A significant increase in traffic turning left from Arastradero Road onto Terman Drive is anticipated with the opening of the Terman Middle School in September 2003. The Terman Middle School Draft Environmental Impact Report identifies creation of left-turn pockets and left-turn signal phases as a traffic mitigation. At present, delay and traffic back-up occur on Arastradero due to left-turning traffic and there is an accident history of collisions between left-turners and opposing through traffic. Present and anticipated traffic congestion and safety problems can be addressed through implementation of left-turn pockets and left-turn signal phases at the intersection of Arastradero and Donald/Terman.

Creation of left-turn pocket requires at least 9.5 feet of pavement width. The Comprehensive Plan, however, discourages increases in curb-to-curb pavement width while at the same time encourages creation or maintenance of cycling facilities such as the existing bicycle lanes on Arastradero which serve schools, libraries, and other community activity centers. Working within these constraints requires re-allocation of pavement width in the vicinity of the Arastradero and Donald/Terman intersection, which is now devoted to parking, to new left-turn pockets.

Staff proposes creation of left-turning lanes of minimum acceptable width and length while retaining minimum acceptable bicycle lane width. Nevertheless, this will require removal of approximately eighteen 24-hour parking spaces, which would be eliminated along the fronts and sides of residences on the north side of Arastradero, and 23 night-time spaces on the south side primarily in front of the Terman and Day School sites. Cycling facilities on the south side of Arastradero would be upgraded, however, by providing a 24-hour bike lane where currently there is a daytime-only bike lane. While the parking spaces removed are used infrequently, residents who abut Arastradero near this intersection have expressed
concern about shifting the travel lane closer to their homes. Staff anticipates enhanced traffic safety for all modes of travel and reduced traffic congestion on Arastradero through the creation of left-turn pockets and signal phases at the Arastradero-Donald/Terman intersection. Staff proposes to do this without widening curb-to-curb pavement width or eliminating the existing bicycle lanes at this location.
RECOMMENDATION
Staff recommends that City Council approve the attached resolution authorizing the establishment of no parking zones on the north and south sides of Arastadero Road for a distance of 300 feet to the east of the easterly crosswalk at Donald and Terman Drives; and for a distance of 165 feet to the west of the westerly crosswalk.

BACKGROUND
In the past few years, staff has received multiple complaints about problems due to drivers making left turns from Arastadero Road to Terman Drive and (to a lesser extent) Donald Drive. There are no left-turn lanes or signals at that intersection. Staff reviewed the crash history and found that a substantial number of crashes related to left-turn movements have occurred at this intersection since 1985. In 1997, the Mid-Peninsula Jewish Community Day School submitted a development application for a new facility with access on Terman Drive. Because the Day School was going to substantially increase left-turning traffic to Terman Drive, the City required the applicant to fund its proportional share of new left-turn lanes and signals, which will be constructed by the City. The new lanes will require that parking be prohibited along both sides of Arastadero Road, which requires Council approval.

Staff first sent the no parking zones request to Council on October 4, 1999, with a recommendation that Council refer the issue to the Planning and Transportation Commission (Attachment C, CMR:375:99). The Commission discussed this issue at great length on November 10, 1999. The Commission’s primary concern was the impact on residences on the north side of Arastadero Road, especially the removal of parking. Nevertheless, the Commission recommended that Council approve the resolution submitted by staff. The Commission also requested that staff prepare for Council consideration an alternate proposal with narrower lanes in order to preserve nighttime parking on the north side of Arastadero Road. The Commission stated that, if staff believed this alternate proposal was safe and workable, this would become the Commission’s preferred plan. The Commissioners did not request that the alternate proposal be brought back to them. Commissioners also requested that staff prepare several other alternatives that might lessen the parking impacts and provide that information to the Council for its consideration. In April 2000, staff prepared that information, but the left-turn project was halted at that point due to news that Terman Middle School might reopen on the site, replacing the Jewish Community Center (JCC). This major change in use would potentially change the site access and/or trip generation.

The site plans and EIR for Terman Middle School have now been completed and approved, with the school scheduled to open in September 2003. The number of peak hour westbound Arastadero left-turns into Terman Drive will be slightly higher than with the JCC occupancy of the site. One of the mitigation measures in the Terman School EIR is that the City install left-turn pockets and signal phasing at the Arastadero/Terman/Donald intersection before the school opens. The Transportation Division has determined that the length of the left-turn pockets proposed earlier in 1999, and hence the length of the proposed
no parking zone, will still be sufficient for the change in use, except the length of the pocket and the associated no parking zone to the west of the westerly crosswalk can be reduced from 200 feet to 165 feet.

**DISCUSSION**

Staff has determined that the April 2000 alternatives analysis is valid for comparison purposes with the new use on the Terman site, and it is included as Attachment B. Staff’s proposed restriping plan recommended for approval by the Planning and Transportation Commission is referred to as Alternative 1. (This alternative is the basis of Exhibit A of the resolution—Attachment 1). The alternative favored by the Commission (if workable), to narrow all lanes in order to preserve some parking, is referred to as Alternative 2. Alternatives 1 and 2 are illustrated in Attachment B and discussed in the following paragraphs. A comparison table of all alternatives is included in Attachment B.

**Alternative 1: Staff’s Proposed Plan.** Arastradero varies in width from 58.3 feet to 60 feet from curb to curb. It is striped with four 10-foot vehicle lanes, a 13-foot bicycle/parking lane on the north side and a seven-foot bicycle lane on the south side. Parking is allowed in the south side bicycle lane only at night (7:00 p.m. to 7:00 a.m.). When cars are so parked, it is not usable as a bike lane. Alternative 1 consists of adding a left-turn pocket in each direction on Arastradero Road at the Terman/Donald intersection, with protected left-turn signal phasing. In order to install the left-turn pockets within the existing traveled way, bicycle lane widths would be reduced to five feet on both sides of Arastradero. Parking would be eliminated as shown in Exhibit A. On the north side of Arastradero, approximately eighteen 24-hour parking spaces would be eliminated along the fronts and sides of residences. This parking area is only occasionally used. On the south side of Arastradero, approximately 23 night-time parking spaces would be eliminated, primarily in front of the Terman and Day School sites. The side of one residence would be affected. Again, these spaces appear to be only occasionally used. All traffic lanes would be 10 feet wide (left-turn lanes 9.5 feet), which is the minimum desirable width for an arterial street. Five feet is the minimum acceptable bike lane width; Palo Alto usually provides at least a six foot bike lane width on major roadways. This alternative upgrades cycling facilities, however, by providing a 24-hour bike lane on the south side of Arastradero, where currently it is a daytime-only bike lane.

**Alternative 2: Planning Commission Proposal--Narrow All Lanes to Preserve Parking on North Side.** Given the existing 60-58.3 foot-wide curb-to-curb width of Arastradero, no design with nine or 9-1/2-foot lane widths can provide sufficient width to maintain 24-hour parking on the north side of Arastradero. With all traffic lanes at 9-1/2 feet in width, the south side bicycle lane would still have to be five feet wide as in Alternative 1. Thus, for both Alternatives 1 and 2, 23 night time parking spaces would be lost on the south side of Arastradero in front of the Terman and Day School sites and the side of one residence. The north side bicycle lane with Alternative 2 would be 7 feet wide (versus 5 feet in Alternative 1), which would then allow parking in the bike lane at night only (7:00 p.m. to 7:00 a.m.).
The bike lane is not usable when cars are parked in it. These 18 spaces would still be lost during the day. Alternative 2 gives residents a slightly wider buffer between moving traffic and their homes than Alternative 1 (an issue raised by some residents). Thus, Alternative 2 would partially address the concerns of some Arastradero Road residents about staff’s proposal, and it addresses a Commission concern about maintaining some parking on the north side of Arastradero. However, staff does not support sub-10-foot traffic lanes on an arterial road, especially adjacent to minimum-width bicycle lanes. Safety concerns with regard to such lanes are especially acute as regards trucks and transit buses in the travel lane adjacent to the bike lane. Arastradero Road is a school commute corridor and carries heavy vehicle traffic. Staff concluded that the advantages to residents do not outweigh the potential negative safety impact of narrow lanes on drivers and bicyclists.

Other Alternatives. Attachment B discusses four other alternatives that the Commission requested be provided for informational purposes for Council review:

- Alternative 3: Add new left-turn lane in westbound direction only (i.e., for Terman Drive only). This is an unconventional design which is contrary to driver expectations and, thus, may be confusing and result in potential safety problems.

- Alternative 4: Widen south side of Arastradero Road and add east and westbound left-turn lanes while maintaining existing parking. This alternative increases curb-to-curb pavement width and project costs, and is not consistent with Comprehensive Plan policies.

- Alternative 5: Split the east and westbound Arastradero signal phases so that left turn lanes are not needed and no restriping would be necessary and no loss of parking would result. This alternative would cause excessive back ups, resulting in potential safety problems and traffic shifting to parallel streets.

- Alternative 6: Consider maintaining the status quo if the crash history is not substantially different from other similar locations and/or if the accident history is mostly minor property-damage-only.

After examining all the alternatives, staff still supports only the original proposal—Alternative 1. This design maintains minimum desirable and typical design standards for left-turn pockets and phasing at intersections. Alternative 1 is the safest alternative, in that it provides the maximum potential reduction in left-turn and left-turn related accidents, as well as retains safe widths for bike lanes and adjacent through lanes. Alternative parking for residents is available on the side streets, although it is not as conveniently located. The demand for parking in this area by residents is not high. The north side traffic lane would be eight feet closer to residences, but Alternatives 2 and 3 reduce that impact only marginally.
RESOURCES IMPACT
The estimated construction cost of this project has increased substantially from staff’s estimate provided in CMR:375:99, to a total of $220,000. This estimate is based on bids received recently for a similar project. This includes all signal, striping, signing, gutter and handicapped ramp work. It also includes a new signal controller and cabinet as well necessary relocation of a utility box. Furthermore, the existing signal must continue to function while the new signal is being installed. The full project will be funded from the Electric Utility Capital Improvement Program. As a condition of approval of the Jewish Community Day School project, the Day School will reimburse the City for $20,300 of the project cost.

TIMELINE
The timeline to have the new signal installed by August 2003, to be in place before Terman Middle School opens, is already very short. As a result, staff has begun designing the new installation assuming that Council will approve the no parking zones. Any delay in this schedule for consideration of other alternatives would jeopardize the installation date. Staff anticipates that construction would start in July 2003 and be completed by the end of August 2003.

ENVIRONMENTAL REVIEW
This project is categorically exempt from the California Environmental Quality Act (CEQA) under Section 15301 of the CEQA Guidelines (minor alterations to existing facilities).
ATTACHMENTS
A. Resolution Approving No Parking Zones on Arastradero Road and Exhibit A
B. Discussion of Alternatives Including Illustrations of Alternatives 1, 2 and 3
C. CMR: 375:99

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EMILY HARRISON  
Assistant City Manager

cc:  Arastradero Road residents
     Mid-Peninsula Jewish Community Day School
     Palo Alto Housing Corporation
     Barron Park Neighborhood Association
     Greenacres I and II Neighborhood Associations
     Palo Alto Unified School District
ATTACHMENT B
DISCUSSION OF ALTERNATIVES FOR ADDING LEFT-TURN LANES
ON ARASTRADERO ROAD AT TERMAN/DONALD DRIVES

Notes: Refer to the comparison table at the end of Attachment B. The data used in this discussion, including crash analysis, has not been updated since it was prepared in April 2000. This does not change the validity of this comparison of alternatives.

Alternative 1: Original Staff Proposal—10-Foot Lane Widths (Figure 1)
This alternative is illustrated in Figure 1 and is the basis for Exhibit A of the resolution approving No parking zones. This alternative is discussed under “Project Description and Alternatives” in this staff report.

Alternative 2: Planning Commission Proposal—Reduced Lane Widths (Figure 2)
This alternative is illustrated in Figure 2. This alternative is discussed under “Project Description and Alternatives” in this staff report.

Alternative 3: Add new left-turn lane in westbound direction only (i.e., for Terman Drive only) (Figure 3).
During the AM and PM peak hours, the sum of westbound left turns into Terman Drive (with JCC present) is 279 vehicles, and the sum of eastbound left turns into Donald Drive is only 15 vehicles (the latter is five percent of the total). Of the 32 left-turn and left-turn-related accidents at the intersection, 23 were caused by left turns into Terman, and nine by left turns into Donald (the latter is 25 percent of the total). The volume of eastbound left turns into Donald and the associated accident history do not support a left-turn pocket and phase for this direction. When left-turn pockets and phasing are installed on a major road, they are typically installed in both directions because they are warranted by the turning volumes or accident history. At Arastradero/Terman/Donald, staff has recommended left-turn facilities in both directions primarily to avoid potential driver confusion. With left-turn facilities only in the westbound direction, some eastbound drivers might think they could make protected left turns because they see westbound drivers doing it. Driver confusion could lead to possible safety problems. There are no locations in Palo Alto where a left-turn pocket and phase are installed in one direction only. At the Alma/Churchill intersection, left-turn pockets are present for north- and southbound Alma. But, up until a few years ago, a protected left-turn signal phase (green arrow) was provided only in the northbound direction because the number of southbound left turns was so small. Over the years, this caused confusion for southbound drivers and caused enough accidents that a left-turn signal phase was also installed for the lightly-used southbound direction.

Commissioners noted that the eastbound Arastradero left-turn pocket and signal phase are not truly necessary for volume or accident reasons, and asked if they could be deleted.
from staff’s proposal. Their hope was that this would enable a portion of the westbound bike lane to remain wide enough for nighttime parking, or even to remain available for full-time parking. Staff therefore prepared Alternative 3, as illustrated in Figure 3. This alternative results in full loss of only ten of the existing 18, 24-hour parking spaces on the north side of Arastradero. Of the eight remaining, six will be for nighttime only and two are 24-hour spaces. On the south side of Arastradero only 15 of the 23 nighttime spaces are lost. In summary, this alternative preserves, in some form, 10 of the existing 18 north side parking spaces that would be lost under Alternative 1. These are the spaces that the Commission and residents were most concerned about. Staff does not believe that the benefits to residents override the concerns of driver confusion and possible resulting negative safety impacts.

Alternative 4: Widen south side of Arastradero Road and add east and westbound left-turn lanes while maintaining existing parking.
The Commission asked whether the south side of Arastradero Road in front of the Terman and Day School sites could be widened to provide space for the new left-turn lanes. This could allow the existing westbound through lanes to remain where they are, thus reducing or eliminating negative impacts on residents on the north side of Arastradero. Staff estimates that this widening would cost at least $200,000, not including the cost of right-of-way acquisition in front of the Day School. This cost would be in addition to that of the signal and restriping work. The landscape strip, which includes several mature trees, would have to be eliminated. Due primarily to the high cost and lack of right-of-way, staff did not investigate this idea in further detail, and does not recommend this alternative.

Alternative 5: Split the east and westbound Arastradero signal phases so that left turn lanes are not needed and no restriping would be necessary and no loss of parking would result.
The Commission did not promote this alternative design, but staff believes it deserves brief mention. Instead of restriping lanes, removing parking, and performing major signal work, the east-west signal phasing could simply be split. This means that all westbound traffic on Arastradero Road (including left turns) would have an exclusive phase, followed by an exclusive phase for all eastbound traffic (including left turns). The third phase for Donald and Terman Drives would remain as it is. No changes would need to be made to the layout of traffic and bicycle lanes or parking areas. This would be a simple way to eliminate left-turn conflicts on Arastradero Road. Split phasing is commonly used where traffic volumes are high and right-of-way is so constrained that additional lanes cannot be added (examples are the East Meadow Drive and Charleston Road intersections with Alma Street). The primary drawbacks are longer queues and congestion due to the increased signal cycle time. At Arastradero/Terman, existing AM level of service (LOS) A (before arrival of Terman School) would degrade to LOS C (after arrival of Terman School and with split phase). The maximum peak-hour queue for westbound through traffic could reach three blocks, and potentially more when pedestrians are crossing
Arastradero. Though LOS C is acceptable, the expected long queues would significantly worsen traffic congestion in this area, possibly leading to greater shortcutting traffic along the Maybell corridor. (For comparison, after arrival of Terman School and with staff’s Alternative 1, AM LOS would be B.) Comprehensive Plan Policy T-39 generally supports Alternative 5 (“To the extent allowed by law, continue to make safety the first priority of citywide transportation planning. Prioritize pedestrian, bicycle, and automobile safety over vehicle level-of-service at intersections.”). However, staff does not recommend this option, due to the increased potential for driver frustration and consequent commute traffic intrusion on neighborhood streets.

Alternative 6: Possibly consider maintaining the status quo if the crash history is not substantially different from other similar locations and/or if the crash history is mostly minor property-damage-only
As requested by the Commission, staff updated and expanded the crash analysis that was presented in CMR:375:99. The Commission did not actually state that they might consider recommending no action. But they seemed to imply that the left-turn pockets should only be installed if the crash history clearly indicated unique and serious problems. Between January 1985 and March 2000, 23 broadside crashes occurred between left-turners and opposing through drivers on Arastradero Road. An additional nine rear-end accidents occurred due to through drivers hitting drivers stopped in the inside through lane to make left turns. Of this total of 32 left-turn and left-turn-related accidents, only five also involved pedestrians or bicyclists in addition to the vehicles. Of the 32, 10 involved relatively minor injury, with the remainder being property damage only. This ratio mirrors that on a citywide annual basis.

During this same 15-year period, a total of 57 accidents of all types occurred on all four legs of this intersection (including the above 32). The breakdown of the types of violations for most of this 57-accident group is shown graphically in Figure 2. “Auto right of way” is the primary type of violation for a left-turn (broadside) crash. The primary type of violation causing left-turn-related (rear-end) crashes is “unsafe speed”. The total of 57 accidents, when computed as a rate per million vehicles entering the intersection, places the Arastradero/Terman/Donald intersection at about tenth worst in the City, which is a poor ranking. Installation of the proposed left-turn lanes and signal arrows is a wise improvement for this location, because it directly addresses the largest clearly identifiable causal group of accidents.
<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>SOUTH SIDE PARKING SPACES AVAILABLE*</th>
<th>NORTH SIDE PARKING SPACES AVAILABLE*</th>
<th>TRAFFIC LANE WIDTH</th>
<th>BUFFER ZONE WIDTH NORTH SIDE</th>
<th>LEVEL OF SERVICE &amp; MAX QUEUE LENGTH PER LANE (AM PK HR)</th>
<th>EASTBOUND DRIVEWAY ACCESS</th>
<th>CONSTRUCTION COST**</th>
<th>RIGHT OF WAY NEEDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>23 spaces in bike lane 7 pm-7 am</td>
<td>18 spaces 24 hrs</td>
<td>All lanes 10 feet</td>
<td>13 feet</td>
<td>LOS A 250 feet</td>
<td>Left turn across 2 through lanes</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1 (Staff proposal—add new east and westbound left turn lanes and phases)</td>
<td>None</td>
<td>None</td>
<td>All lanes 10 feet</td>
<td>8-foot decrease</td>
<td>LOS B 425 feet</td>
<td>Left turn across 2 through lanes and 1 left turn lane</td>
<td>$220,000</td>
<td>None</td>
</tr>
<tr>
<td>2 (Add new east and westbound left turn lanes and phases with reduced lane widths)</td>
<td>None</td>
<td>18 spaces in bike lane 7 pm – 7 am</td>
<td>All lanes 9-1/2 feet</td>
<td>6-foot decrease</td>
<td>LOS B 425 feet</td>
<td>Left turn across 2 through lanes and 1 left turn lane</td>
<td>$220,000</td>
<td>None</td>
</tr>
<tr>
<td>3 (Add new left turn lane and phase westbound direction only)</td>
<td>8 spaces in bike lane 7 pm-7 am</td>
<td>6 spaces in bike lane 7 pm-7 am; 2 spaces 24 hrs</td>
<td>All lanes 10 feet</td>
<td>8-foot decrease east leg; 0-6-foot decrease west leg</td>
<td>LOS B 425 feet</td>
<td>East leg—left turn across 2 through lanes and 1 left turn lane. West leg—left turn across 2 through lanes</td>
<td>$200,000</td>
<td>None</td>
</tr>
<tr>
<td>4 (Add new east and westbound left turn lanes and phases and widen south side)</td>
<td>None</td>
<td>Same as existing</td>
<td>All lanes 10 feet</td>
<td>Same as existing</td>
<td>LOS B 425 feet</td>
<td>Left turn across 2 through lanes and 1 left turn lane</td>
<td>$420,000 not including cost of new right of way from Terman and Day School</td>
<td>Right of way needed from Terman and Day School</td>
</tr>
<tr>
<td>5 (Split phasing on Arastradero)</td>
<td>Same as existing</td>
<td>Same as existing</td>
<td>All lanes 10 feet</td>
<td>Same as existing</td>
<td>LOS C 925 feet</td>
<td>Same as existing</td>
<td>$60,000</td>
<td>None</td>
</tr>
</tbody>
</table>

*All parking space counts are approximate.

**Costs do not include partial reimbursement from Mid-Peninsula Jewish Community Day School. All costs except the $220,000 are “rough estimates”.

Attachment B