

Mr. Bob Branz  
City Engineer  
City of Belvedere  
450 San Rafael Avenue  
Belvedere, CA 94920

## **Crosswalk Evaluation Study**

Dear Mr. Branz;

Whitlock & Weinberger Transportation, Inc. (W-Trans) has completed a study of the City of Belvedere's existing crosswalks and potential need for additional locations. We reviewed eleven marked crosswalks with a focus on the adequacy of existing signing, markings and sight distance, and looked for other locations that might potentially benefit from adding crosswalk markings.

### **Existing Crosswalks**

A list of the existing crosswalk locations was obtained from City staff, including eight locations on San Rafael Avenue and three on Beach Road. Of the eight San Rafael Avenue locations, there are five intersection crosswalks, two mid-block crosswalks, and one location which does not actually have crosswalk markings. One of the Beach Road crosswalks is a mid-block crossing at the San Francisco Yacht Club, one is at the intersection with Cove Road, and the third marked crosswalk was described as a mid-block crossing even though it is located at the intersection with Teal Road, a private street.

A site review of the eleven locations was performed on December 4, 2008, to determine the adequacy of existing signing and markings. Factors which may affect driver awareness of pedestrian crossings, such as road width, landscaping, street lighting, traffic controls, sidewalk features and adjacent land use, were considered. A tabulated summary of the crosswalk inventories is enclosed, with findings summarized below.

In addition, collision records for each location were researched and studied to identify any locations where pedestrian-involved collisions have occurred. Collision records for March 2003 through February 2008 obtained from the California Highway Patrol and published in their Statewide Integrated Traffic Records System (SWITRS) reports were reviewed. No collisions involving pedestrians were reported during this time frame at any of the study locations.

### **San Rafael Avenue Crosswalks**

There are four intersections along the segment of San Rafael Avenue fronting Richardson Bay, including Lagoon Road, Hilarita Circle, Windward Road, and Edgewater Road. While all are on the list of marked crosswalk locations, there is not currently a marked crosswalk at Hilarita Circle. However, it is recommended that a marked crossing be provided at this location, which would result in a pattern of marked crosswalks approximately 360 feet apart along this segment. The crosswalk should also be equipped

with the In-Street Pedestrian Crossing sign (RI-6) that exists at the other crossings. Such a consistent design in this area will create a pattern, increasing driver awareness of pedestrian crossings along this segment of San Rafael Avenue.

The marked crossing on the south leg of San Rafael Avenue at West Shore Road is in a curve, with sight distance restricted to 190 feet for southbound motorists and 160 feet for northbound motorists. Though the curve limits sight distance to the crossing for northbound motorists, it is the adjacent landscaping and parked vehicles that create the greatest sight obstructions on this approach. It is recommended that the adjacent landscaping be trimmed to increase visibility for northbound drivers. Also, this is a tee-intersection, with West Short Road stop-controlled and both San Rafael Avenue approaches uncontrolled. W-54, Pedestrian Crossing warning signs with “Ped Xing” placards have been installed in advance on both San Rafael Avenue approaches, with the northbound approach equipped with an In-Street Pedestrian Crossing sign (RI-6) and pavement legend marked in the travel lane indicating a reduced speed zone of “15 mph.” These signs are listed in the *California Manual on Uniform Traffic Control Devices (CA-MUTCD)* as “deleted traffic control devices”, with a target compliance date of January 1, 2011, or two years from now. You may wish to review this section of the CA-MUTCD and the *California Vehicle Code* Section 21401, “Conformity to Uniform Standards,” referenced therein. These warning signs are to be removed or replaced with the current standard, the W11-2 by the target compliance date. These signs are shown below.



In addition to the sign upgrade, the placards should be replaced with “Ahead” placards, to clarify that the pedestrian crossing is located beyond the sign location.

The mid-block intersection at Belvedere Community Park, near 339 San Rafael Avenue, is equipped on both approaches with the Pedestrian Crossing Symbol warning sign (W11-2), including a diagonal arrow placard. though the sign posted on the northbound approach is sufficiently distant from the crossing that the arrow placard is inappropriate, and should be replaced with the advanced signing placard, “Ahead.” In addition, mid-block crossings are unexpected, and to increase driver awareness, it is recommended that the crosswalk be striped with the continental striping pattern.

Further south, the Community Road intersection at San Rafael Avenue includes a marked crosswalk. This tee-intersection is stop-controlled on the minor street approach, Community Road, and immediately south of the intersection is a mid-block crossing, at 515 San Rafael Avenue. These two crossings help to define the intersection, which is helpful due to the odd geometry and restricted sight distance. A W54 warning

sign and “Ped Xing” placard are posted for southbound traffic, and the sign should be removed or replaced with the W11-2 before January 1, 2011. In addition, the curve in San Rafael Avenue at this location limits sight distance to the mid-block crossing for southbound drivers. This sight obstruction is exacerbated by the adjacent shrubbery and boulders on the west side of the street along the church property frontage. It is recommended that the shrubs be trimmed to increase visibility for southbound drivers. On the northbound approach to this intersection, the crosswalks share a common Pedestrian Crossing warning sign (W54), though a wood utility pole is directly behind this sign, somewhat limiting the view of the Community Road crosswalk. This sign should be removed or replaced with the W11-2, and for clarification, the supplemental “Ped Xing” placard should be replaced with a “Ped Xings” placard, to clarify that the sign applies to more than one crossing, and a double diagonal arrow placard should be added for further clarification of the proximity of two crosswalks.

### Beach Road Crosswalks

There are three existing crosswalks on Beach Road, including one at the entrance to the San Francisco Yacht Club, one at the intersection of Teal Road (private), and one at the Cove Road intersection.

#### *San Francisco Yacht Club Entrance Crosswalk*

The yacht club crossing is on a one-way segment of Beach Road, and is located nearly within the tee intersection of Beach Road and San Rafael Avenue, which includes an oblong-shaped landscaped park-like island approximately 60 feet wide by 140 feet long. The perimeter of the island is landscaped with trees and a two-foot-high hedge. The westbound approach is yield-controlled, the eastbound approach is stop-controlled, and the southbound San Rafael Avenue approach is uncontrolled. Therefore, southbound drivers have the highest approach speed of vehicles entering the intersection, yet are unable to see the crosswalk until they are within 50 to 60 feet due to the curve and landscaping. Further complicating the driving task for southbound drivers is the presence of an enormous hedge, estimated to be nine feet high, along the west side of San Rafael Avenue, essentially blocking the view of eastbound Beach Road traffic. Southbound drivers were observed to look right, around this hedge, to judge the speed or volume of eastbound traffic even though eastbound traffic is required to stop. The task of looking right takes their attention away from the crosswalk which is located to the left of this critical decision-making location. It should also be noted that the placement of the Pedestrian Crossing sign (W11-2) and supplemental “diagonal arrow” placard facing the southbound approach is placed to the left of the approaching drivers, in the center island, at a point in the curve where the crosswalk is not visible. This sign placement is confusing. Several improvements to this crosswalk are recommended.

- Remove the boxwood hedge and replace it with very low-growing plants to expand the view of the crosswalk through the landscaped island for southbound San Rafael Avenue traffic.
- Relocate the W11-2 sign to the far side of the intersection, at the “top of the tee,” and replace the existing arrow placard with a “left arrow” placard and a distance placard, “50 feet.”
- If possible, trim the hedge on the west side of the intersection to expand the view of Beach Road.
- Restripe the crosswalk with continental striping.

### *Teal Road and Cove Road Intersection Crosswalks*

The crosswalk at the Teal Road intersection is approximately 160 feet east of the yacht club entrance crossing noted above, though it crosses Beach Road where there is two-way median-divided traffic. There is a second intersection crosswalk on the south side of Beach Road, across Teal Road, which helps define the intersection, and improves pedestrian awareness. Signing at this location could be improved by adding a Pedestrian Crossing sign at the crosswalk for the eastbound approach, and replacing the “diagonal arrow” placard with an “Ahead” placard on the existing Pedestrian Crossing (W11-2) sign installation facing westbound traffic.

The crosswalk on Beach Road at Cove Road is adequately visible on the uncontrolled eastbound approach. Similar to the crosswalks along the waterfront on San Rafael Avenue, eastbound drivers may be distracted by views of the San Francisco Bay that forms the south side of the street. It is recommended that an In-Street Pedestrian Crossing sign (R1-6) be installed.

### **Citywide Pedestrian Signage**

The background color on all the Pedestrian Crossing warning signs, including the W54 and W11-2, in the City of Belvedere is standard yellow. Upgrading these to the fluorescent yellow-green background color would be appropriate for the mid-block or restricted sight-distance crossings. Such a systematic approach to the application of different sign colors could help alert drivers to use extra caution when approaching these particularly challenging crosswalk locations.

### **Potential Future Crosswalk Locations**

In addition to San Rafael Avenue and Beach Road, other primary streets were driven, including Cove Road, Lagoon Road, the southern end of Beach Road, Belvedere Avenue, and Golden Gate Avenue, to search for any locations where a crosswalk should be considered. Collision records were reviewed for these streets to identify any locations where pedestrian-involved collisions have occurred. Based on this information, the following intersections are recommended as potential future crosswalk locations.

#### Cove Road/Lagoon Road

Cove Road and Lagoon Road are essentially the same street, with Cove Road providing a connection to the south and Beach Road, and Lagoon Road providing a connection to the north and San Rafael Avenue. These streets are stop-controlled where they intersect, at Mar West Street and Tiburon Boulevard. There is a marked crosswalk on Tiburon Boulevard, providing a pedestrian connection into the Town of Tiburon. There is a sidewalk along the west side of Lagoon Road and both sides of Cove Road. A crosswalk on the south leg, across Cove Road, would provide a link to the Town of Tiburon crossing.

Lagoon Road/Maybridge (southerly loop)

This is an all-way stop-controlled tee-intersection, with a pedestrian path forming a fourth leg (for pedestrian traffic) to the east, to Tiburon Boulevard and to Reed School. A marked crosswalk on the southerly leg of this intersection would align with this path, providing a reasonable crossing location.

Beach Road/Peninsula Road

This is a tee-intersection, with the minor street, Peninsula Road, stop-controlled. There is a median within the center of all of the street approaches. Despite the challenges that these medians pose to marking a crosswalk on either leg of Beach Road, a marked crosswalk would be particularly helpful for the Peninsula Road residents who wish to reach the waterfront on the south side of the street.

**Recommendations**

- Install a marked crosswalk on San Rafael Avenue at Hilarita Circle, with the same signs and markings that exist at the other three crosswalks on San Rafael Avenue along Richardson Bay, including the In-Street Pedestrian Crossing sign (R1-6).
- Trim the landscaping on northbound San Rafael Avenue near the West Shore Road crosswalk, to improve the visibility of the crossing, and remove the W54 warning signs by January 1, 2011, or replace with W11-2 warning signs.
- Add continental striping to the mid-block crossing at 339 San Rafael Avenue at Belvedere Community Park, and replace the “diagonal arrow” placard with an “ahead” placard for northbound traffic.
- Trim the shrubs along the church property frontage that obstructs the sight distance for southbound motorists approaching the mid-block crosswalk located at 515 San Rafael Avenue, and remove the W54 warning sign with a W11-2 warning sign per the CA-MUTCD requirements. Similarly, replace the northbound-facing W54 sign with a W11-2 sign and “Ped Xing” placard with the “two diagonal arrow” placard that serve this mid-block crosswalk and the adjacent Community Road crosswalk.
- At the mid-block crosswalk on Beach Road at the yacht club entrance, consider implementing four changes, including replacing the hedge in the island with very low-growing plants (12 inches or shorter); relocating the W11-2 to a more visible location on the far side of the intersection at San Rafael Avenue/Beach Road, and change the placard to a “left arrow” and “50 feet”, to add more description to the crossing location; add continental striping to this crosswalk; and trim the very tall hedge on the west side of San Rafael Avenue to improve visibility of the Beach Road eastbound approach.
- Replace the “Ped Xing” placard on westbound Beach Road at Teal Road with an “Ahead” placard.
- Add an In-Street Pedestrian Crossing (R1-6) sign on eastbound Beach Road at the Cove Road crosswalk.

- Consider upgrading the background color from standard yellow to fluorescent yellow-green at the three mid-block crosswalks, including those located at 339 and 515 San Rafael Avenue at the yacht club entrance, as well as the sight-restricted intersection crosswalk at San Rafael Avenue/West Shore Road.
- Consider marking crosswalks on Cove Road at Lagoon Road, on Lagoon Road at the southerly loop of Maybridge to align with the pedestrian path on the east leg, and on Beach Road at the Peninsula Road intersection.

Thank you for giving W-Trans the opportunity to provide these services.

Sincerely,

Mary Jo Yung, P.E. PTOE  
Associate

MJY/mjy/BEL003.L1.wpd

Enclosure: Crosswalk Inventory Summary

December 2008  
**Crosswalk Inventory**  
**City of Belvedere**

Locations	Crosswalk Type	Collisions Involving Pedestrians	Signs				Markings	Restricted View of Crosswalk	Sidewalk/Path on one side (1) or both sides (2)
			W11-2	R1-6	Ped Xing placard	Arrow placard			
<b>Existing</b>									
San Rafael Ave/Lagoon Rd	Intersection	0		X			Crosswalk	No	2
San Rafael Ave/Hilarita Circle	Intersection	0						No	2
San Rafael Ave/Windward Rd	Intersection	0		X			Crosswalk	No	2
San Rafael Ave/Edgewater Rd	Intersection	0		X			Crosswalk	No	2
San Rafael Ave/West Shore Rd	Intersection	0	Both approaches	X		SB approach	Crosswalk	Yes, NB approach	2
San Rafael Ave @ 339-Community Park	Mid-block	0	Both approaches			Both approaches	Crosswalk	No	1
San Rafael Ave @ 515	Mid-block	0	Both approaches		Both approaches		Crosswalk	Yes, SB approach	1
San Rafael Ave/Community Rd	Intersection	0	NB		NB		Crosswalk	No	2
Beach Rd @ Yacht Club	Mid-block	0	X			X	Crosswalk	Yes	1
Beach Rd/Teal Rd (private road)	Intersection	0	WB approach			WB approach	Crosswalk	No	2
Beach Rd/Cove Rd	Intersection	0					Crosswalk	No	2
<b>Potential</b>									
Cove Rd/Lagoon Rd	Intersection	0					Stop Legend, limit line	No	2
Lagoon Rd/Maybridge (Southerly loop)	Intersection	0					Stop Legend, limit line	No	1
Beach Rd/Peninsula Rd	Intersection	0						No	2