges.

**(IV) El Camino Real to Gunn High School (Arastradero Road Option #2)** - retain four lane cross-section, but add small intermittent raised and landscaped center medians (6' wide).

Both Option #1 and Option #2 for Arastradero Road would create a new right turn lane on Arastradero at the Gunn High School driveway in the westbound direction, shift existing bicycle lane to the left for through bicyclists, widen the Gunn High School driveway throat, and install a right turn indicator with pedestrian actuated signal across the driveway. This was completed in the Summer of 2006 before the start of school in the Fall.

All design options (both three and four-lane cross-sections) would include continuous bicycle lanes (5' to 7' wide, depending on space available) on both sides of the Corridor. Bicycle lanes would be tinted or painted to more clearly indicate the presence of a bicycle facility. All

design options would also include installation of traffic-adaptive traffic signal operation along the Charleston-Arastradero Corridor.

Other Corridor Plan provisions include selected installation of corner bulb-outs at minor intersections to reduce pedestrian crossing distance, installation of pedestrian “countdown” signal indicators at all signalized intersections along the Corridor, deployment of additional (two are currently deployed) radar read-out speed advisory signs at selected Corridor locations, repair damaged or uneven sidewalk sections, install road side landscaping on the public right-of-way, increase service frequency for the community Shuttle Bus service on the Corridor, and re-design of the busiest Corridor intersection (at El Camino Real) to replace existing “porkchop” islands on two corners with a more bicycle- and pedestrian-friendly design and install more visible pavement treatment on all four intersection crosswalks.

### **Conclusion**

TJKM assisted the City in the conversion of Charleston Road from four lanes to three lanes during the past year. Except for some minor issues, it seems to have been very well received by the residents. Working with City staff, TJKM is currently collecting detailed traffic data to determine pertinent performance measures factors. In addition, TJKM will be installing the Bitrans traffic adaptive software in the next few weeks. We hope to share all the data during the July 2007 conference.

About the author:

Christopher Thnay, PE, AICP is a Senior Associate with TJKM Associates, Transportation Consultants, in Pleasanton, California. Mr. Thnay holds a Bachelor’s degree in Civil and Environmental Engineering from the University of Wisconsin at Madison and a Master’s degree in Transportation/Infrastructure Planning and Management Stanford University. He has more than 23 years of professional experience.