Bike & Ped Safety Improvement Study: El Camino Real between Maple & Charter Streets
Conceptual Design Drawings

1. Shared Right Turn Zone
(see page 31)

2. Protected Corner/Intersection
(see page 32)

3. Separate Right Turn Phase
(see page 33)

4. Raised Crossing
(see page 34)

DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED (see page 31)

CONCEPTUAL - NOT FOR CONSTRUCTION

OPPORTUNITY FOR GREEN INFRASTRUCTURE (E.G. LOW-S-BUS OR GRASSES)
LANDSCAPE AREA

REDWOOD AVE
LINDA AVE
MANZANITA ST
REDWOOD AVE
LINDA AVE
MANZANITA ST

LEGEND
OPPORTUNITY FOR GREEN INFRASTRUCTURE (E.G. LOW-S-BUS OR GRASSES)
LANDSCAPE AREA

Shared Right Turn Zone
(see page 31)

Protected Corner/Intersection
(see page 32)

Separate Right Turn Phase
(see page 33)

Raised Crossing
(see page 34)
BEECH STREET REALIGNMENT AND BUILDING FOOTPRINT BY OTHERS

REDUCE DRIVEWAY WIDTH TO ALLOW ADEQUATE SPACE FOR BIKE RAMP. BUS ISLAND IS 76' AND DESIGNED FOR 60' BUS. CONFIRM BUS SIZE BEFORE FINAL DESIGN.

SIDEWALK REDUCED FROM 8' TO 5.5' TO PROVIDE ADEQUATE SPACE FOR NEW BUS ISLAND

LEGEND

OPPORTUNITY FOR GREEN INFRASTRUCTURE (GI) LOW SHRUBS OR GRASSES
LANDSCAPE MEDIAN
6 FT TO 17 FT USE LOW SHRUBS OR GRASSES
17 FT ADD NEW CANOPY TREES
FUTURE DEVELOPMENT AREA
SAMPLE INTERSECTION TREATMENTS
SAMPLE PROTECTED CORNER (OPTION 2)
SAMPLE SHARED RIGHT TURN ZONE (OPTION 1)
SAMPLE RAISED CROSSING (OPTION 4)
REMOVED CURB
EXISTING CURB
PROPOSED CURB
PROPOSED TRAFFIC SIGN
BUFFER WITH SOFT-HIT POSTS

CONCEPTUAL - NOT FOR CONSTRUCTION
DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED

1 Shared Right Turn Zone
(see page 31)
2 Protected Corner/Intersection
(see page 32)
3 Separate Right Turn Phase
(see page 33)
4 Raised Crossing
(see page 34)
MAPLE ST
LINCOLN AVE

PROPOSED LEFT TURN REMOVAL

PROPOSED LEFT TURN REMOVAL

BEECH STREET REALIGNMENT AND BUILDING FOOTPRINT DESIGNED BY OTHERS

SAMPLE RAISED CROSSING (OPTION 4).

ALTERNATIVE TREATMENT IF LEFT TURN REMAINS: PROTECTED CORNER (OPTION 2)

Beech Street Realignment: Alternative Layout

LEGEND

LANDSCAPE MEDIANS:
6 FT TO 17 FT USE LOW SHRUBS OR GRASSES
17 FT ADD NEW CANOPY TREES

FUTURE DEVELOPMENT AREA

HARDSCAPE AREA

PROPOSED CURB

REMOVED CURB

EXISTING CURB

PROPOSED TRAFFIC SIGN

CONCEPTUAL - NOT FOR CONSTRUCTION
DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED

Figure A
Addressing Safety at Intersections

Intersection treatments summarized in the following sections were chosen on a technical basis, following best practices for intersection design along protected bikeways and feedback from the Complete Streets Advisory Committee while considering the constraints and context of El Camino. The focus for these treatments is minimizing potential “right hook” conflicts between vehicles and bicycles at intersections. Main considerations include existing traffic control, available right-of-way, and the volume of conflicting right turns during the peak periods.

**OPTION 1**

**Shared Right Turn Zone**

**What is it?**

Cars and bikes share the same road space in shared right turn zones, which help position vehicles closer to the curb to help facilitate the right turn and reduce “right hook” collisions with bicyclists. A dashed green bike lane is used to indicate that cars and bikes may “mix” in this area.

**Location Considerations**

<table>
<thead>
<tr>
<th>TRAFFIC CONTROL</th>
<th>VOLUME OF RIGHT TURNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNAL</td>
<td>LOW</td>
</tr>
</tbody>
</table>

**Design Considerations**

- Only recommended for physically constrained locations

**Pros**

- Does not require dedicated right-of-way for bicyclists at intersections in constrained locations
- Allows vehicles to merge with bikes against the curb prior to turning, reducing the likelihood of the “right hook”

**Cons**

- Requires vehicles to look over their shoulder to avoid conflicts with bicyclists
- Does not provide physical separation for vehicles and bicyclists
What is it?
Protected intersections clearly define pedestrian and bicyclist operating spaces and minimize potential conflicts between users. For example, the corner refuge island protects bicyclists from right-turning vehicles by physically separating the bike lane up to the point where the bicyclist crosses the side street, while reducing vehicle turning speeds and guiding vehicles to meet the bicycle crossing at a near-90 degree angle to improve sight lines of oncoming bicycles.

Where Does this Work on El Camino Real?

Design Considerations
- Requires space for setback placement of bike crossing (i.e., locations with additional space due to on-street parking removal or slip-lane closures)
- Recommended where it’s important to facilitate left turns for cyclists

Pros
- Extends the physical barrier of the protected bike lane into the intersection, creating a refuge and a clear path of travel for bicyclists
- Provides a forward stop bar for cyclists to provide a "head start" and improve visibility of bicyclists
- Setback crossing prevents vehicles from turning right into their blind spot, thus improving visibility of bicyclists and pedestrians
- Reduces vehicle exposure for pedestrians/bicyclists
- Helps facilitate left turns for bicyclists

Cons
- Requires adequate space for dedicated right-of-way for people who walk and bike and for corner refuge islands

Location Considerations

Traffic Control
- STOP signs

Volume of Right Turns

Low

Medium

High

• Requires adequate space for dedicated right-of-way for people who walk and bike and for corner refuge islands
• Extends the physical barrier of the protected bike lane into the intersection, creating a refuge and a clear path of travel for bicyclists
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• Setback crossing prevents vehicles from turning right into their blind spot, thus improving visibility of bicyclists and pedestrians
• Reduces vehicle exposure for pedestrians/bicyclists
• Helps facilitate left turns for bicyclists
**What is it?**
Protected bicycle phases are desirable in locations where high volumes of right-turning vehicles conflict with a parallel separated bike lane. Provision of a protected bicycle phase requires a dedicated right turn lane and should be tested for potential impacts to intersection delay and queuing.

**Where Does this Work on El Camino Real?**

**TRAFFIC CONTROL**
- Redwood City
- Palo Alto

**VOLUME OF RIGHT TURNS**
- Low
- Medium
- High

**Location Considerations**
- Dedicated right turn pocket required
- Consider electronic LED blank-out signs to emphasize no right turn on red during bicycle phase
- Separates signal phase for right-turning vehicles
- Separates signal phase for right-turning vehicles and bicyclists, removing the “right hook” conflict
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**Cons**
- Requires dedicated right turn pocket, pocket length
- Can result in longer cycle lengths at signals, and thus increased delay, at intersections where right-turn vehicle volumes are high

**OPTION 3**
Separate Bicycle Phase

- Bikes proceed with through traffic
- Optional near-side signal for bikes

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- Optional near-side signal for bikes
What is it?

Raised crossings are an effective strategy for reducing crashes between motorists and bicyclists because they slow vehicle speeds, increase visibility of people walking and biking, and increase motorist yielding behavior. Raised crossings are usually appropriate only on minor road crossings and driveways and could be considered for separated bike lane crossings where motorists are required to yield to bicyclists while turning or crossing.

Where Does this Work on El Camino Real?

<table>
<thead>
<tr>
<th>Location Considerations</th>
<th>Design Considerations</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRAFFIC CONTROL</td>
<td>VOLUME OF RIGHT TURNS</td>
<td>Only appropriate at driveways or minor stop-controlled side streets that are intended to be calmer (&lt;30mph) with lower volumes (no through traffic)</td>
<td>Slows vehicle traffic when entering and exiting side streets and driveways</td>
</tr>
<tr>
<td>STOP ISLAND</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
</tr>
</tbody>
</table>

| Raised Crossing |

OPTION 4

LOW

MED

HIGH

4